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THE IMPACT OF WOOD MARKET ON SOCIO-ECONOMIC COMPONENT OF SUSTAINABLE DEVELOPMENT OF WOOD SECTOR IN SERBIA

DOCTORAL THESIS

Belgrade, 2015.

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Date of thesis defense:

Title of thesis:

„ THE IMPACT OF WOOD MARKET ON SOCIO-ECONOMIC COMPONENT OF SUSTAINABLE DEVELOPMENT OF WOOD SECTOR IN SERBIA”

Summary:

The subject of research in this thesis is the wood market and, connected to it, economic activities in the wood sector in Serbia. Aiming to determine and quantify the significance of social factors and their contribution to wood sector development, indicators which numerically present this significance, have been chosen. The analysis of chosen indicators has been carried out aiming to contribute to the social role and significance of wood sector in a clearer and economically more quantifiable way.

The present state and its socio-economic significance is the result of many factors. Transition processes in Serbia, which started in the 1990s, have led to the significant changes in wood sector in Serbia. The changes moved towards state centralization of management of forest resources and privatization and defragmentation of works in forest utilization and wood processing. Processes of privatization and building of new factories were fostered by the suitable offer of wood raw material. The approximate production of industrial wood in the period 2000-2012 was 0.96 *million m³,* which positively influenced the development of the wood sector.

The number of companies in 2011, especially small ones, dealing with wood processing was exceptionally high. It was evidenced that as many as 2,855 active companies and entrepreneurs existed, out of which 1,827 belonged to the category of companies employing fewer than 50 workers. At the same time, 12 companies did the work of forest management. The total number of the employed and self-employed in the wood sector was as high as 31,000 workers, out of which 18,293 directly employed. The most significant changes in relation to the number of the employed in the wood sector were related to the ''migration'' of labor force towards economically more developed parts of the country, most of all Belgrade and Vojvodina. By analysis of the flow of wood traffic the relocation of wood processing factories to more developed parts of the country was noted, which led to territorial discrepancy of processing facilities and forest resources. Consequently, in the region ''South and East Serbia'' which covers 46% of the total forest area in Serbia, not more than 21% of workers in the field of wood

processing and wood production are employed. On the other hand, in the region of Vojvodina and Belgrade, 43.7% of workers are employed.

Export-import trends in the wood sector are positive. As a result of demand and business activities in the wood sector, the export of wood products was rising, and in 2012 reached €183.8 *million*. The positive balance, of not more than €2 *million* in relation to the import of wood products, was evidenced for the first time in 2011 and in the next year it reached the sum of €19.5 *million*. The analysis of current trends, as well as the rise in consumption in countries of the UNECE region, shows that the export of wood products may have the positive increase. Modern use of the biomass can also influence further growth of production and export. However, the structure of export points at the underdevelopment of final wood processing and production of furniture made of solid wood, which directly reduces potentials for employment and productivity of using forest resources.

The analysis of the value chain showed the significance and the presence of certain phases of production through making added value and the employment of workers. In the example observed, the participation of technical roundwood in the value of the final product was only 13.3%. At the same time, all business activities covering wood sector participated with 33.8%. The remaining value added of 66.2% was made during the process of making final wood products and their transport to the ultimate customer on EU market. It was also determined that the price of the roundwood during processing to the final wood product could rise by 7.5 times.

Despite all the problems, the contribution of the wood sector to the Serbian economy is not negligible. Calculation carried out on the basis of real data showed that the participation of the wood sector in the gross domestic income of the country was 0.64%. The contribution of the wood sector to public revenue in 2011 amounted to €95.5 *million* and was 6.7 times higher than state allocations for the development of the sector.

Naslov doktorske disertacije:

„UTICAJ TRŽIŠTA DRVETA NA SOCIO-EKONOMSKU KOMPONENTU ODRŽIVOG RAZVOJA DRVNOG SEKTORA U SRBIJI"

Rezime:

Predmet istraživanja u ovoj disertaciji predstavljaju tržište drveta i s njim povezane ekonomske aktivnosti u drvnom sektoru Srbije. U cilju utvrđivanja i kvantifikovanja značaja društvenih faktora i njihovog doprinosa razvoju drvnog sektora, izabrani su indikatori kojima se ovaj značaj može numerički iskazati. Analiza odabranih indikatora sprovedena je sa ciljem da doprinese jasnijem i ekonomski merljivijem sagledavanju društvene uloge i značaja drvnog sektora u Srbiji.

Sadašnje stanje drvnog sektora i njegov socio-ekonomski značaj rezultat je uticaja mnogih činilaca. Tranzicioni procesi u Srbiji koji su započeli 90-ih godina XX veka doveli su do značajnih promena u drvnom sektoru. Promene su se odvijale u pravcu državne centralizacije upravljanja šumskim resursima i privatizacije i defragmentacije poslova na korišćenju šuma i preradi drveta. Procesi privatizacije i izgradnje novih fabrika za preradu drveta bili su podstaknuti odgovarajućom ponudom drvne sirovine. Prosečna proizvodnja industrijskog drveta u periodu 2000. do 2012. godine iznosila je 0,96 *million m³*, što je imalo značajan pozitivan uticaj na razvoj drvnog sektora.

Broj preduzeća u preradi drveta, posebno malih preduzeća, u 2011. godini bio je izuzetno visok. Evidentirano je čak 1.855 aktivnih preduzeća i preduzetnika, od čega 1.827 pripada kategoriji preduzeća koja imaju manje od 50 zaposlenih. U isto vreme, poslove gazdovanja šumama obavljalo je 12 preduzeća. Ukupan broj direktno zaposlenih i samo zaposlenih u drvnom sektoru je preko 31.000 radnika, od čega je 18.293 direktno zaposlenih. Najznačajnije promene u odnosu na broj zaposlenih u drvnom sektoru Srbije odnose se na „pomeranje" radne snage ka ekonomski razvijenijim područjima, pre svega ka Beogradu i Vojvodini. Analizom tokova prometa drveta takođe je uočena pojava premeštanja fabrika za preradu drveta ka ekonomski razvijenijim delovima zemlje, što je dovelo do teritorijalne neusklađenosti preradnih kapaciteta i šumskih resursa. Kao posledica ovoga, u području „Južna i Istočna Srbija", koje obuhvata 46% od ukupne površine šuma Srbije, zaposleno je svega 21,0% radnika iz oblasti prerade drveta i proizvoda od drveta. Na drugoj strani, na području Vojvodine i Beograda zaposleno je 43,7% radnika.

Trendovi izvoza i uvoza u drvnom sektoru su pozitivni. Kao rezultat potražnje i poslovnih aktivnosti drvnog sektora, izvoz proizvoda od drveta beležio je rast i u 2012. godini dostigao vrednost od 183,8 *million €*. Pozitivan bilans u odnosu na uvoz proizvoda od drveta prvi put je zabeležen 2011. godine, od svega 2 *million €*, ali već u narednoj godini dostigao je 19,5 *million €*. Analiza dosadašnjih trendova, kao i razvoj potrošnje u zemljama UNECE regiona, ukazuju da bi izvoz proizvoda od drveta i dalje mogao da ima pozitivan rast. Savremena primena biomase za energetske potrebe takođe može uticati na dalji rast proizvodnje i izvoza. Međutim, struktura izvoza ukazuje na nizak stepen razvijenosti finalne prerade drveta i proizvodnje nameštaja od masivnog drveta, čime se na direktan način smanjuju potencijali za zapošljavanje i umanjuje produktivnost korišćenja šumskih resursa.

Analiza lanca vrednosti pokazala je značaj i zastupljenost pojedinih faza proizvodnje kroz stvaranje dodate vrednosti i zapošljavanje radnika. U posmatranom preduzeću, učešće tehničke oblovine u vrednosti gotovog proizvoda iznosilo je svega 13,3%. Istovremeno, sve poslovne aktivnosti koje obuhvata drvni sektor učestvovale su sa 33,8%. Preostala dodata vrednost od 66,2% nastala je u procesu izrade finalnih proizvoda i njihovog transporta do krajnjeg kupca na tržištu EU. Takođe, utvrđeno je da se vrednost oble tehničke građe njenom preradom do finalnog proizvoda može povećati za 7,5 puta.

Pored svih problema, doprinos drvnog sektora ukupnoj ekonomiji Srbije nije zanemariv. Obračunom koji je izvršen na osnovu realnih podataka ustanovljeno je da učešće drvnog sektora u ukupnom bruto domaćem prihodu zemlje iznosi 0,64%. Doprinos drvnog sektora javnim prihodima u 2011. godini iznosio je 95,5 *million €* i bio je 6,7 puta veći od državnih izdvajanja za potrebe razvoja sektora.

CONTENT

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ABBREVIATIONS

ATM – *Analysis of Material Flows*

GDP – *Gross Domestic Product*

BRA – Agency for Business Registry

CCIS – *Chamber of Commerce and Industry of Serbia*

CoC – *Chain of Custody*

CSR –*Corporate social responsibility*

EU – *European Union*

FAO – *Food and Agriculture Organization of the United Nations*

FSC – *Forest Stewardship Council*

ISIC – *International Standard Industrial Classification*

MAFW– *Ministry of Agriculture, Forestry and Waters*

MCPFE – *Ministerial Conference on the Protection of Forests in Europe*

NFI – *National forest inventory*

NP – *National Park*

NTUS - *Nomenclature of Territorial Units for Statistics*

PE – *Public Enterprise*

SORS – *Statistical Office of the Republic of Serbia*

UNFF – *United Nations Forum on Forests*

VAT – *Value Added Tax*

1 INTRODUCTION

The forest, as a renewable natural resource, represents the source of the raw material by which, during the process of wood processing and trading, many economic and social needs of a society are fulfilled. At the same time, the forest is just a conditionally renewable natural resource that must be used in accordance with the criteria and principles of sustainable development. Therefore, the economic and social potentials of forestry and wood processing are limited, since forests can be used exclusively in the way and in quantity insuring the fulfillment of ecological, economic and social functions of present and future generations.[1]

The basic principles of sustainability of forest production were defined back in the 13 century, as a result of the aspiration of European rangers to insure durability of the yield, production and income. The first recording of a permanent usage of forests was noted by Hanns Carl von Carlowitz in Germany, in 1713 (Sylvicultura Oeconomica") (Grober, 2013) (Grober, 2007), who connected the necessity of continued and sustainable usage of forests to the very survival of the country. At that time forests in Europe were managed by clean logging,which, in case of failure to renew, led to the reduction of production potentials of forests. Also, due to deforestation caused by the intensive industrialization and changes in the purpose of the soil, the areas covered by forests were drastically reduced. Consequences of deforestation caused major concern because forests were important boosters of European economy. Aiming to solve the problem, rangers, especially in Germany, established the principle of permanence of yield in forest management. The basic idea was simple, if you planted enough trees to replace those you had cut in the course of a year, and you managed to ensure that the newly planted stands grew regularly, you would have the permanent wood production. At that time it was an original idea which boosted the development of the principle of permanence and caused the change in usage of forests based on needs to use forests according to natural possibilities and forest productivity. Then established principle of permanence was the first defined attitude to usage of natural resources and laid the foundation on which the modern forestry was developed. This, for that time, basic change of a concept in management and usage of forests, had an important impact on wood market. The demand for wood could no longer be crucial for making decisions

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[1] Acknowledging the pronciples MCPFE Helsinki Resolution, 1993.

about the amount of logging. Likewise, the market could be planned and developed for longer periods, considering the fact that the amount of forest utilization became defined and predictable in the long term.

The original principle of permanence has since been improved with the purpose to encompass the more distinctive social and ecological aspects of the wood sector.

Such a positive change is vividly seen in the report „Our common future" (Brundtland, 1987), within The World Commission on Environment and Development, given by Gro Harlem Brutland, which was actually the beginning of an intensive development of global concept of sustainable development. This concept, basically, consists of principles of sustainability in forestry, which is of considerable importance for sustainable development

Figure 1: Presentation of the concept of sustainable development *(IUCN 2006)*

of the wood market. The concept also supplements the principles while confronting with the more striking environmental and social needs of the planet. Identification of problems concerning deterioration of environment and possible consequences to economy and social development preceded the development of the concept. Brutland's report, itself, defined sustainable development as „*development that that meets the needs of the present generations without compromising the ability of future generations to meet their own needs*" (Brundtland, 1987). The concept was also based on the necessity to ensure the basic vital needs for poor world population, and, on the other hand, on imposing limits to technological development and social organisation related to the present and future demands.

The National Strategy of Sustainable Development of the Republic of Serbia defines sustainable development as a target oriented, longterm, continuous, comprehensive and synergetic process influencing all aspects of life (economic, social, environmental and institutional) at all levels. The long-term concept of sustainable development implies continuous economic growth, but such growth which, apart from economic efficiency and technological progress, greater participation of clean technologies and innovations and corporate social responsibility, ensures reduction of

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poverty, better usage of resources, improvement of health conditions and life quality and reduction of pollution to the level acceptable by all factors of environment, prevention of imminent polution and preservation of the biodirvesity (Vlada Republike Srbije, 2008).

Ensuring sustainable development of a country, region, industry or a segment of society cannot be viewed in isolation from other areas or activities. Interaction and linkage of all the factors of sustainable development contribute to dynamics and changes that are almost always reflected through changes in some of the segments of the market, goods, labor force or capital. On the other hand, changes in the market directly or indirectly influence many factors of sustainable development. What is the cause and what the consequence of this mutual relationship, is often very difficult to determine.

Applicable principles of sustainable development aim to establish a harmonious relationship among many environmental, economic and social demands of society. However, they generally do not recognize the market and its fluctuations. Forced, unplanned deviations from the long-term defined forest management plans, intensification of forest management measures and increase in deforestation (eg. due to inclement weather, windthrow, insect infestations, etc.) often have a direct and usually negative impact on the market of wood. In the opposite direction, a change on the wood market (compared to the demand or assortment structure), often affects the implementation of the long-term plans and the objectives of forest management. All unplanned and unexpected market changes, as a rule, influence the overall state of the wood sector, including its socio-economic component.

1.1 Formulation of research problems

During the late twentieth and early twenty first century the wood sector in Serbia went through significant changes that affected the relations between supply and demand of wood and wood products. Wood processing companies were fully privatized in the process of ownership transformation. During that process a large number of state-owned companies disappeared, and many new private companies appeared. Investments of foreign companies in the construction of a wood procession plant additionally contributed to changing relationships within the wood sector in Serbia. A large number

of small private companies, in the field of forest utilization, arising in the process of restructuring public forest companies, contributed to these changes.

The effects of changes, due to the impact of market and economic flows in wood sector, are more complex than in any other segment. They go deep within the activity and manifest through numerous features of the sector. One of the characteristics is manifested in performing activities in a large area, under the open sky and employing population in rural and underdeveloped areas. This population is particularly sensitive because, in cases of a job loss due to disruption of the market, there are no many other employment opportunities. Also, there are labor-intensive sectors in wood industry because a large number of production workers are engaged per production unit, and any change in the market can significantly affect their engagement. Within the supply chain of raw material, as well as in the distribution of most products from the wood sector (including all wood fuels), a relatively large number of workers is additionally engaged, thus increasing its socio-economic importance.

It is necessary to emphasize the fact that, in general, the sectors of forestry and wood industry in Serbia are low-profit. This statement is especially true for the industrial sub-sector whose level of technological development is very low (Glavonjić, 2008). On the other hand, the situation on financial market, the height of interest rates and the opportunities for support are of extreme importance for the development of this sector.

Despite all this, the importance of the wood sector is, by habit, viewed through its economic indicators, such as production and trade of wood products, its share in GDP, employment and participation in export. Other aspects, arising from the concept of sustainable development, and which additionally take into account the economic and overall social and environmental importance of the wood sector in Serbia have never been the subject of any significant research so far.

1.2   Theoretical basis and review of previous research

The concept of sustainable development in the field of forestry on national level got its defined framework on the Ministerial Conference on the Protection of Forests in Europe (MCPFE). The principle for sustainable forest management is defind as: „sustainable forest management means the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration

capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and thus does not cause damage to other ecosystems.''

The concept of the development of forestry based on these principles was accepted at the conference in Helsinki, where the participating countries (EU-27 + other European countries), adopted the so called ''Helsinki Resolution'' (1993). In the follow up activities within MCPFE process, at the conference in Lisbon in 1998, the resolution L1 (People, Forests and Forestry) was adopted, defining socio-economic aspect of sustainable development and identifying the basic indicators and guidelines for future activities to increase social contribution of wood sector.

Through the development of The Concept of sustainable development, today are generally recognized three main aspects of sustainability (Harris, 2000),:

- **Economic,** An economically sustainable system must be able to produce goods and external debt, and to avoid extreme sectoral imbalances which damage agricultural or industrial production;
- **Environmental,** An environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources;
- **Social,** A socially sustainable system must achieve distributional equity, adequate provision of social services including health and education, gender equity, and political accountability and participation.

After, on the initiative of the United Nations, the concept of sustainable development had become globally accepted, research was intensified in order to determine the importance of economic activities, including the wood sector, compared to the overall environmental, social and economic aspects at all levels of society. Elaboration of the concept of sustainable development in the wood sector at the supranational level started back in 1993 and since then it has been developing under the patronate of the United Nations.

Non-governmental sector responded to the objectives relating to sustainable development of the wood sector by establishing a process of forest certification and the certification of the process in the wood sector, as a market-based instrument that verified the compliance of practices with the principles of sustainable development in this sector. Regardless of many difficulties, forest certification has been very successful in raising awareness and disseminating knowledge on a holistic SFM concept, embracing economic, environmental and social issues, worldwide (Rametsteiner, i drugi, 2003). Wood products that incorporated all requirements set had an open road to markets of developed countries. Using developed indicators in the process the assessment of fulfillment the set of criteria and the impact of the wood sector to processes in society and nature was carried out. The percentage of forests that had some of the recognized certification for sustainable forest management, as well as the number of participants in the control chain monitoring processes (CoC) showed the achieved level of compliance of practices with the principles of sustainable development. Concluding December 31, 2012, 980,504 ha were certified in Serbia, which represented 43.5% of the total area under forests. Also, on the same date, there were 80 CoC certificates in Serbia (Source: FSC database).

These processes and activities, aiming at the implementation of sustainable development in the wood sector, have had the support of the scientific community for the last fifteen years,. However, sufficient research to define criteria and indicators against which you can evaluate the contribution of the sector and the impact of changes in social development have not been carried out.

Many developed European countries established a list of indicators on which they performed appropriate studies and analyses of the situation in the sphere of socio-economic and environmental aspects of the wood sector. Such analyses were continuously being carried out and they indicated changes, their cause and importance for situation in a sector. Global economic crises and the intensity of changes on the market asked for continuous follow-up of values and changes of chosen indicators.

Wood sector generates higher employment than conventional statistics shows. Traditional definition of employment, meaning taking part in a labor market, is not adequate in relation to reality where forestry is an important source of income to many people. The difference among employment, self-employment and work to survive is not essentially important to these people (Poschen, 2004). The impact of working forests on

rural jobs has been of special interest given the dependence of timber dominant communities on forest-related jobs (Lippke, et al., 2005).

Multifunctionality of forests requires that all of its contributions be evaluated in order to assess the overall contribution of forestry to the economy. In some areas, the forest production sector may be the greater contributor to rural economic well-being. In others the local forest-dependent spending associated with firms and households living in a tree-rich environment might contribute more to local economies than the benefits arising from production forestry. (Slee, et al., 2004).

In order to assess these contributions of the wood sector, the indicators, as a means of information, received great attention in a short time. From the standpoint of the overall socio-economic importance of the wood sector and the necessary consideration of all contributions within the (ECE/FAO, 2013), a set of criteria and indicators considering the wood sector as a whole, have been developed. They are divided into two parts :

a. Indicators of forest management in accordance with the approved pan-European criteria and indicators;

b. Indicators relating to production, consumption and trade of wood and non-wood forest products and services.

Accepting multifunctionality requires evaluating many impacts on the development of society, and it is necessary to apply appropriate techniques (COFORD, 2006). It seems that the major economic benefits of forests (employment and economic benefits) may be unchanged or declining, while at the same time social and cultural benefits grow (GFRA, 2010).

Researches, within socio-economic criterion, considering impact of some factors to sustainable development of the wood sector in Europe have been intensified in the last ten years. Taking in account the growing need for quantitative evaluation of the importance of the wood sector in relation to socio-economic and other aspects within sustainable development, numerous national and regional studies dealing with this subject of research can be found [2]. In these studies is given the overview of wood sector, analyzed the contribution of the sector to the national economy, it's social significance, the impact on the employment, importance for the community development and other aspects.

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[2] Study of wood sector (Lithuania), 2008, Methodological Centre for Vocational Education and Training, Vilnius; The socio-economic contribution of forestry in Ireland, 2006.

At global level within FAO (Forest Products and Economic Devision, Rome) surveys (research), dealing with the state and contribution of the wood sector in a larger number of national economics, were carried out , (Lebedys, 2004), (Lebedys, 2008). This research had analyzed the current status of the values of economic and social indicators. The trends are assessed in the relation to certain indicators, such as employment, productivity, value added, the share of gross domestic product, import and export, etc..

In a certain number of studies, investigating social importance of the wood sector, and which were implemented in other countries, the research was focused mainly on the employment generated by the wood sector. This approach was the result of too much emphasis put to economic significance in the past and due to the lack of appropriate tecniques to evaluate its social significance (COFORD, 2006). Since the social significance changes in time, the indicators must be able to show these changes (John, et al., 2001).

When it comes to Serbia, current researches have predominantly been focused on monitoring of participation of indicators in the gross domestic product, foreign trade, number of companies and employment. However, the methodology and the way of recent monitoring differ considerably from the methodology of monitoring and presentation defined by the UN and the MCPFE. According to this methodologies, more comprehensive look at the overall socio-economic importance of the wood sector is required. For example, MCPFE methodology contains six groups and 35 valuable indicators, that comprehensively assess the economic, environmental and social importance of the wood sector (MCPFE, 2002).

1.3 Subject, Object and Purpose of research

Wood sector offers a wide range of social and economic benefits, from those that can easily be quantified through their economic value (concerning products and services), to those that that cannot be quantified because of their indirect contribution to social development. In order to monitor the progress of the sustainable development concept, it is necessary to monitor changes in results in social and economic sphere, as well as in protection of the environment (GFRA, 2010).

The subject of research in this thesis is the wood market and related socio-economic activities in the wood sector in Serbia. In the domestic professional literature wood sector is mainly conceptually linked to the field of wood processing while the foreign literature usually indicates the sector as forestry sector[3]. Besides the term forestry sector, international terminology uses the term forest based sector or forest wood chains, which implies activities generating added value in production processes in which forest resources are processed into products and services. This chain can be extended from forest management to the final use of a product (Marcus, et al., 2010).

In some neighboring countries, notably in Croatia and Bosnia and Herzegovina, the term "wood sector" is in use, which more accurately reflects the essence of the idea, and suggests that the mentioned term does not refer only to forest management and natural resource management, but the wood is considered as the object of work and trade, in all its forms in which it appears on the market[4].

In international practice, business activities of forestry and forest utilization, wood industry and paper and pulp production, are often observed as a unique system, which is in common use in UNECE/FAO[5].

Ideally, the sector should be defined to include all economic activities that mostly depend on the production of goods and services from forests. This would include commercial activities that are dependent on the production of wood fibre (i.e. production of industrial roundwood, woodfuel and charcoal; sawnwood and wood based panels; pulp and paper; and wooden furniture). It would also include activities such as the commercial production and processing of non-wood forest products and the

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[3] FAO in its definition implies „Ideally, forestry sector should be defined to include all economic activities that mostly depend on the production of goods and services from forests. This would include commercial activities that are dependent on the production of wood fibre (i.e. production of industrial roundwood, woodfuel and charcoal; sawnwood and wood based panels; pulp and paper; and wooden furniture)..", http://www.fao.org/docrep/007/ad493e/ad493e05.htm, UN 2003

[4] In Bosnia and Hezegovina and Craotia, in official documents and papers, one can find the use of the term wood sector which encompasses business activities of forestry and wood sector, as it has been explained in this chapter(eg "Export Strategy in Wood Sector", Foreign trade Chamber of Bosnia and Herzegovina; "Competitiveness of Croatian wood processing sector," Martin Basarac Sertić, 2013, Croatian Academy of sciences and Arts "Opportunities and constraints to increase the competitiveness and productivity ofthe Croatian wood processing sector,"Dr. Mladen Figurić, 2006, Faculty of Forestry, Zagreb, etc..).

[5] Forest and economic development: A Driver for the Green Economy in the ECE Region, United Nations economic commission for Europe, Geneva 2013.

subsistence use of forest products. It could even include economic activities related to production of forest services (although it would be difficult to determine exactly which activities are really dependent on forest services) (Lebedys, 2008).

Within the UNECE / FAO, by the analysis of economic activities in the forest sector, the following activities in ISIC classification are included[6]:

1. ISIC Division 02 (Forestry and logging and related activities);
2. ISIC Division 20 (Manufacture of wood and wood products, except furniture, manufacture of plaiting);
3. ISIC Division 21 (manufacture of paper and paper products).

This division is in accordance with the division of MCPFE, where the term forestry sector includes the same activities.[7]

If the specified classification is conveyed to the classification of activities applying in the European Union, as well as the classification of activities in Serbia[8], the following list of activities which are included within the term "wood sector" is obtained, and as such are the subject of research in this dissertation:

Sector a) Agriculture, forestry and fisheries, covered in section 02: Forestry and logging, which by definition includes the production of round wood and the most necessary processing of felled trees in the forest (cutting branches, peeling, making of logs, logs and fuelwood). Further processing of wood and other assortments, which are not usually done in the woods but in separate production units, falls under section 16.

Sector c) - Manufacturing covers section 16: Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materialsmanufacture of wood and wood products, cork, straw and plaiting materials, excluding furniture. Manufacture of wood products (eg. planks, boards, veneer, crates, flooring, tiles, prefabricated wooden houses, wood, etc.) is covered by this section. Within section 16 there are the following sections and groups: Sawmilling and planning of wood (16.1), Manufacture of products of wood, cork, straw and plaiting

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[6] According to International Standard Industrial Classification of all Economic Activities (ISIC) (ISIC Revision 3.0).

[7] Forestry and logging (ISIC/NACE 02), Wood industries (ISIC/ NACE 20) i Pulp and paper industries (ISIC/NACE 21)

[8] Classification, which is in use in Serbia, is harmonized with Eurostat classification – Statistical Classification of Economic Activities in the European Community, Rev. 2 (2008).

materials (16.2), Manufacture of veneer sheets and wood-based panels (16.21), Manufacture of assembled parquet floors (16.22), Manufacture of other builders' carpentry and joinery (16.23), Manufacture of wooden containers (16.24), Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials (16.29).

The above mentioned areas do not include manufacture of furniture.

Industry of pulp and paper is not the subject of analysis in the thesis, although wood sector includes production of pulp and paper, according to the mentioned definitions. The reason to exclude pulp and paper production from the research in the thesis is the fact that the last active production plant of pulp stopped working in 2007, after bankrupcy of the company ''Milan Stepanovic Matroz'' in Sremska Mitrovica. After that, the activities referring to pulp and paper production were not directly connected to the activities and resources of forestry in Serbia.

In section 02 "forestry and logging" for the purpose of this thesis, only the basic elements of importance to wood market and wood products have been discussed, such as production and trade in wood, the share of industrial roundwood, employment and number of workers engaged, as well as other data correlating with the production and trade of wood.

Taking into account the social importance of the forest sector under the patronate of the MCPFE, the principle of its sustainable development is defined as a unique principle used to monitor the condition and evaluate the results of the development. Within the principle of sustainable development a group of 7 criteria is defined and these criteria characterize or define the key elements or a group of conditions or processes according to which we may assess and evaluate the sustainability of the forest, and accordingly, the wood sector (Rametsteiner, et al., 2003). They are:

- Extent of forest resources,
- Health and vitality of forests,
- Productive functions of forests,
- Bio diversity,
- Protective functions of forests,
- Socio-economic benefits and needs, and
- Politics and institutional framework.

A unique list of indicators used to monitor changes of each criterion of sustainable development and progress towards achieving the set goals has been defined. The list of indicators contains 35 quantitative and 17 qualitative indicators. Within the criteria referring to socio-economic significance, the value of indicators and the conditions and changes in wood market and wood products are clearly connected. It is especially true for the part that wood sector has in the GDP, as well as in the level of employment in this sector.

Within the socio-economic criteria, an additional set of indicators has been identified where a significant connection between conditions and changes in the wood market and wood products is present. On the bases of this dependence, a selection of indicators, which, in accordance with the subject of research, have major influence on sustainable development of the wood sector in Serbia, has been made. For each of these factors, appropriate indicators were selected, which represent the base for understanding the causal relationship between factors and socio-economic components of sustainable development of the wood sector.

The selected socio-economic factors are roughly divided into two groups:

1.   social factors, (meeting the demand for wood and wood products, employment, development of responsible business) and

2.   economic factors (number and structure of enterprises and entrepreneurs, production value and business results, share of gross domestic product, the contribution of public revenues and reducing of energy dependence of the country)

With the purpose to determine and quantify the significance of social factors and their contribution to the development of the wood sector, the following indicators that can numerically express the significance, have been selected:

- Trade flow of wood (roundwood) and wood products in Serbia and their contribution to public revenues Serbia (added value tax),
- Consumption of wood *per capita* in Serbia with a comparative analysis of the relationship between import / consumption and export / production,
- Trade of wood and wood products,
- Employment (direct and indirect employment),
- Salaries of the employed and their contribution to local and public revenue of Serbia,

-   Contribution of the wood sector to cost reduction of unemployment in Serbia
-   Contribution of the wood sector to reducing energy dependence of the country.

Apart from the selected indicators that can be quantified, a research and analysis of indicators that cannot be accurately quantified in total, but have an impact on socio-economic component of sustainable development, have been performed:

-   contribution of wood market and wood products to the development of CSR in the wood sector in Serbia
-   Analysis of the value chain, as well as the role and importance of some of the participants in the chain, and
-   flow of wood trade for the year 2011 according to the methodology of the UNECE.

In order to determine and quantify the significance of economic factors to socio-economic component of sustainable development, the following factors have been selected:

-   the number and structure of a company according to its size, ownership and form of foundation,
-   the structure of a company according to the number of employees (small, medium and large),
-   the structure and territorial distribution of companies according to activities they perform,
-   the number of entrepreneurs and structure according to activities in the wood sector,
-   profit gained by companies and entrepreneurs in the wood sector in 2011,
-   the structure of employees and participation of highly educated personnel in companies in wood sector
-   the value of production of roundwood with the analysis of participation of individual assortments in public companies and national parks,
-   participation of wood sector in GDP in Serbia,
-   Allocations from the budget (amount and structure) for the wood sector in Serbia, with an analysis of the relationship: *the contribution of public sector to revenues / budget allocations for the wood sector*.

The selected groups of factors and their indicators haven't been the subject of a significant research so far, especially not in this form and amount as defined for the purpose of this thesis. It is necessary to mention that certain indicators are of a double importance: social and economic. Classification and grouping of such indicators into one or other group was done according to their importance to the observed components of sustainable development of the wood sector in Serbia.

Selected factors and their indicators present general and accepted terms that have been in use for the last couple of years all over the world. Speaking of Serbia, in the domestic professional scientific practice, the term wood sector and some indicators have rarely been used so far. By adopting the concept of sustainable development Serbia has officially incorporated among the countries whose strategies of development are based on the principle of sustainability, so the selected indicators and the new approach of considering the rule and importance of the wood sector have been given a new dimension and importance. Thus, this thesis, besides scientific, has a considerable practical significance.

Having in mind all specific things of proposed researches, the basic objectives of research in this thesis are:

- the analysis of the nature and depth of structural changes in the wood sector in Serbia during the transition period and their previous effects (both positive and negative) on the development of the wood market and wood products, with special emphases on the condition of the sector and its current strengths and weaknesses;
- the analysis of the role and significance of wood market for future development of the wood sector in Serbia using value indicators of selected indicators and their changes in a selected period of time;
- Benchmarking analysis of the value of selected indicators of the wood sector in Serbia compared to average values in a selected country in the EU, aiming at understanding the level of development, strengths and weaknesses of the wood sector in Serbia compared to the selected country;
- determining mutual relationship and causal connection of selected indicators using regression and correlation analysis, synergy effects, and, related to it, quantifying their impact and importance for achieving future (target) values of indicators, where the target values will be the values of indicators in a selected country of the EU;
- on the grounds of previous analyses (particularly benchmarking analysis) and mutual functional dependence of selected indicators, an optimal combination of

value of indicators in Serbia has been defined, with all the necessary measures, and the time needed to achieve the level of socio-economic component of the wood sector in Serbia compared to a selected country in the EU.

- Based on the results of previously conducted analyses and modeling, a set of measures has been provided to improve market mechanisms in order to boost sustainable development of the wood sector in Serbia in the future.

The results of the conducted researches, especially quantitative values of selected indicators, will contribute to a clearer and more economically measurable understanding of the social role and significance of the wood sector in Serbia, which is the basic purpose of the thesis. Values of selected indicators depend a great deal on situation on wood market and wood products, making the suggested researches even more important.

Territorial frame included all the districts in Serbia, and for the purposes of comparative analysis of some indicators, some countries of the European Union are included, with particular reference to Slovakia. The choice of Slovakia is result of the fact that the structure and characteristics of the wood sector in this country is largely similar to the structure and characteristics of the wood sector in Serbia.

1.4 Starting hypothesis

Bearing in mind the object and the purpose of the research, as well as the character of selected factors (social and economic), the following initial (working) hypotheses have been defined, for the purposes of this dissertation. They are:

H1: There is a strong causal connection between the flow of supply and demand on the marketof wood and wood products and selected indicators of a socio-economic component of sustainable development in Serbia.

H2: There is a strong synergy impact of the wood market and socio-economic factors on an overall sustainable development of the wood sector In Serbia.

H3: The total contribution of the wood sector to the public revenues of the Republic of Serbia is significantly higher than allocation of public funds for the wood sector in Serbia.

During the process of defining the initial hypotheses the starting assumptiont was that the changes in supply and demand on the market of wood and wood products largely influenced the value of selected indicators. The market initiates production and influences its volume and structure. This impact directly reflects in business results, employment and satisfying numerous social needs. Sustainable development of the sector, by its definition, depends on the state of an economic, environmental and social component, which implies that there is a significant impact of the wood market on the overall sustainable development of the wood sector. This fact was the starting point to define hypotheses H1 and H2.

Broader social contribution of the sector can be observed through its contribution to public revenues. On the other hand, one of the functions of public revenues is to encourage activities having economic prospects or special social significance (development of rural and underdeveloped regions, employment, better usage of renewable natural resources, etc), where the activities within the wood sector are some of them. The aim of research within hypothesis H3 directly referred to the analysis of the contribution of the wood sector to the public revenue of the Republic of Serbia and the allocation of public funds for its development.

Within the framework of defined hypotheses, forms and strength of interconnections of selected indicators have been researched, their synergy impact on socio-economic component of sustainable development of the wood sector in Serbia analyzed, and appropriate interpretations given.

2 Materials and methods of the research

In accordance with the objectives of the research and the main purpose of the thesis, an appropriate methodological framework has been adopted, consisting of general and specific scientific research methods. In the introductory part of the thesis the descriptive method was used, describing in details the subject, objectives and purpose of the research.

Historical methods and methods of analysis and generalization, induction and deduction were used as general scientific methods. The historical method was used in the part of the thesis relating to the determination of the changes of observed phenomena with the aim of reviewing the presence of patterns and understanding patterns in the existing socio-economic conditions.

Methods of quantitative analysis were used to determine the number and structure of companies, their regional dispersion, number of employees, foreign trade balance and financial results of company's and entrepreneurs' businesses in the wood sector in Serbia. The primary sources of the data for these analyzes were the official financial reports of companies and entrepreneurs in the wood sector in Serbia, obtained from the Business Registers Agency of the Republic of Serbia, as well as official data on foreign trade operations of the Statistical Office of Serbia, the data of the Serbian Chamber of Industry and Commerce, business reports of companies and other sources. Since companies are required to make their financial reports using unique methodology and patterns and whose accuracy is checked by the Agency before they are official approved, the relevance of the data has been obtained. It is also the case with official statistics on foreign trade in the wood sector in Serbia.

The sample on which the study on the financial results of business activities was conducted included all registered companies in the wood sector in Serbia.

Time coverage of the research of the selected indicators and factors depended on availability and accessibility of the data that the relevant institutions and companies had at the time. Availability of necessary data depended, as rule, on procedures of their collecting and processing and the deadlines for their publishing. The target year to analyze the selected indicators was 2012, but the data for that year were not available, so analyses were done using the data for 2011. Thus, for each single analysis of selected indicators there was the year given, as well as the source of the data. In all cases where

it was possible to obtain data for a longer period, they were processed and analyzed for that period.

Methods for quantitative analysis were used in the research process of development of corporate social responsibility in the wood sector in the part relating to the survey of decision makers. This choice was the result of the fact that business policies of public companies was such that they implemented corporate social responsibility, while with the companies dealing with wood processing the awareness of implementation of the concept was mostly present in large companies (although there were rare exceptions in medium and small companies). The reports of the Agency for Business Registry were used as additional source of data.

In addition, using the methods of quantitative analysis contributions of wood sector to public revenue of the local communities and the budget of the Republic of Serbia wereviewed and analyzed. Thus, as a primary source of data, business reports of companies, institutes and institutions, reports of the Ministry of Agriculture, Forestry and Waters, the Ministry of Education and Science, official data of the Agency for Business Registry, Tax Administration of the Ministry of Finance, and other institutions, were used. Time coverage was determined by the availability of the data requested in above mentioned institutions.

Methods of induction and deduction were used in determining the share of the wood sector in the gross domestic product of Serbia, as well as in consideration of the current situation in education and participation and the structure of skilled manpower in this sector. Deductive method was used to prove the hypotheses, and in the process of determining the contribution of the wood sector to reduction of the cost of unemployment and energy dependence of the country as well. To highlight the facts, knowledge and principles, that did not require special proof because they were obvious, the axiomatic method was used.

The method of generalization was used to make general conclusions about the importance and impact of selected factors on sustainable development of the wood sector in Serbia.

Considering special scientific methods, the econometric methods, based on regression and correlation analyses, were used. These methods were the basis for research of mutual relationship of selected values, as well as their synergy effect. Regression analysis was used to determine the type of dependence among the observed values, while the correlation analysis was used to determine the degree of their

dependence. The above mentioned analyses were made for the indicators where it was possible to obtain sufficiently large and reliable set of data.

The application of the author ''Correlation V 2.0'', intended for regression and correlation analyses, was used for data processing and making of statistical models. This application was adapted, and functionally extended for the functional needs of this thesis. In a smaller number of cases, with the purpose to check additionally the obtained results and analyses, the application ''SPSS Statistics 17.0''was used.

Statistical tests which were calculated for all displayed regression and correlation analysis are as follows[9]:

Mean	$Ya = \dfrac{\sum_{i=1}^{n}(Yi)}{N}$	(1)
Standard deviation(S)	$S = \sqrt[2]{\left(\dfrac{\sum_{i=1}^{n}(Yi - \overline{Y})^2}{(N-1)}\right)}$	(2)
Variance	$S2 = \left(\dfrac{\sum_{i=1}^{n}(Yi - \overline{Y})^2}{(N-1)}\right)$	(3)
Degrees of freedom of	$N\text{-}R\text{-}1$	(4)
Suma kvadrata odstupanja	$S = \sum_{i=1}^{n}(Yi - Yr)^2$	(5)
The standard error of estimate	$Sd = \sqrt[2]{\left(\dfrac{\sum_{i=1}^{n}(Yi - Yr)^2}{(N-R-1)}\right)}$	(6)
The average rate of change of	$Sp = \left(\sqrt[N-1]{\dfrac{Yn}{Y1}} - 1\right) * 100$	(7)
The coefficient of determination (bez stepena slobode)	$R = \left(\dfrac{\sum_{i=1}^{n}(Yr - \overline{Y})^2}{\sum_{i=1}^{n}(Yi - \overline{Y})^2}\right)$	(8)
The correlation coefficient (bez stepena slobode)	$R^2 = \sqrt[2]{\left(\dfrac{\sum_{i=1}^{n}(Yr - \overline{Y})^2}{\sum_{i=1}^{n}(Yi - \overline{Y})^2}\right)}$	(9)

[9] Variables that were applied in display functions indicate: N: Number of pairs (X, Y) data series, R level function, Y: dependent variable, Xi: independent variable, Yr: value of the dependent variables was obtained by the selected function, $\overline{Y}$ − arithmetic mean

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The coefficient of determination (korigovan sa stepenima slobode)	$R = 1 - \dfrac{\left(\dfrac{\sum_{i=1}^{n}(Yi-Yr)^2}{(N-R-1)}\right)}{\left(\dfrac{\sum_{i=1}^{n}(Yi-\overline{Y})^2}{(N-1)}\right)}$	(10)
Fisher's F-test	$F = \dfrac{\left(\dfrac{\sum_{i=1}^{n}(Yi-\overline{Y})^2}{(R)}\right)}{\left(\dfrac{\sum_{i=1}^{n}(Yi-Yr)^2}{(N-R-1)}\right)}$	(11)

These parameters were used in order to confirm the statistical significance of the obtained models. Arithmetic mean and standard deviation as well were used in all analyzes in order to determine the mean and average deviation from the mean of the observed values. The quotient of determination (r^2) was used to determine the representativeness of the regression line in order to determine the variability of Y, which could be explained by changes in X. The quotient of determination was used to analyze sales, relationship between sales and consumption, export of wood products, etc. Quotient of correlation was used to check the functional dependence and importance of models obtained by correlation analysis, as well as to select functions showing the pattern between Y an X values most successfully. In cases of large dispersion of points in the dispersion diagram it was not always possible to establish functional pattern. In ideal conditions quotient value is 1, so that the value closer to 1 shows greater importance of the selected function and correlation dependence. To test statistical significance of the established models the values of *F-test* were used, comparing the obtained result with the values on the table. The average rate of change, used in the analyses of time series of data, represents an average, relative (in %) change in the values of data during the whole time period. This figure shows the change in the value with an equal percentage of change during the given period.

To collect primary data relating to education and employment structure in companies, the research methods, such as survey and interview, were used.

Methodologies developed on Global (UNFF), European (MCPFE), and regional and national levels were the starting points for selection and analyzing the indicators.

Besides the mentioned methods and techniques, SWOT analysis was used with the aim to see advantages and disadvantages, as well as the danger and convenience for sustainable development of the wood sector, with special regard to its socio-economic component. SWOT analysis is an analytical method that defines critical factors having

the largest influence to socio-economic possibilities of the wood sector. This analysis is carried out through matrix of 4 elements: S- Strengths, W-weaknesses, O- opportunities, T- threats. Strengths represent positive, while weaknesses represent negative internal factors. Opportunities represent positive, while threats represent negative external factors. On the basis of this analysis the main weaknesses and threats that exist within the sector as a whole are shown, and which strengths and opportunities the sector can rely on in its future development. Timely identification of factors that adversely affect the development of the sector is important from the standpoint of creating an appropriate policy and, in this respect, the measures that will contribute to reducing the effects of their actions.

In order to compare indicators of development of the wood sector in Serbia with indicators of development of the wood sector of the selected countries of the European Union the comparative "benchmarking" technique was used. Within the analysis of some indicators, the values of the corresponding indicators in other countries were shown. In the concluding remarks (section 4 "

Discussion"), values of indicators of wood sectors in Serbia and the Slovak Republic were comparatively analyzed, and, on the basis of that analysis, advantages and disadvantages of the wood sector in Serbia have been identified and measures to improve its condition proposed. Slovakia was selected as an example, because these two countries had very similar structure of ownership within wood sector, organization, forest area, and historical heritage as well. Natural conditions for forest management, the forest coverage, the significant presence of beech (29-30%), additionally equal conditions. From the economic and political point of view, the Slovak Republic has gone the way of transition from socialist block country with a planned economy to a market-oriented economy and membership in the European Union. Serbia is on the path of transition and accession to the European Union, with a lot of problems to solve. Differences in the economic and political situation to a certain extent influence the performance of business of the wood sector.

For the purposes of collecting data for corresponding analyses the relevant databases of national and international organizations and institutions (National Bureau of Statistics, MCPFE, United Nation Economic Commission for Europe - UNECE, Food and Agricultural Organization - FAO, European Commission) were used, as well as research results of relevant research organizations.

The collected data were stored, in order to be analyzed, in databases in MS Access format and they were grouped, selected and summarized according to relevant queries. With the aim to interpret them geographically, the corresponding ''GEO-database'' was made using ''Esri - Arc Map 9.3''programme. Complete cartographic presentation in this paper was done using the GIS program tools.

Work program and procedures used to perform the research and elaborate this thesis are shown in the following scheme:

| A review of previous researches of this area (domestic and foreign) | → | Analysis of the existing literature of the defined areas and selection of the information relevant to research | → | Selection of appropriate methodology |

| Analysis and selection of data sources for the selected indicators | → | Data collection |

| Systematization of collected data and creation of databases | → | Logical and analytical data check | → | Software programming and statistical analysis | → | Display of spatial data (GIS) |

| Calculation and analysis of the values of selected indicators | → | Statistical modeling, analysis and interpretation of the results | → | Discussion of the results and proposals for further research | → | Conclusions |

Chart 1: Procedures in elaboration of doctoral thesis:

The presented chart shows that the investigations were divided into four logical sections. However, in the closing phases, during the development of analysis and interpretation of the results, in some cases was necessary to collect more data, complete the database and repeat the procedures for their verification.

3 RESEARCH RESULTS AND THEIR ANALYSIS

In conditions of market business the importance of the market for sustainable development of any sector of industry, economy and society in general is very large. The fact that all business activities of a company, salesman and any other participant start and finish on the market, can confirm this. For that reason the market is being paid a great attention today. Understanding the market, relationships among participants on the market, the level of organization and disorganization, and other elements, are essential for every company and its survival and development.

Importance of the market for sustainable development of a sector can be measured and expressed in different ways. In order to find out what the influence of the market for the social and economic sustainable development of the wood sector in Serba is, the principle of quantifying values and analyzing selected indicators, listed and explained in chapter „Object, aim and purpose of research"' has been adopted. In this sense what follows are the results of conducted surveys with relevant analyses, both for the social and economic component of sustainable development of the wood sector in Serbia.

3.1 Wood market and social component of the sustainable development of the wood sector in Serbia

Many social benefits provided by the wood sector its final valuation gain on the market. Some of them can be quantified, while others, of no less importance, are not directly measurable. Information on the status and trends of the social benefits of the wood sector are essential for monitoring the state sector.

Exploring the importance of the wood market for social component of sustainable development of the wood sector in Serbia included the study of all the elements that were important for the quantification of indicators that could express the significance in the best possible way. In this regard, the following are the results of surveys, with appropriate analyzes for the following indicators:

- Condition and production capacities of forests in Serbia in terms of wood supply;

- Wood turning in Serbia and its importance to public revenues;

- Contribution of the wood sector to public revenues in Serbia;

- Contribution of the wood sector to reduce energy dependence of the country;

- Export and import of wood and wood products in Serbia;

- Wood consumption per capita in Serbia;

- Employment in the wood sector in Serbia;

- Salaries of the employed and their contribution to local and public revenues in Serbia;

- Contribution of the wood sector to reduction of costs of unemployment in Serbia.

In addition to the listed indicators, for this segment of sustainable development of the wood sector, other surveys have been conducted, relating to:

- Contribution of the wood market and products of wood to development of CSR in the wood sector in Serbia;

- Analyses of the value chain and the role and significance of some participants in the chain;

- Flow of wood market in Serbia, aiming to review the amount of wood that is spent for production of some wood products in Serbia, to meet energy needs, or that is exported.

All these indicators have relevant significance for social component of sustainable development of the wood sector in Serbia, and thus, the defined and used methodology meant for the purpose of this thesis can be used for monitoring them and, in the years to come, it can be used for the needs of the development policy makers and other decision makers.

3.1.1   State and productive potential of forests in Serbia with regard to wood supply

Exploring the wood sector, its weaknesses and problems, developing potentials, wood supply and market prospects ask for prior analyses of conditions of forests as a natural source, where all activities in processing and trade of wood and wood products

begin. Supply of wood in the market, amount and assortment structure, to a large extent, reflect the state of forests.
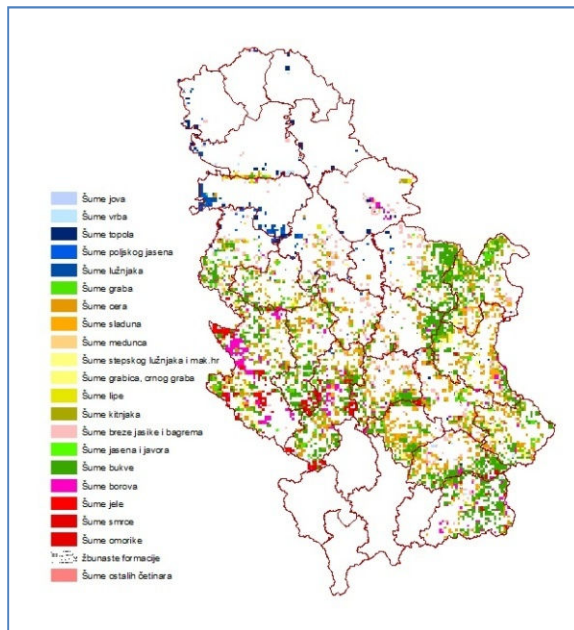
Picture 1: Distribution of forest types in Serbia (Original, data from NFI, 2008)

The extent and the treatment of forests in the last couple of years have had a considerable influence to the present state of forests in Serbia and their production capacities. Written documents dating from the Middle Ages point out that Serbia was very rich in forests, and that characterized this region till the beginning of 21 century. The forest coverage in Serbia (excluding today's Vojvodina) at that time was between 75% and 80%. At the beginning of the nineteenth century, due to intensive settling, deforestation and reduction of forest areas occurred. The decrease continued till the middle of the twentieth century, when the lowest percent of forest land of only 21.4% was noted (Aleksic, i drugi, 2006). Consequences of deforestation and unplanned use of forest from that period are still present and influence the amount and quality of wood supply on the market.

Criteria for assessing conditions of forest resources have been defined within (MCPFE, 2001) criteria and indicators of sustainable management and they belong to an important group of indicators that, besides conditions in resources, can define economic and social potentials of the wood sector.

Data from the National Forest Inventory, conducted in the period of 2006-2008 (NIŠ, 2008), suggest that forests in Serbia (excluding Kosovo) cover an area of 2,252,400 ha or 29.1% of the total area of the Republic. According to the inventory, other forest land, as well as barren land, include 474,400 ha (6.1%), so that, according to the present situation, about 35% of the area of the Republic is exclusively related to forests and forestry.
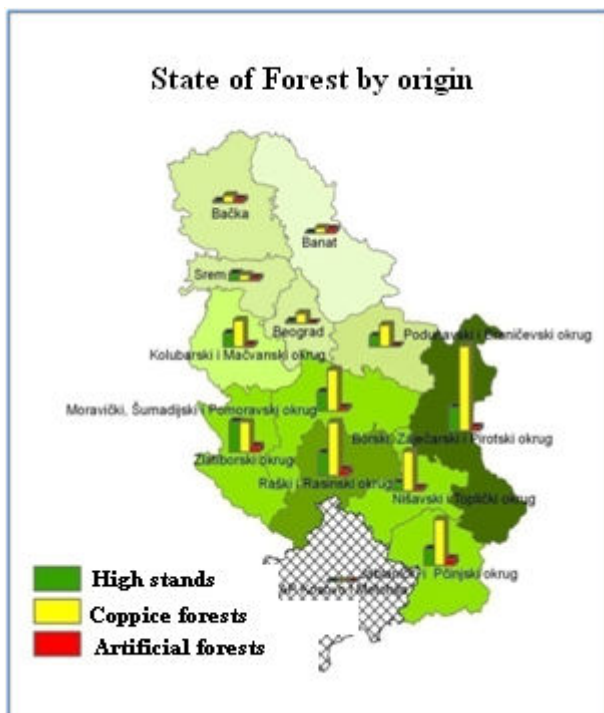
Picture 2. State of Forest by origin
(original, data from NFI)

Other data on conditions in forests are not encouraging. They suggest that the extremely high level of forest are of coppice origin (1.45 *million* ha or 64.7% of the total forest area). These forests have a very low average wood volume (124.4 $m^3 \cdot ha^{-1}$) increment (3.1 $m^3 \cdot ha^{-1}$), so that their production potentials are significantly reduced. Too thinned (opened) stands are present at about 27%, while completely devastated forests account for 2.5% of the total forest area. In relation to the types of a trees, most common are Beech forest, covering 660,400 ha, followed by forests of Turkey oak, Sessile oak, Hungarian oak, Acacia, Pine and other tree species.

Other indicators of forest conditions in Serbia are wood volume, which amounts to 362.5 *million* m^3 and 160.9 $m^3 \cdot ha^{-1}$ and an annual groth of 9.08 *million* m^3 and 4,0 $m^3 \cdot ha^{-1}$. These indicators, particularly wood volume per hectare, are below the optimal value.

The condition of forests in Serbia has been assessed as unsatisfactory, according to many authors. According to (Aleksic, et al., 2007), the average values of forest volume per hectare are significantly bellow estimated optimal (200-280 $m^3 \cdot ha^{-1}$) for the Republic of Serbia. Also, the presence of too thinned (with reduced canopy) and insufficient overgrown stand categories in state forests in Serbia, on one third of the area, is one of the basic problems of the long-term management (Medarević, et al., 2009). According to (Vučićević, 2008) the main reasons for lesser degree of utilization of yields are insufficient openness of forests (by forest roads), obsolete machinery and a lack of market of the less valuable assortments.

Forest Inventory registered 174,800 ha (7.8%) artificially grown forests, being the result of intensive reforestation since the second half of the twentieth century. Comparing data from forest inventories of 1979 ("State forest fund in 1979."), a positive difference in the area of 5.2% (270,000 ha) was pinned down. Also, the increase of the

volume of wood in state forests of approximately 2 $m^3 \cdot ha^{-1}$ was noted and 1.6 $m^3 \cdot ha^{-1}$ annually in private forests (NIŠ, 2008).

Listed indicators show that even with unsatisfactory conditions in forests there are some positive trends and that by applying measures of forest management numerous faults could be overcome, which, in the long term, should contribute to increased production and supply of wood in Serbia.
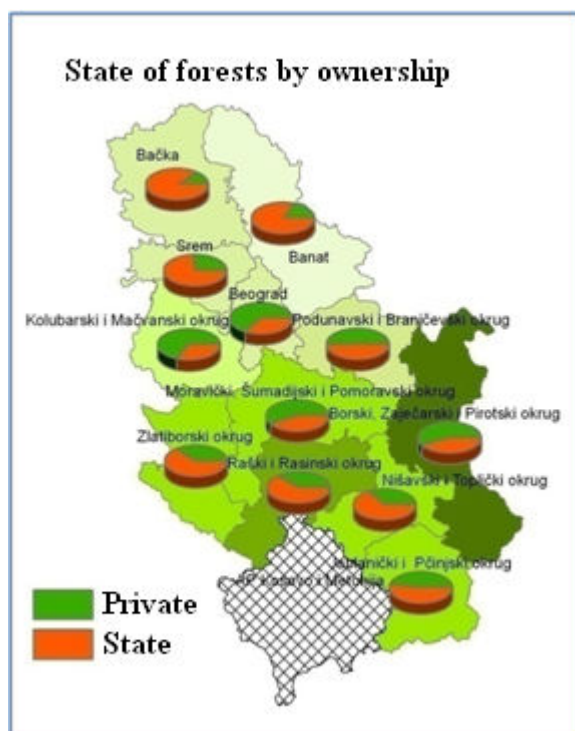
Picture 3. State of forests by ownership (original, data from NFI)

The ownership structure of forests is an important category of forest management, and it is also important for relationships on the wood market. By supply of wood from two very different ownership categories, state owned companies and private forest owners the needs of consumers are being satisfied and competition in the market is being created. Regarding ownership structure of forests, it is slightly more favorable for state owned forests (1.19:1.06 *million* ha). However, conditions of private forests are even worse and their primary purpose is the production of fuelwood, for own needs of forest owners and partly for the market. Particularly unfavorable is the fact that private forests are very fragmented. According to (Gluk Peter et.al., 2011), there are 0.5-0.8 *million* private forest owners, whose average size of lot is just 0.34 ha[10]. This fact clearly indicates difficulties in management and organization of private forest sector. Accordingly, their presence on the market is insufficiently organized.

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[10] Number of private forest owners in Serbia is not precisely estimated. According to the relevant source, in table 1.1 on page 12 it is said that there are 500-800 000 owners of private forests. In the same source in table 5.1, on page 132, this number is estimated to 900 000 on the basis of internak data of the public company "Srbijašume". According to the data (Nonic Dragan, 2012) the number of private owners is 750 000''.

When it comes to private forests, reliable data on the production volume do not exist, because the main part of produced quantities owners use for their private needs and they often avoid prescribed procedures. Professional services of public companies recorded annual harvest volume of about 0.8 *million m³* gross, while the official statistics noted cutting in private forests of only 697,021$m³$ in 2010. Many studies point out that the overall wood production in private forests is significantly higher than the registered values. The analysis of wood consumption from privately owned forests is presented in a separate chapter of the thesis.

The possibilities of wood supply on the market is directly connected to the allowed cutting volume (possible yield, etat). The volume of allowed cutting is estimated on the basis of the data obtained by forest inventory and is mostly dependent on conditions of forests. Based on available data, it is estimated that the annual volume of allowed cutting is about 5.9 *million m³* (table 1). This includes the yield of forests owned by the state, which is obtained on the bases of forest stand inventory and that is 2.8 *million m³* per year. Possible yield for private forests is calculated on the bases of 90% current volume increment, determined by national forest inventory (NIŠ, 2008) and represents the approximate value. This estimation is not based on detailed inventories and management plans, since they do not exist for all forests belonging to this type of ownership. Amount of the allowed cutting according to statistical areas are shown in Table 1.

It should be mentioned that the amounts of allowed cutting change in a smaller percentage every year, because new stand inventories are regularly performed on a part of the territory.

According to (Medarević, i drugi, 2008), possible yield in forests of Serbia is estimated to about 6,336,000 *m³* a year, provided that it was supported by adequate silviculture mesures (in the broadest sense).

Table 1. Possible volumes of cutting (yield) in forests of Serbia relevant to the wood market (supply)

Statistical area	State forests ($m³$)	Private forests ($m³$)	Total ($m³$)
Beograd	85 815	87 173	172 988
Kolubarski i Mačvanski okrug	105 151	393 901	499 052
Podunavski i Braničevski okrug	148 307	219 295	367 601

Zlatiborski okrug	236 309	421 498	657 807
Moravički Šumadijski i Pomoravski okrug	288 166	501 605	789 771
Borski Zaječarski i Pirotski okrug	397 433	638 881	103 6314
Raški i Rasinski okrug	341 680	413 625	755 305
Nišavski i Toplički okrug	218 103	173 730	391 833
Jablanički i Pčinjski okrug	243 766	360 257	604 023
Srem	216 122	72 287	288 409
Bačka	317 084	18 582	335 666
Banat	196 658	15 378	212 036
Total	2 794 595	3 316 212	5 937 819

(Sources: 1. For state owned forests, the bases of forest management, 2. For privately owned forests, estimates based on National forest inventory)

In practice, the amount of realized logging, and therefore, the actual supply of wood on the market vary in relation to the possible extent of logging (see chapter "Wood trade in Serbia ").

3.1.2 Wood trade in Serbia and its importance for public revenues

Trade of wood in terms of quantity, value, trends and other indicators reflects the relationships between the factors that had and have an impact on a market. These relationships are most often complex, especially on markets where the flow of goods and products is intensive and where the social and economic relations are developed.

Wood market in Serbia is relatively small in terms of quantity and value, compared to some neighboring countries (Croatia, Romania, Bulgaria) and elsewhere in Europe (Germany, France, Austria). Consequently its internal traffic is not so great. Quantity and quality of wood that appear in the trade largely depend on the production capability of forests and allowed volume of wood cutting.

The ownership structure of forests that is characterized by almost equal presence of state owned and privately owned forests, significantly influences wood trade and regulation of wood market. Private forests in Serbia are more important in terms of production and trade of fuelwood, while state companies for forest management are main suppliers of wood for wood industry. The differences between private and state sector are not simply in different structure of production, but they are significantly

important in terms of market regularity and relations between buyers and sellers. In fact, trade of wood originating from state owned forests is arranged and controlled, among others, by the activities within FSC certification. On the other hand, wood trade originating from privately owned forests is carried out outside the official, registered courses. This is confirmed by the official statistics, where only 0.6-0.7 *million m³*[11] net wood from private forests, which is produced under the control of professional services of public companies, can be accepted as completely legal, with the appropriate documentation of origin. The rest of wood that is harvested in private forests is realized outside the registered courses, for the needs of owners themselves or through sales on local markets, on trucks and in other ways.

3.1.2.1 Wood trade in Serbia

Research about the extent of wood trade in Serbia and its contribution to public revenues included analyses of official statistics on the extent of wood production in the period from 2000-2012 and company data on forest management.

Data on officially registered timber production in Serbia are presented in Table 2 Analysis of the data shows that the volume of wood production in Serbia in the selected time period was pretty even. In the period from 2000 to 2012, the average value of wood production in Serbia was, according to the National Statistical Office, 2.58 *million m³* of wood. Significant deviation from the fairly even production was recorded in 2001 when the total production was only 2.19 *million m³*, while the highest value of production of 2.94 *million m³* was recorded in 2000[12]. Some particular extremes in wood production haven't been recorded since 2002.

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[11]According to the National Statistical Office in 2011, in private owned forests 696,028 m3 gross wood is felled . Based on the annual report of "Srbijašume", the total net quantity of shipped products from private forests was 496,213 m3.

[12] Summary data of the Statistical Office of the Republic of Serbia for 2002, published   in the Bulletin "Forestry in the Republic of Serbia", were not available due to the transfer of statistical activities from the federal level to the national

Table 2. Wood production in Serbia in the period 2004-2012

Godina	Industrial and technical wood	Fuelwood	Residue	Total
2000	1,222,601	1,411,528	312,468	2,946,615
2001	953,205	1,024,400	216,096	2,193,701
2002[13]	970,372	1,198,573	235,650	2,404,595
2003	826,068	1,490,892	275,470	2,592,432
2004	998,507	1,431,220	288,878	2,718,605
2005	856,286	1,372,485	255,720	2,484,491
2006	951,350	1,414,693	243,619	2,609,662
2007	848,384	1,171,734	226,390	2,246,508
2008	976,963	1,347,204	285,327	2,609,494
2009	935,190	1,365,021	303,252	2,603,463
2010	968,433	1,450,654	277,242	2,696,329
2011	1,018,808	1,513,636	300,566	2,833,010
2012	938,596	1,422,102	275,126	2,635,824
Statistical analysis 2000 – 2012	Industrial and technical wood	Fuelwood		Total
Mean	958,827.92	1,354,934.00		2,582,671.46
Std. Error of Mean	27350.55	39032.49		58669.842
Std. Deviation	98613.81	140733.67		211537.123
Variance	9.725E9	1.981E10		4.475E10
Minimum	826068	1024400		2193701
Maximum	1222601	1513636		2946615
Sum	12464763	17614142		33574729

Source: RSO Bulletins ''Forestry in the republic of Serbia''.
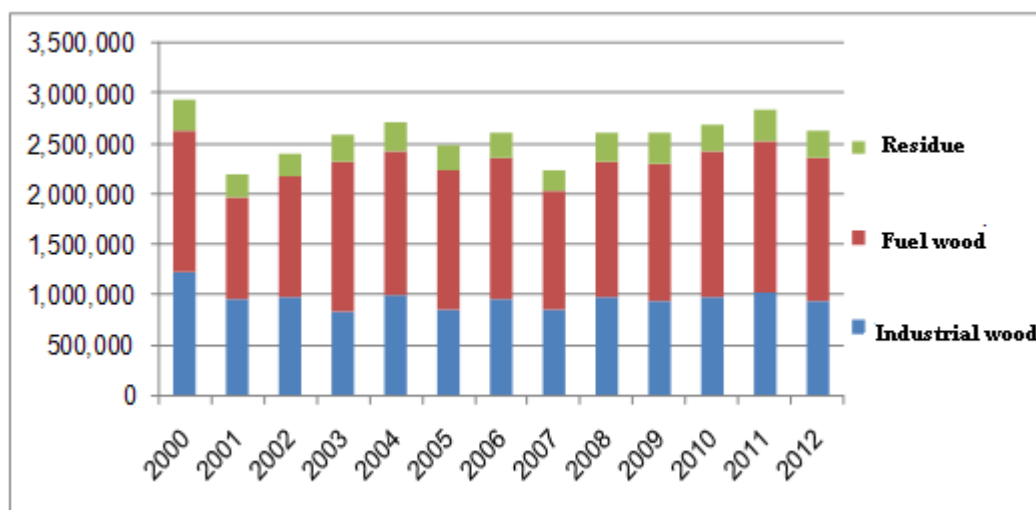
Figure 2. Production of wood in Serbia in the period from 2000 to 2012 (m3).
(Source: RSO bulletins "Forestry in the Republic of Serbia")

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[13] The Statistical Office of the republic of Serbia doesn't possess the data for 2002. The data are estimated based on written evidence of production of the Public Company.

However, the given data on wood production in Serbia must be, as already explained in the previous chapter, taken as incomplete. They completely cover only the wood that comes from forests owned by the state, while the data on the volume of logging in private forests are partial[14] . Since the reliable data on wood trade exist only for the wood that comes from state owned forests, the detailed analysis of wood trade was made just for the wood belonging to this type of ownership.

In 2012, the state owned forests and forests belonging to religious communities[15] achieved sales of 1.99 *million m³* of wood (table 3).

Table 3. Sale of wood in 2012 in companies for forest management

Company	Total	Round technical wood		Fuelwood and pulp	
	m³	*m³*	*%*	*m³*	*%*
PE "Srbijašume"	1,236,103	414,736	33.6	821,367	66.4
PE "Vojvodinašume"	551,147	330,683	60.0	220,464	40.0
National parks	151,389	76314	50.4	75,075	49.6
Others	53,177	28,315	53.2	24,862	46.8
Total	1,991,816	850,047	42.7	1,141,768	57.3

Source: Business reports of listed companies and religious communities

The volume of utilization of forests is limited by regulated forest yield determined by forest inventory which is 2.79 *million m³* gross for state ownership (chapter 3.1.1). The real volume of utilization in State Forests in Serbia is smaller in relation to total allowed volume of cutting, due to insufficient openness and underdeveloped network of forest roads, as well as other limitations, and in 2012 it was 79.2% of this value (on the bases of gross felled timber in the amount of 2.23 *million m³*)[16].

Based on the data on production and realisation of PE "Srbijašume", it can be estimated that the company is making efforts aiming to increase the level of the

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[14] As already noted, significant amounts of timber from private forests are realized outside the registered courses.

[15] Data based on reports of companies, including eight companies: "Srbijašume" and Vojvodina forests, national parks and forests belonging to religious communities.

[16] Accordin to the report of RSO ''Forestry 2012'' the total volume of cutting in the gross amount, in state owned forests, was 2.075 million *m³* in 2012. According to the reports of forest management companies, the volume of cutting in the gross amount was 2.23 million *m³*.

utilization of the yield. Data analysis on wood sales for the period 1992-2012 shows that the average annual increase in sales in that period was 10911 m^3 (figure 3).
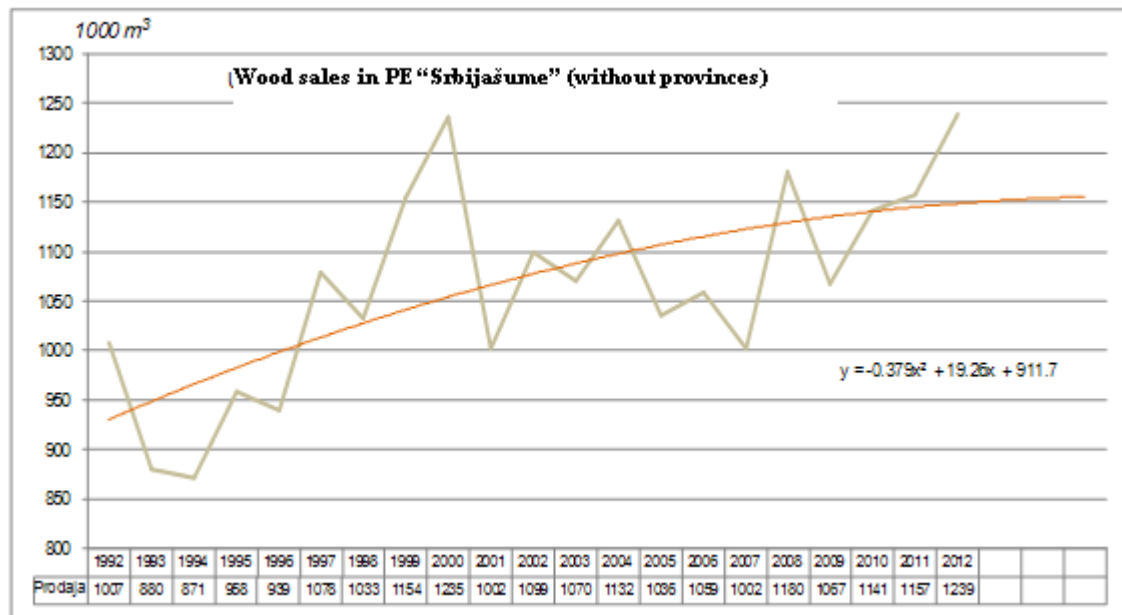
Figure 3: Wood sales in PE "Srbijašume" (without provinces)
(Source: Annual business report)

For trend analysis of the total amount of wood sales in PE "Srbijašume"[17] the polynomial of the second degree, because by the lowest value of the correlation coefficient is obtained. The basic parameters of the above trend are as follows:

The applied function of the quadratic polynomial ($y = a_1 + a_2 * X + a_3 * X^2$).
a_1 =911.66786: a_2 =19.255799: a_3 =-0.37929

1.	Number of pairs of series	N=21
2.	Mean	Ya=1063,68
3.	Minimum	Ymin=871.15
4.	Maximum	Ymax=1238.70
5.	Standard deviation(Ya)	S(Ya)=103.12
6.	Variance(Ya)	S^2=10634.5
7.	Level of function	R=2
8.	Degrees of freedom of	N-R-1=18
9.	The amount (sum) of deviation(Yi – Yr)	S=117789
10.	The standard error of estimate	Sd=80.894
11.	The average rate of change of	Sd=1.04
12.	The coefficient of determination	R^2=0.446
13.	The correlation coefficient	R=0,668 (significant

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[17] Part of Serbia without provinces.

		correlation)
14.	The coefficient of determination (adjusted)	R^2=0.385
15.	Fisher's F-test	F=7.25 (+)

The value of the correlation coefficient for demonstrated model is 0.67, which implies that there is a statistical significance. The resulting value for the F-test is also greater than that on the table for the adopted value of significance. However, small value of determination coefficient (0.45) leads to the conclusion that the greater number of factors influences changes in the sales amount. The average rate of change in the period 1992-2012 was 1.04, i.e. by that percentage the sales of wood increased annually.

Based on the resulting function it can be predicted that in the next three years the volume of wood sales in PE "Srbijašume" will be about 1.15 *million m³* (range from 1.152 to 1.156 *million m³*). However, in conditions of economic crisis, many unseen factors can affect this prediction, which should be taken into account when used for various analyses.

3.1.2.2 Contribution of wood trade to public revenues in Serbia

Wood sector, and other sectors as well, give their contribution to public revenues by paying value added tax[18] (VAT) which is used to tax trade of goods and services. The standard VAT rate in year 2011. was 18% and it is applied to wood trade. The exception to this is the fuelwood, for which the tax is paid at a special rate at 8%[19].

The total revenue from the sale of goods in the wood sector in 2011. was 44,329 *million* dinars or *€*432.6 *million*, calculated according to the average exchange rate.

In 2011. within the section 02, based on the financial reports of the companies[20], the companies made revenues of 9,880 *million* dinars (*€*94.46 *million*) from selling goods in 2011. Within activities 16, the total revenue of the sales of wood in 2011 was 34,449 *million* dinars or *€*336.2 *million*.

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[18] Law on Value Added Tax ("Off. Gazette of RS", no. 84/2004, 86/2004 - corr., 61/2005, 61/2007 and 93/2012), Article 23, the tax rate set at 20%. Fuelwood has a special rate of 8%.

[19] Until January 2013 the rate of VAT for technical wood was 18%, and for fuelwood 8%. From 1.1.2013. the new tax rates are 20% and 10%.

[20] The financial report of the company taken from the database of the Agency for Business Registers.

Based on financial reports of enterprises for forest management, these enterprises generated sales revenue of goods in the amount of 8,480 million (€ 82.76 million) in 2011. Revenue from sales of goods made in the year 2012 was higher by 2.3% and sales were realized in the amount of 8,676.5 *million*. Converted into the euro[21], sales of these companies in 2012 amounted to € 76.91 *million*, which is 9.3% less than the value of sales in 2011.

On the basis of the reported data in the annual accounts of the obligation to pay VAT, forest management companies recorded the obligation to pay VAT[22] in the amount of €11.34 *million* for the year 2011. In 2012, the liabilities for tax amounted to €11.5 *million*. The value of VAT, expressed in this way, covered to a smaller degree, other business activities which were not related to wood sector and which could not be separated by accounting records.

The expressed tax liability for the VAT only applies to wood that comes from forests owned by the state. Data about the obligations for VAT on the sales of wood from private forests (individuals) could not be obtained from tax records. Analyzing the way of production and sale of wood from private forests, it can be concluded that the direct tax revenue from private forests based on the VAT are practically non-existent. The forest owners are not obliged to pay VAT[23] and treated as individual farmers. Tax authorities reduce their tax obligation to the obligation to pay property taxes (in this case the forest). In cases when the forest owner is the final user of the wood, for personal needs, there is no obligation to pay VAT. For wood that comes from private forests, which is the subject to further processing, VAT is payable on the sale of lumber (or other products) to meet tax obligations. The problem occurs in the retail sale of wood, on trucks, where the obligation to pay the VAT is avoided. This way of selling creates unfair competition in relation to the dealers who charge and pay taxes in accordance with the Act (primarily public companies).

According to the Law on Forests, prior to placing wood on the market, forest owners are obliged to pay compensation for harvested wood. This fee is payable at the

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[21] Medium value of the euro at June 30, 2011 amounted to 102,46 din., and for year 2012, 115,82 din

[22] Based on the annual accounts taken from the database of the Agency for Business Registers.

[23]According to the Law on value added tax ("Off. Gazette of RS", no. 84/2004), "a farmer whose total turnover of goods and services in the previous 12 months was not greater than 8,000,000 dinars, not charged VAT on the supply of goods and services, and has no right to declare VAT in the accounts..

rate of 5% of the market value of manufactured wood products on the felling site and the fee is a dedicated revenue fund to the forest[24]. Without payment of compensation and related documents issued by professional forest services, forest owners cannot legally trade in wood[25]. However, due to the fact that they usually sell wood on the open market directly to consumers, or use it for their own needs, public revenues remain deprived of a part of the related funds.

In cases where wood trade is performed by entrepreneurs registered for forest use, transport or purchase of agricultural products, the tax based on VAT is rarely expressed because they are mostly registered as entrepreneurs with lump-sum taxation which is not included in the VAT system. In this case, the total tax is paid by the processors during the sale of goods.

In practice, the only obligation of private forest owners refers to the payment of compensation for harvested wood in the amount of 5%. The value of the collected charge for harvested wood in private forests was, according to the Directorate of Forestry in 2011, 0.85 *million €*, while in 2012 was lower and was 0.7 *million €*.

On the basis of obligations for VAT, which are given in the annual accounts for the year 2011 as a part of other activities of the wood sector, the largest amount of liability for payment VAT in 2011 was recorded in wood industry "1610 - Sawmilling and planing of wood", *€* 13.56 *million*[26] (1,383 *million* dinars). This is also the sector within wood industry which had the greatest liability. In the manufacture of joinery VAT amounted to *€*10.63 *million* (1,084 *million* dinars). The total value of VAT for companies and entrepreneurs in the field of wood processing is calculated in the amount of *€* 41.94 *million* (4,279 *million* dinars), Ie for all companies and entrepreneurs within the wood sector *€* 55.06 *million* (5,617 *million* dinars). The review of obligation for VAT within the wood sector is given in table 4.

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[24] Based on Article 48 of the Law on Forests in 2010 (Gazette 30/2010).

[25] Forest Law (30/2010) in Article 60 expressly defined "It is prohibited to place on the market a tree felled in the forest, or outside of forest, or manufactured wood assortments, if not stigmatized (marked) visible with forest stamp."

[26] Conversion is done on the basis of the mean value of the euro at June 30, 2011, which amounted to 102.46 din.

Table 4. Liabilities for VAT in wood sector in 2011

Activity	Total VAT For wood sector			VAT in supply of wood, wood products and services		
	million din.	million €	%	million din.	million €	%
0210 - Silviculture and other forestry activities	1,255.3	12.25	22.3	1,134	11.07	20.9
0220 - Logging	1.1	0.01	0.02	1.1	0.01	0.02
0240 - Support services to forestry	72.2	0.70	1.3			
0230 - Gathering of wild growing non-wood products	9.6	0.09	0.2			
Total 02	**1,338.2**	**13.06**	**23.8**	**1,135.1**	**11.08**	**20.96**
1624 - Manufacture of wooden containers	594.4	5.80	10.6	594.4	5.80	10.98
1621 - Manufacture of veneer sheets and wood-based panels	527.0	5.14	9.4	527.0	5.14	9.73
1623 - Manufacture of other builders' carpentry and joinery	1,084.9	10.59	19.3	1,084.9	10.59	20.04
1622 - Manufacture of assembled parquet floors	4.8	0.05	0.1	4.8	0.05	0.09
1629 - Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	685.1	6.69	12.2	685.1	6.69	12.65
1610 - Sawmilling and planning of wood	1,383.0	13.50	24.6	1,383.0	13.50	25.54
Total 16	**4,279.3**	**41.76**	**76.2**	**4,279.3**	**41.76**	**79.04**
Total 02 + 16	**5,617.5**	**54.82**	**100.0**	**5,414.4**	**52.82**	**100.0**

Source: BRA, data base

The table bellow provides an overview of obligations for VAT in the wood sector, as well as in the relation to the wood supply which is achieved in wood sector in 2011. The total VAT in wood supply is €52.8 *million*. However, we should bear in mind that the table presents connected phases in wood processing (eg sales of logs is covered by activity 0210 for activity 1610) where there is the right to deduce input tax, as well as with products meant for export.
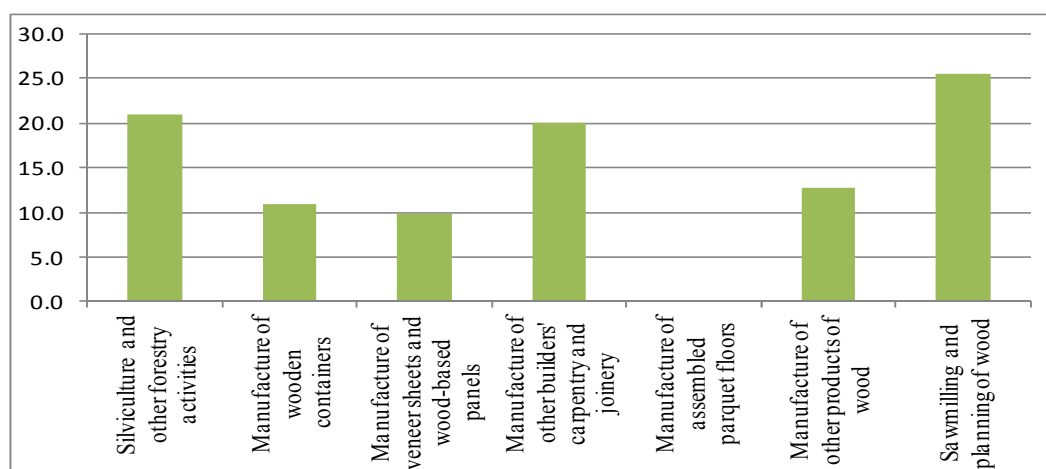
Figure 4: Liabilities for VAT on the supply of wood, wood products and services in the wood sector in 2011.

Participation of certain activities in relation to VAT obligations is presented in Figure 4. The largest share was recorded in industry "logging and wood processing" (25.5%), followed by silviculture (forest management companies) 20.9%, manufacture of joinery and others.

3.1.2.3   Wood Flows in Serbia

Until the beginning of transition processes and privatization in Serbia, by planned guidance of the development of the wood industry, the territorial distribution of facilities for wood processing was in harmony with the distribution of forests. After that period the development of wood industry proceeded without control, without clearly defined strategy, with predominant profit interests of investors. The former socially owned companies had mostly stopped working, which significantly changed the situation in wood processing activities. Building new factories for wood processing started, often on sites far away from forests and sources of raw materials. By removing factories for wood processing from forest complexes, the possibilities for employment of local population on whose lands the raw materials existed were reduced, and that was the major change which largely reflected the change of labor force structure (urban/rural labor force) within the social component of wood sector in Serbia. This conclusion is the result of research conducted in the segment of the analysis on the flows of wood supply in Serbia, whose results are presented below.

Research of flows of wood supply in Serbia included the collection and analysis of data on the sale of wood in forest management companies owned by the state in 2012. The trade of wood in the amount of 1.99 *million m³* was analyzed, which practically covered the total flow of wood produced in these companies.

Table 5 shows the obtained results, which include the review of produced wood that remains for further processing and consumption in the district in which it has been produced, as well as the percentage of wood that goes to other districts. It also shows the number of districts were wood is distributed to from each particular district. The review covers only the wood produced in state owned forest management companies, because there are no data on bases of which the appropriate analysis can be carried out for privately owned forests.

Table 5. Flows of wood trade from state owned forests in 2012

District	Wood in total			Round wood			Fuel wood		
	Rem-ain	Leaving district		Rem-ain	Leaving district		Rem-ain	Leaving district	
	%	%	Number of districts	%	%	Number of districts	%	%	Number of districts
Severno-Bački	65.9	34.1	4	63.7	36.3	4	93.4	6.6	2
Srednje-banatski	55.5	44.5	9	53.7	46.3	8	66.5	33.5	6
Severno-Banatski	0.0	0.0	0	0.0	100.	0	0.0	0.0	0
Južno-Banatski	79.7	20.3	13	75.7	24.3	12	85.7	14.3	8
Zapadno-Bački	72.2	27.8	5	70.1	29.9	6	93.2	6.8	3
Južno-bački	73.0	27.0	12	77.8	22.2	12	65.2	34.8	9
Sremski	68.2	31.8	6	45.9	54.1	6	82.9	17.1	4
Mačvanski	77.3	22.7	11	67.4	32.6	9	86.7	13.3	10
Kolubarski	41.5	58.5	9	24.9	75.1	7	51.2	48.8	8
Podunavski	0.0	0.0	0	0.0	100	1	0.0	0.0	0
Braničevski	57.5	42.5	16	31.4	68.6	13	64.1	35.9	14
Šumadijski	67.9	32.1	7	30.0	70.0	6	79.7	20.3	5
Pomoravski	47.0	53.0	13	20.4	79.6	9	55.8	44.2	10
Borski	49.1	50.9	20	9.7	90.3	12	57.5	42.5	19
Zaječarski	74.2	25.8	14	18.9	81.1	11	85.6	14.4	11
Zlatiborski	85.5	14.5	11	84.1	15.9	9	87.0	13.0	8
Moravički	89.7	10.3	9	87.2	12.8	7	90.9	9.1	8
Raški	85.8	14.2	8	78.1	21.9	9	93.6	6.4	5
Rasinski	49.9	50.1	14	17.5	82.5	10	66.8	33.2	12
Nišavski	85.4	14.6	11	20.2	79.8	9	95.0	5.0	7
Toplički	80.2	19.8	11	67.3	32.7	9	84.5	15.5	8
Pirotski	49.0	51.0	9	3.3	96.7	8	64.5	35.5	8
Jablanički	71.8	28.2	9	93.2	6.8	5	61.0	39.0	7
Pčinjski	54.6	45.4	8	38.2	61.8	2	63.0	37.0	8
Grad Beograd	68.5	31.5	10	69.2	30.8	10	67.5	32.5	6
Total	**70.4**	**29.6**	**24**	**63.1**	**36.9**	**24**	**75.8**	**24.2**	**24**
Min	41.5	10.3	4	3.3	6.8	1	51.2	5.0	2
Max	89.7	53.0	20	93.2	96.7	13	95.0	48.8	19

Source: Business data bases of companies

Graphical presentation from table 8 is given in figure 4, where the different colors in circles represent the color of a district.
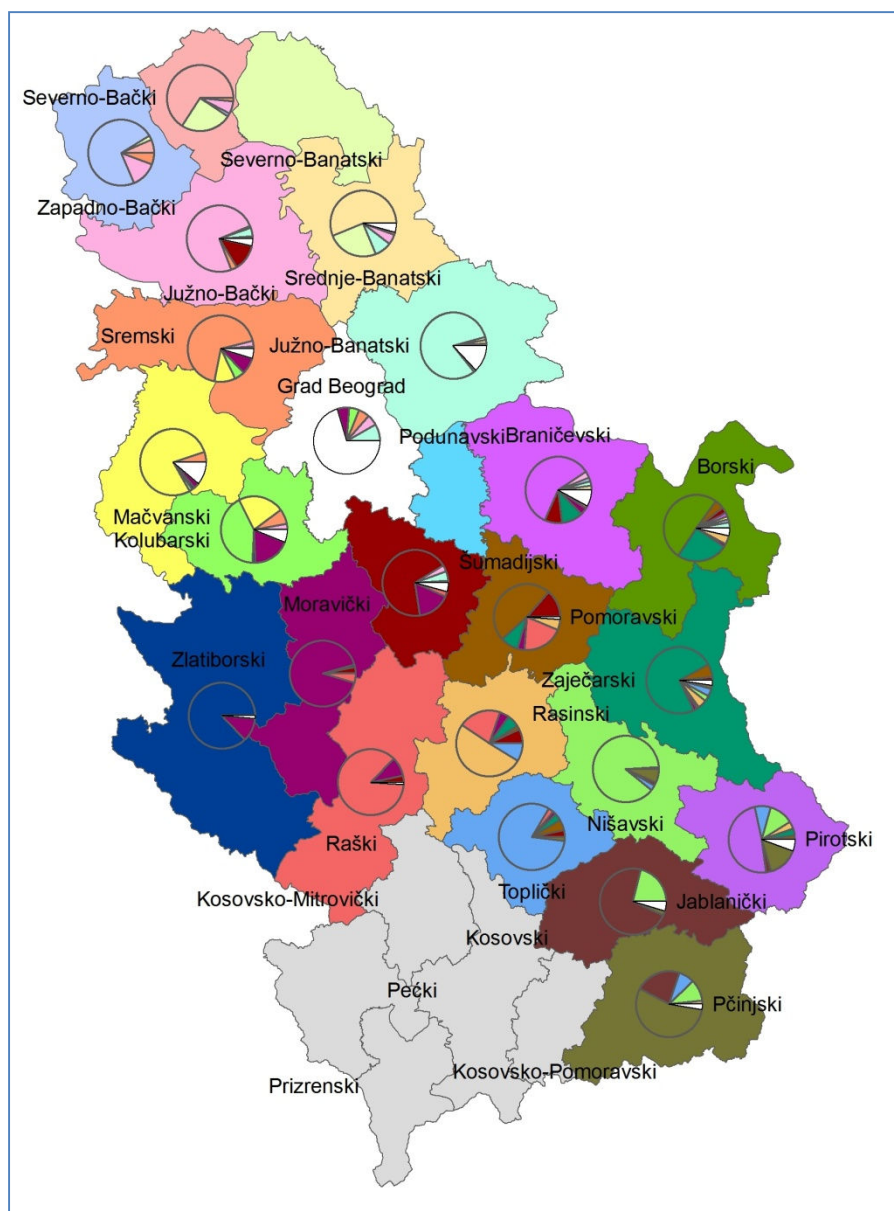
Picture 4. Distribution of produced wood (all assortments) from state owned forests[27].
Source: Business database, the data presented in Table 5.

Based on data from table 8, and a summary given in Figure 4, it can be concluded that, when it comes to the total amount of wood (all assortments), districts with high level of utilization of wood are located in different parts of Serbia. The high percentage of utilization of local wood in the districts in western Serbia is distinctive. However, high level of utilization of wood within particular districts is largely the result of the consumption of fuelwood by locals and wood sold on the stump.

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[27] On the picture, districts are represented by different colors. Different colors in pie charts are represented districts to which wood is delivered

A somewhat different picture, with more intensive flow of traffic, which also indicates the distribution of primary wood processing capacities is obtained by analyzing the flow of traffic of technical roundwood as shown in Table 6 and Figure 5.

Table 6. Flow of traffic of technical roundwood per districts (state owned forests) in 2012

No	District	Total production	Wood which remains in district	Wood which leaves the district (K3-K4)	Wood which comes to the district	Consumption in the district (K4+K6)
				m^3		
1	2	3	4	5	6	7
1	Severno-Bački	14,074	8,959	5,115	6,386	15,345
2	Srednje-banatski	36,077	19,390	16,686	3,353	22,743
3	Severno-Banatski	0	0	0	16,336	16,336
4	Južno-Banatski	56,527	42,763	13,764	14,867	57,630
5	Zapadno-Bački	68,353	47,893	20,461	1,778	49,671
6	Južno-bački	102,447	79,741	22,706	21,558	101,299
7	Sremski	68,511	31,436	37,076	19,715	51,151
8	Mačvanski	41,787	28,156	13,631	20,257	48,413
9	Kolubarski	9,996	2,489	7,506	14,528	17,017
10	Podunavski	0	0	0	2,493	2,493
11	Braničevski	16,232	5,094	11,138	1,584	6,678
12	Šumadijski	3,025	906	2,119	7,050	7,956
13	Pomoravski	20,709	4,223	16,487	10,986	15,209
14	Borski	18,469	1,798	16,671	188	1,986
15	Zaječarski	16,591	3,129	13,462	15,352	18,481
16	Zlatiborski	99,863	84,008	15,856	1,383	85,391
17	Moravički	42,985	37,478	5,508	35,717	73,195
18	Raški	70,981	55,463	15,518	33,869	89,332
19	Rasinski	39,499	6,893	32,606	10,363	17,256
20	Nišavski	4,454	898	3,557	1,430	2,328
21	Toplički	19,159	12,887	6,272	790	13,677
22	Pirotski	9,169	307	8,862	0	307
23	Jablanički	24,888	23,192	1,696	14,759	37,951
24	Pčinjski	20,762	7,937	12,824	12,595	20,532
25	Grad Beograd	45,489	31,461	14,028	46,208	77,669
	Ukupno	850,047	536,501	313,547	313,545	850,046

Source: Business data base of companies

Graphical presentation from table 6 is given in figure 5, where different colors in circles represent colors of a district.

Picture 5. Distribution of technical roundwood from state owned forests[28].
Source: Business database, the data presented in Table 5.

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[28] On the picture, districts are represented by different colors. Different colors in pie charts are represented districts to which wood is delivered
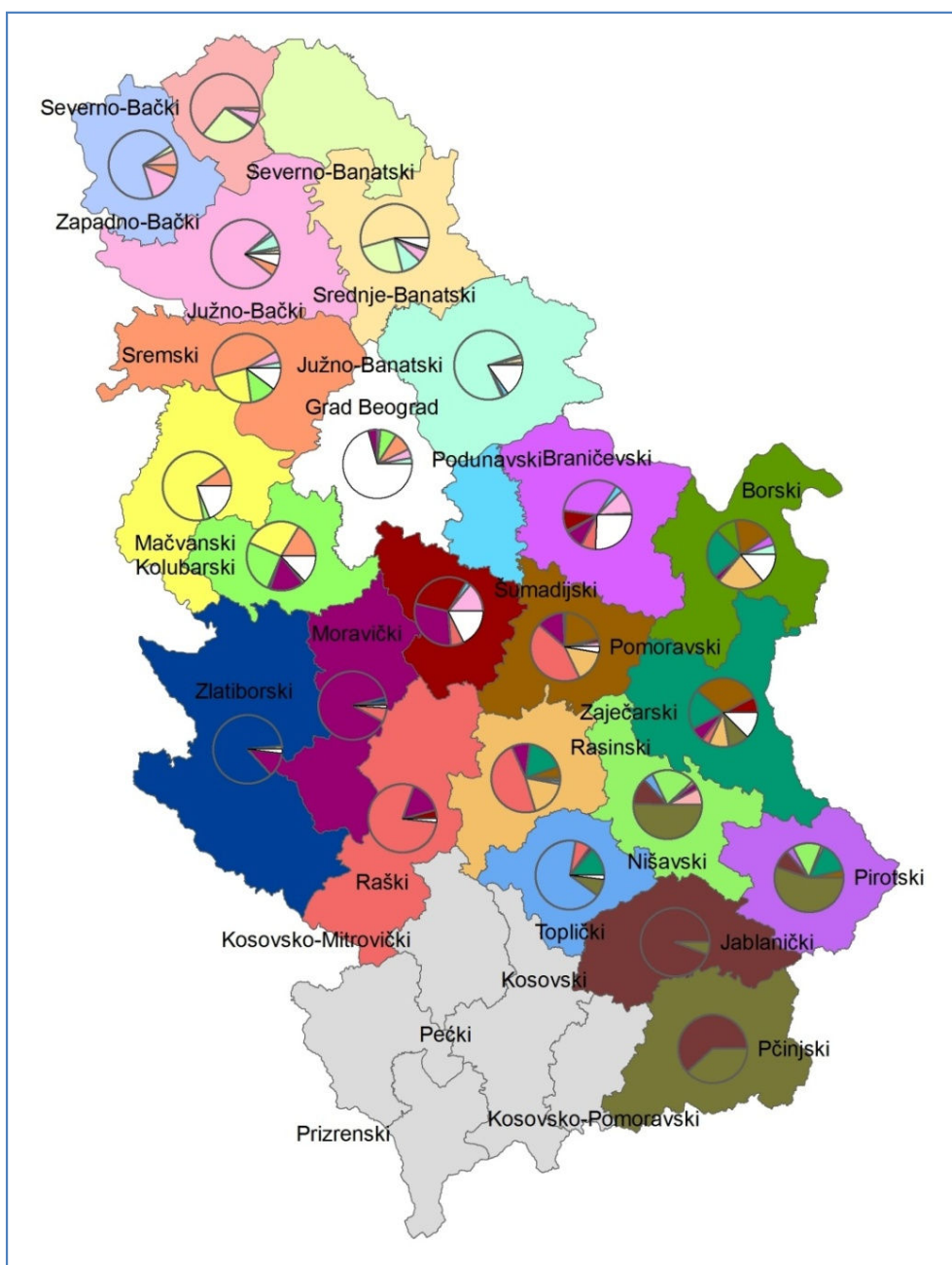
On the bases of the given data, it can be noticed that some district are distinguished by high outflow of technical wood towards other districts. For example, the region of East Serbia is distinguished by high quality beech forests of mountain massifs of "Južni Kučaj" and "Stara Planina", and they present an important raw material for wood industry of Serbia. However, due to a small local demand, a significant quantity of a round technical wood is transported and processed in other regions of Serbia. The most unfavorable situation is in Pirot District where, only 3.3% of round technical wood remains within the district, then in Bor District 9.7% and in Zajecar District 18.9%. This situation is particularly dramatic for these districts if we take into account the fact that only 23 years ago the wood from the area of "Južni Kučaj" was processed in local production plants of wood industry. Depopulation, which characterizes these areas, can partly be the cause, as well as the consequence of this state.

Picture 6. Spatial distribution of a wood processing plants by districts

The most favorable situation, in relation to flows of round technical wood, is in Zlatibor and Moravica districts. These two districts are distinctive by a significant production of technical wood, as well as the high percentage of roundwood which remains for further processing within these two regions (84.1% and 87.26%).

The reasons why the manufacturers benefit more from transporting wood raw material to distant areas instead of building factories near the raw material areas were not the subject of the research. Private business owners are certainly not unfamiliar with the importance of positioning the company close to raw material, yet most of them have decided to build their factories close to consumption centers. This leads to a conclusion that other factors have had dominant influence for decision making about the location for factories. If we look at other industries, unemployment rate by region, as well as

other indicators, similar trends can be noticed. To potential investors, the desire to do business closer to consumers and areas where the overall economic activities are more intensive,was probably decisive. A good example of such choice of location is a factory for the production of composite materials based on wood "Kronospan SRB doo" Lapovo, which is extremely well located in terms of consumption and transportation of the final product, labor supply, infrastructure and others, but they are forced to transport the raw materials from a great distance due to the very small percentage of forests areas in the region.

Data showing the total sales and consumption of round technical wood per certain district are shown in table 6, and, based on it; correlation analysis has been made and shown on figure 5. Relation between the total sales (x) and total consumption (y) of round technical wood within every individual district (blue dots and a blue line). Also, the relation between the total sales of round technical wood and the wood remaining for further processing within a district (red dots and a red line) are shown. On the basis of obtained correlation coefficients in a linear module, it can be concluded that, in both cases, there is a high mutual connection between the sales and consumption of wood on a district level. The values of the F test also show a statistical significance of observed relations. On the bases of the value of determination coefficient (R^2), it can be concluded that 79.2% of variations in the total consumption of round technical wood in districts is caused by changes in production on a district level. When it comes to the consumption of a ''local wood'', ie the wood produced in a district, even 91.6% of variations can be explained by changes in sales, in other words, changes in the production in a district itself. On the basis of the correlation data analysis it can be concluded that, even with the dynamic flows of wood in Serbia, the increase in sales significantly influences the increase in consumption (and processing) of the technical wood within a district. This impact is present in districts where the volume of the produced round technical wood does not exceed 55,000 m^3. Beyond that amount there is a ''surplus'' which goes to other districts. By applying the obtained function of dependence, shown in Figure 5, of the amount of 100,000 m^3 of produced technical roundwood, some 93,312 m^3 is processed in a district. This shows that there is certain ''adjustment'' on the market, because some quantities of roundwood are bought in other districts, for needs of local processing, which is certainly necessary given to the established distribution of processing plants which is shown on Figure 6

In the analysis which covers sales and consumption (processing) of wood within a district, there is an emphasized correlation connection, showing that in average the increase of production has significant impact on the increased consumption of the wood in the district.

The difference between the obtained values of these two functions (shaded in grey), shown on Figure 5, is an average value of a wood coming to procession from other districts.
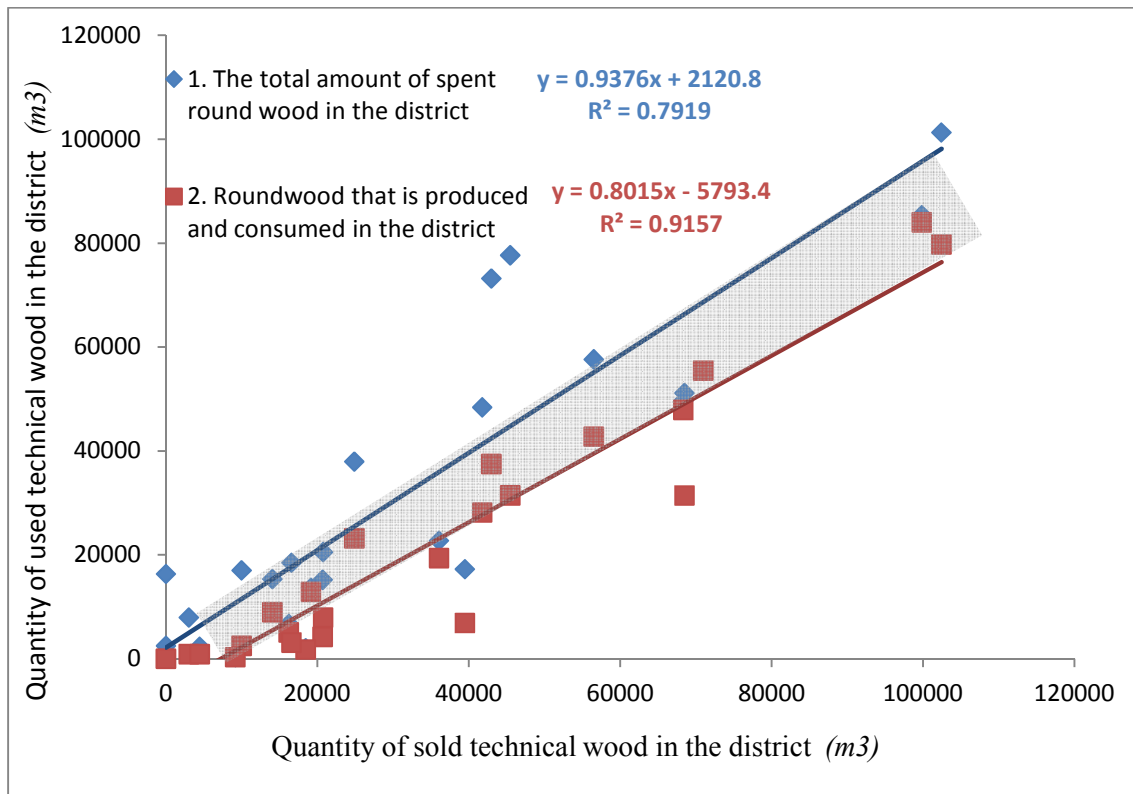
Figure 5. Correlation analysis of relations between the total sales and consumption of round technical wood per districts.
Source: Business data base of companies (based on data from table 6)

The parameters of a linear module obtained by correlation analysis of relations between the total sales and consumption of round technical wood (for all districts in total) are as follows:

The function of the linear regression y = a1 + a2 * X

		Figure 1	*Figure* 2
	Parametri	a1 =2120.7622 a2 =0.93762	a1 =-5793.54068 a2 =0.80153
1.	Number of pairs of seris	N=25	N=25
2.	Mean	Ya=34001,84	Ya=21460,04
3.	Minimum	Ymin=307	Ymin=0
4.	Maximum	Ymax=101299	Ymax=84008
5.	Standard deviation (Ya)	S(Ya)=31038,34	S(Ya)=24674,54
6.	Variance (Ya)	S^2=9,633788E+08	S^2=6,088327E+08
7.	Degrees of freedom of	N-R-1=23	N-R-1=23
8.	The amount (sum) of deviation (Yi – Yr)	S=4.81164E+09	S=1.231974E+09
9.	The standard error of estimate	Sd=14463,81	Sd=7318.75
10.	The coefficient of determination	R^2=0.792	R^2=0.916
11.	The correlation coefficient	R=0.89 visoka pov.	R=0.957 visoka pov.
12.	The coefficient of determination (corrected)	R^2=0.783	R^2=0.912
13.	Fisher's F-test	F=87.52 (+)	F=249.79(+)

On the bases of the presented analyses of the flow of round technical wood it can be concluded that the spatial distribution of wood processing plants is not sufficiently aligned with the distribution of forests. On average, 63.1% of technical wood remains within the district where it was produced. In Bor district, only 9.7% of wood remains for further processing, in Zajecar district 18.9%, in Pirot district 3.3%, in Rasina district 17.5% and in Pomoravlje district 20.4%. The flow of traffic of round technical wood for these four districts is shown in picture 7.
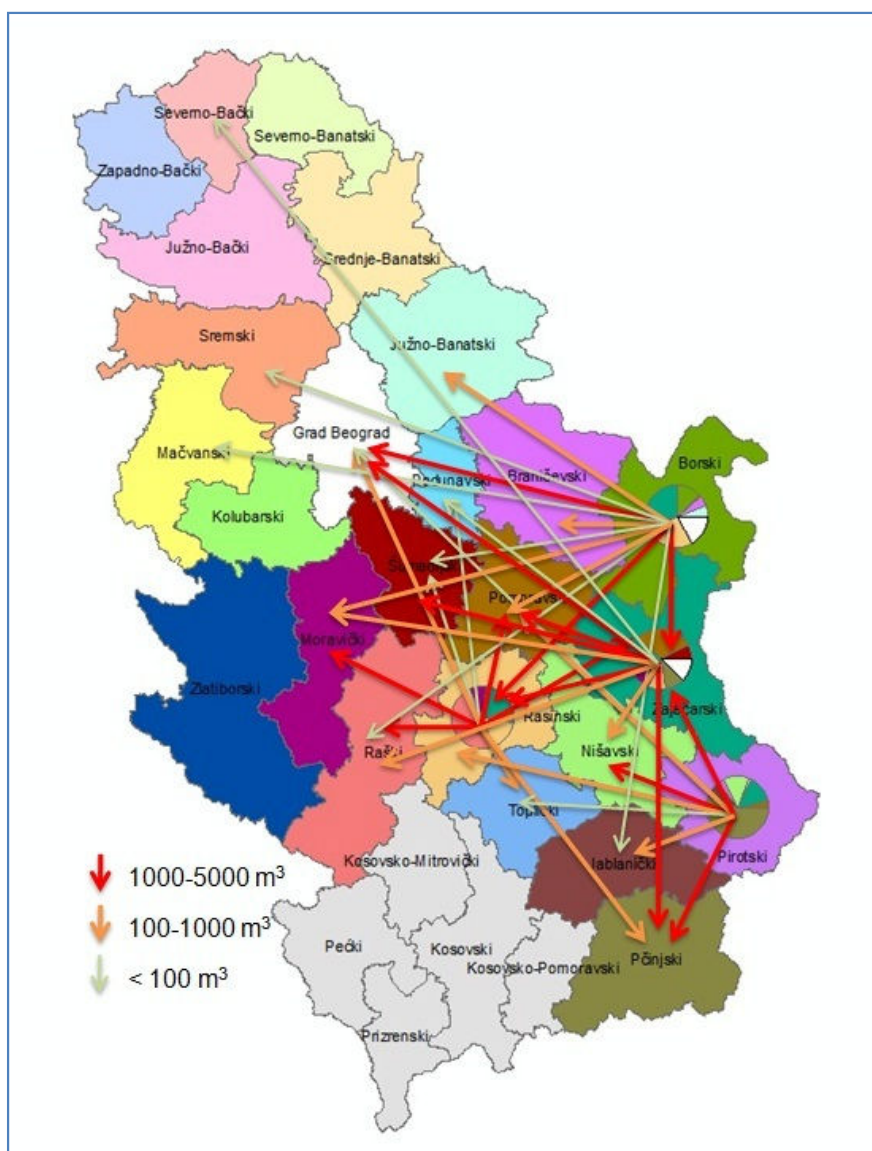
Picture 7. Flows of traffic of round technical wood from state owned forests in Bor, Zajecar, Pirot and Rasina districts[29].
(Source: Business data bases, data presented in Table 5).

Based on the analysis on the flow of wood, Bor district can be emphasized as a particularly negative example. It characterizes a very small percentage of wood consumption within the district and highly complex flows of wood traffic. The wood of this district, as a rule, outflows to other districts. Technical wood goes to 12, while fuelwood is distributed to 20 other districts. This method of selling is not the result of a business policy, but of circumstances and lack of local processing facilities.

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[29] On the picture, districts are represented by different colors. Different colors in pie charts are represented districts to which wood is delivered

Lack of capacity for processing technical beech roundwood is especially pronounced in the area of "Južni Kučaj" and "Stara Planina". Capacities for wood processing are mainly located near the industrial centers and main roads, making their potentials less economical for the development of rural areas, which contributes to their depopulation. It is obvious that in the current situation flows of raw material are mainly routed through the market, in relation to supply and demand, without a clearly defined long-term development of regional policy of the wood sector in Serbia.

Local consumption of fuelwood is directly related to the number of population who use wood for heating, forest resources, areas of private forests, etc. According to (Glavonjić B. at all, 2010) 40.9% of households in Serbia use solid fuel for heating.

The analysis shown in Figure 8 is based on trade of wood from state-owned forests and does not provide complete and realistic picture, since there is already a significant share of fuelwood from private forests on the market. Also, the flow of fuelwood from state forests is influenced by plants for the production of wood-based panels and wood pellet, primarily in Lapovo, Ivanjica, Boljevac and others. It can be seen (Picture 8) that the flow of fuelwood from state owned forests is mainly performed within or close to the area where it was produced. It is certainly affected by costs of transport, sales on the stump and relatively low price of fuelwood. It is notable that in Vojvodina, due to high demand and low supply, all the quantities of fuelwood remain on the local market.
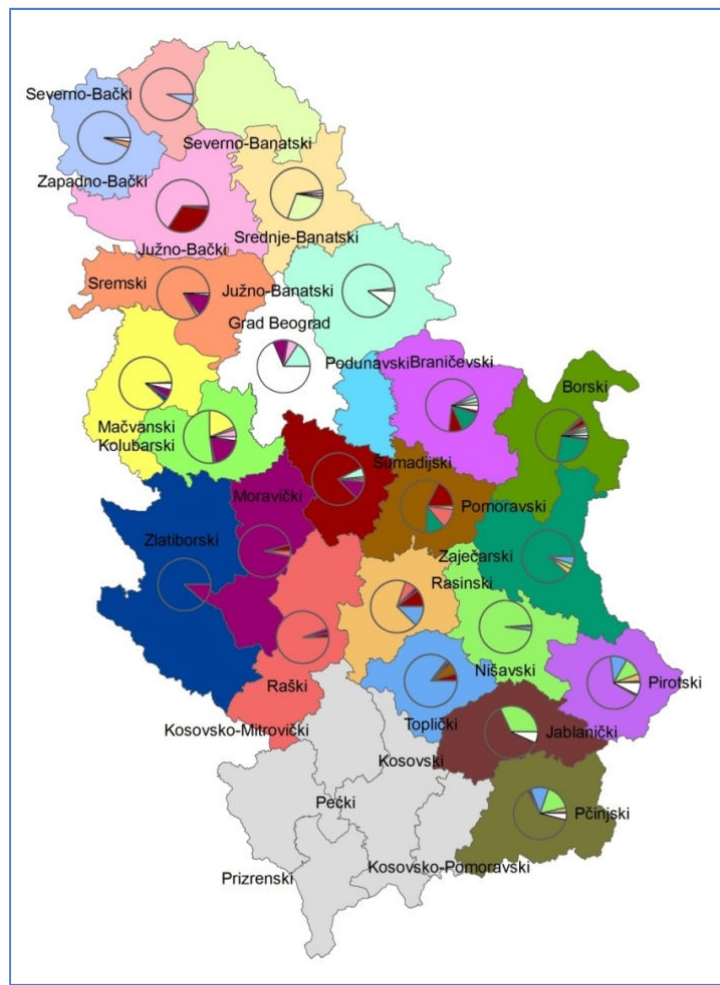
Picture 8. Distribution of fuelwood from state owned forests[30].
Source: Business data bases, shown in Figure 5.

The flow of wood trade is a very important element of the social component of sustainable development, Population, particularly from rural and under developed areas, expect that natural resources existing in their region be used for local economic development and employment. Outflow of raw material to other areas, which are according to given analyses, always economically more developed, reduces employment opportunities and, in time, leads to dissatisfaction of the local population and negative attitude towards forestry. By the analysis which was done on the example of the company ''A.D.Tina'' Knjaževac and which was presented in Chapter „**Error! eference source not found.**“, it was found that, in complete value chain in production of final products, forestry and logging (management, forest utilization, transport of

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[30] On the picture, districts are represented by different colors. Different colors in pie charts are represented districts to which wood is delivered.

roundwood) engaged only 16.5% of the total number of workers engaged in that chain. This is especially important for areas that are characterized by a high percentage of forest areas and no other natural resource that can be used for economic development and employment. In the end, the lack of local processing facilities inevitably leads to an outflow of population to the economically developed areas.

3.1.3 Export and import of wood products of Serbia

One of the important elements of the social component of sustainable development of wood sector in Serbia is the foreign trade of wood and wood products. This element shows not only the importance of wood sector to national economy and its foreign trade balance, but also the way and degree of usage of a domestic wood raw material in terms of its finalization, production and export of products with higher added value.

Participation of the wood sector in foreign trade balance, taking into account the overall national economy, is not particularly high. However, the wood sector is important because it is the export- oriented sector, recording continuous positive trend in export growth. The share of wood products (excluding furniture) in the overall export of the Republic of Serbia increased from 1.84% in 2008 to 2.08% in 2012 (table 7).

Table 7. Export and import of wood products and their share in total export and import of the Republic of Serbia in the period 2008-2012 (€1.000)

	2008.	2009.	2010.	2011.	2012.
Exports of products of wood sector	136,273	110,175	139,187	160,986	183,788
Total exports of the Republic of Serbia	7,424,755	5,956,390	7,388,251	8,436,431	8,836,735
The share of wood sector in the export of Serbia (u%)	1,84	1,85	1,88	1,91	2,08
Imports of wood sector	226,420	168,856	173,218	158,921	164,263
	15,408,495	11,324,864	12,519,130	14,152,711	14,782,284
The share of wood sector in the import of Serbia (u%)	1.47	1.49	1.38	1.12	1.11
Foreign trade balance of the wood sector	-90,147	-58,680	-34,031	2,065	19,525
Foreign trade balance of the Republic of Serbia	-7,983,740	-5,368,474	-5,130,879	-5,716,280	-5,945,549

Source:Data on the total export of the Republic of Serbia, bulletins ''Foreign trade exchange of the Republic of Serbia, according to the characteristics of a company. For data on the export of the products of the wood sector, data bases of Serbian Chamber of Commerce.

In the same period, the import of wood products decreased from 1.47% (2008) to 1.11% (2012). Expressed in absolute terms the export ranged from €110.17 *million* (2008) to €183.79 *million* in 2012. The average annual amount in the given period was €146 *million*. In the same period, the total amount of import of wood products was reduced from 226.4 to 158.9 *million €* (table 7).

Table 8. Export and import of wood products (in € 1,000)

Year	Export		Import	Difference		
	1000€					
2008.	136,273		226,420	-90,147		
2009.	110,175		168,856	-58,680		
2010.	139,187		173,218	-34,031		
2011.	160,986		158,921	2,065		
2012.	183,788		164,263	19,525		
total	730,409		891,677	-161,268		
mean	146,082		178,335	-32,254		
	N	Minimum	Maximum	Mean	Std. Deviation	
Export	5	110,175	183,788	146,081.80	27,735.09	
Import	5	158,921	226,420	178,335.60	27,400.40	

Source: Data base of the Serbian Chamber of Commerce, on the bases of data bases taken from the Customs Administration

In the period from 2008 to 2010 the foreign trade balance of wood products was negative. The largest negative value was recorded in 2008 in the amount of € 90.1 *million*, while in 2010 it amounted to 34.01 *million €*. Beginning with 2011, the balance of wood products was positive again (in 2011 amounted to € 2.06 *million*), and this trend continued in 2012 when the realized difference amounted to € 19.5 *million* (table 8).
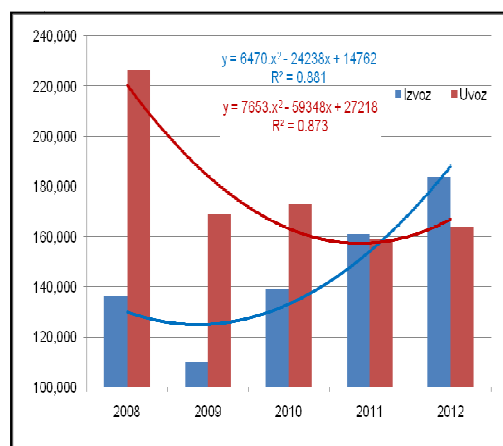
Figure 6: Export and import of wood products in the period 2008-2012
(Source: Database of Serbian Chamber of Commerce)

Data on the exchange of certain wood products, according to a unified customs tariff (the Customs Tariff Act, "Fig. Gazette" 62/2005, 61/2007 and 5/2009), which are collected by the customs authorities, show the value of the foreign trade in relation to certain product groups. The data for 2012 are displayed in Table 10. Columns 3, 6 and 9 show the value of imports, exports, and their balance. Columns 4, 7 and 10 show the difference between the values in 2012 and 2011. Columns 5, 8 and 11 show the average values for the period 2008-2012. The names of the tariff codes are shown in Table 9.

Table 9. The names of custom tariff

Tarifa	Product Name
4401	Fuelwood in logs, in billets, in twigs, in fagots or in similar forms; wood in chips or particles, sawdust and wood waste and scrap of wood, whether or not agglomerated in logs, briquettes, pellets or similar forms.
4402	Wood charcoal (including charcoal from shells), whether or not agglomerated.
4403	Wood in the rough, whether or not stripped of bark or sapwood, or roughly (squared)
4406	Railway or tramway sleepers of wood.
4407	Wood sawn lengthwise sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness exceeding 6 mm.
4408	Sheets for veneering (including those obtained by cutting laminated wood), for plywood or for similar laminated wood and other wood, sawn lengthwise, sliced or peeled, planed or nerendisano, cut or uncut, unconnected or end-jointed, of a thickness not exceeding 6 mm.
4409	Wood (including strips and friezes for parquet flooring, not assembled) continuously shaped (tongued and groove, žlebljeno, rounded or the like) along any of its edges, ends or faces, whether or not planed, sanded or end-jointed.
4410	Particle board, called "oriented strand board" (OSB) and similar board (for example: "waferboard") of wood or other ligneous (ligninskih) material, whether or not agglomerated with resins or other organic substances.
4411	Fibreboard of wood or other ligneous materials whether or not agglomerated with resins or other organic substances.
4412	Plywood, veneered panels and similar laminated wood.
4415	Cases, boxes, crates, drums and similar packings, of wood; drums (reels) cable, made of wood; pallets, box pallets and other load boards, of wood; pallet collars of wood.
4418	Builders' joinery and carpentry of wood, including cellular wood panels, assembled flooring panels, shingles and shakes.
	Cumulative other products.

Source: Customs Tariff Act ("Off. Gazette of RS" 62/2005, 61/2007 and 5/2009)

Table 10. Export and import of wood products according to the group of products for 2012

Product Group - customs Tariff	Export			Import			Balance (export-import)		
	u 1,000€								
	Export	Differ. 2012 - 2011.	Average 2008 – 2012.	Import	Differ 2012 - 2011.	Average 2008 – 2012.	Balance	Differ 2012 - 2011.	Average 2008 – 2012.
1	3	4	5	6	7	8	9	10	11
4401	9,608	2,252	5,841	1,477	639	742	8,132	1,613	5,099
4402	3,631	962	2,712	1,013	817	452	2,618	145	2,261
4403	3,226	-1,834	4,315	3,634	-362	4,364	-407	-1,472	-49
4406	1,543	-138	1,109	615	-469	735	928	332	375
4407	31,852	2,626	28,799	48,757	1,257	52,973	-16,904	1,369	-24,174
4408	3,764	682	3,351	8,916	957	6,865	-5,152	-274	-3,515
4409	7,265	-141	8,152	6,477	-113	8,834	788	-27	-682
4410	18,281	7,025	9,394	35,874	488	44,403	-17,593	6,537	-35,009
4411	8,395	4,160	3,740	31,417	1,201	32,847	-23,022	2,958	-29,107
4412	7,333	1,980	5,743	6,250	-617	6,203	1,082	2,597	-461
4415	12,261	2,690	10,295	4,714	513	3,616	7,547	2,177	6,679
4418	59,620	1,841	49,316	9,608	3	11,187	50,013	1,838	38,129
4499	17,009	696	13,315	5,512	1,029	5,115	11,497	-333	8,200

Izvor: Database of the Serbian Chamber of Commerce, on the bases of database taken from the Customs Administration[31].

The most important products in the export of wood products in 2012 were the joinery and floors made of wood, lumber and wood-based panels (4418, 4407, 4410). The most common import goods were conifer lumber, which is mainly intended for construction work, wood-based panels and joinery (4407, 4410, 4411, 4418). Joinery, fuelwood, packaging products and charcoal (4418, 4499, 4401, 4415, 4402) had the most favorable balance. These data are graphically displayed on table 7.

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[31] Detailed data on export and import of wood products in groups of products for the period 2008-2012 are given in the appendix in table 51.
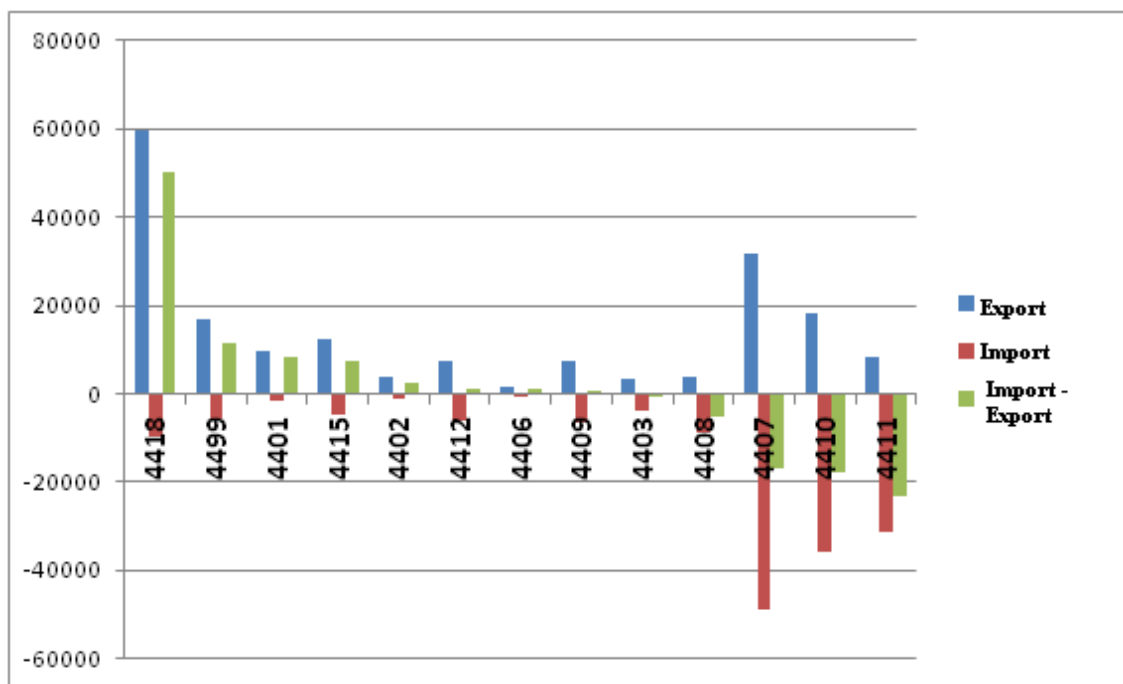
Figure 7: Balance by product groups in 2012 year. *(Source: Table 10)*

The analysis of export and import of some group of products pointed out that, for certain groups of products, there were satisfying trends. The export of wood-based panels had a continuous increase, in average, € 3 *million*, while the import decreased for about € 4.7 *million* a year. By building the factory for production of composite materials based on wood, ''Kronospan SRB doo'', which was completed in August 2009, significant changes occurred in relation to chipboards and the results of its business activities are included in balance sheets, starting from 2010. However, the import of particle boards `and other wood-based panels is still significant, so that there is room in the market to expand their production. A similar, but less favorable situation is in fibreboard (hardboard), whose import in 2012 was 17.6 *million €* higher than exports.

Also, a significant positive change was noticed in products belonging to group 4401, where, besides fuelwood, there were wood pellets. The production of wood pellets in Serbia started in 2006, and the constant growth of export of this product has been recorded since then. During this period, the export of € 2 *million* in 2008 reached € 7.7 *million* in 2012.

The export of wooden packing (group 4415) in the period 2008-2012 had a rather uniform annual value of export, with an average of 10.3 *million €* and a positive balance of € 7.5 *million*.

Particularly significant value of export could be seen in builders' joinery and carpentry of wood (group 4418), in which the export, after the fall in 2009, also

recorded steady growth. In 2011, compared to the previous one, the highest growth was recorded. The average amount of export in the period 2008-2012 was €49.3 *million* and import €11.18 *million*.

In addition to these products, it is important to note that the export of charcoal had also a steady increase of an average of 0.38 *million €* per year, and that the growth in 2012, compared to 2011, was 0.96 *million €*.

If the total export of the wood sector in Serbia is viewed in relation to the number of employees, it can be found that the export of wood products in 2012 amounted to € 10,047 per worker. Compared with the data from other countries[32], the export per worker in Austria was higher by 10.7 times, 8.8 times in Germany, 2 times in Slovakia, 2.6 times in the Czech Republic and 1.2 times in Croatia, compared to export from Serbia (based on the data in 2010). It is important to note that the export per worker in 2012 was 32% higher than the export in 2010.
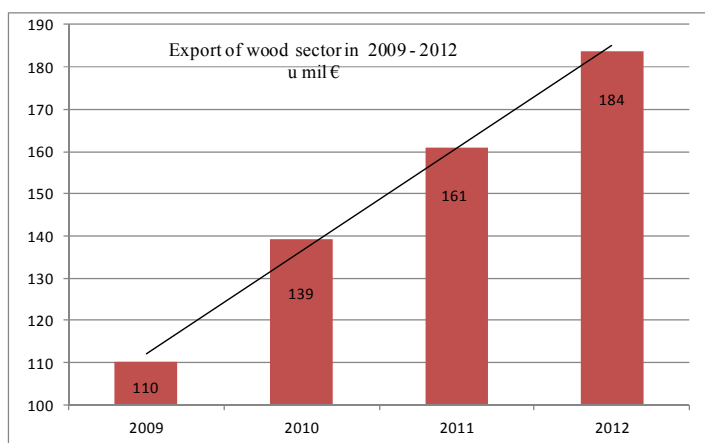
Figure 8: Export 2009-2012 in € million.
Source: Database of Serbian Chamber Of Commerce

Overall, by a significant increase in the export of wood products, for the period 2008-2012, which amounted to €730.4 *million*, or an average of €146 *million* per year, the wood sector contributed to the National economy, among other things, in the creation of new jobs.

Taking into account the current situation and registered trends, there is no reason not to proceed with further increase. There is space for further development of activities and increase in export in the field of production of wood base panels, joinery and other construction products, energy products, such as wood pellets, wooden packaging, and other products. There are considerable opportunities in the field of charcoal production where rural population is mainly employed, which is a direct contribution of the wood sector to the social component of the sustainable development of these areas.

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[32] Na osnovu baze podataka UNECE – Statistical database, podaci u broju zaposlenih i izvozu u 2010. godini. http://w3.unece.org/pxweb/database/STAT/26-TMSTAT1/006-TMSE1/?lang=1

Sawmilling and planning of wood will likely to continue with the current volume of export if there are no major disruptions on major export markets. Their export is important from the standpoint of a positive export balance of the wood sector. However, it also indicates a low level of development of the final wood processing and production of furniture made of solid wood, which is a direct way to reduce the potentials for employment through the process of finalization.

The analysis of recent trends, as well the development of consumption in the countries of the UNECE region, suggest that it can be expected for the export of wood products from Serbia (excluding furniture) to exceed €200 *million*. The prognosis is confirmed by the estimates given by (UNECE, 2012) which states that: ''*Even with the still present economic problems in most countries of the UNECE region, there is optimism that the recovery of wood market has started. The situation differs in certain groups of products, but it shows signs of improvement in most of them*''.

The given trends and predictions coincide a great deal with the EU policies relating to energy efficiency of housing and other buildings, which directly affects the production of joinery and other building materials (policies for energy efficiency and green building). Also, the modern use of biomass for energy purposes in the form of pellets and wood chips, and the growing needs of the European market for these products will contribute to the further growth of their production in Serbia, as well as export. When it comes to wood-based panels and fiber boards, it is more realistic to expect a reduction in import and further substitution of import with domestic production.

3.1.4 Contribution of wood sector to reduction of energy dependence of the country

Wood and woody biomass globally have great significance for mankind. Using wood as a fuel is growing in proportion to the population growth in the world. This type of energy in particular has an important role in the developing part of the world and it is estimated that it is the primary source of energy for about 2,4 billion people (IEA, 1998). About 40% of the world's population, mostly in Africa and India, now use wood as the only fuel for preparing food (US Energy Information, 2012).

Wood, as the oldest form of energy, which has been used for thousands of years, now gains the deserved attention. High prices of fossil fuels and political decisions made in order to increase energy security and alleviate climatic change, provide a powerful stimulus to the development of renewable energy sources, especially energy from wood.

There are many advantages in using woody biomass for energy purposes, some of them are:

• environmentally acceptable fuel that can contribute to efforts to reduce CO_2 emissions;

• renewable energy source using measures of sustainable forest management;

• reducing dependence on imported energy and

• ensuring economic development in rural areas.

The above mentioned benefits of using biomass resulted in the fact that in the last ten years the market of biomass has been recording rapid growth. Production of energy from biomass for heating and electricity production, as well as liquid fuels, accounts for about 14% of world production. About 25% of this is used in developed countries, while the remaining 75% is spent in developing countries (Parikka, 2004).

By adopting the Kyoto Protocol under the Convention on Climate Change (United Nations Framework Convention on Climate Change UNFCCC), signatory countries have undertaken commitments to stabilize the concentration of gases that produce the greenhouse effect, and, by which they are involved in solving this very important global issue. CO_2 emission from combustion of fuels based on biomass is neutral due to the fact that the emitted amounts of CO_2 are absorbed by other trees through the process of photosynthesis. Therefore, the use of biomass for energy purposes provides opportunities towards reducing CO_2 emissions on one hand, and the storage of carbon in forests and forest plantations, on the other hand.

Wood fuels are also one of the solutions to reduce emissions of gases causing the Greenhouse effect in the atmosphere (Hagauer, 2007).

Demands for wood fuels are globally rising, motivated by policies aiming to the usage of renewable energy sources. For example, the EU has set the goal to reach the amount of 20% share of renewable energy by 2020. Thus, the financial support to improve the competitiveness of wood fuels becomes an instrument for sustainable growth of woody biomass sector.

Among others, the increase in the cost of petrol in 2011 has influenced the consumers to prefer wood instead of fossil fuels (UNECE, 2012) .

Performing activities to increase energy production from renewable sources, the energy sector is intensely connecting to wood sector, encouraging competition and demand for wood. As a result, energy sector and wood industry are beginning to compete for wood biomass, and the quantities that can be mobilized and traded rapidly increase.

Through history, Serbia was dependent on forests and wood was a very important and reachable source of energy. The tradition to use private forests mostly as a source of energy for heating and cooking has remained till the present day.

Fuelwood is one of significant energy resource in the Republic of Serbia. According to (Macura, 2012) over 50% of population in Serbia uses solid fuels for heating, and within the poorest part of population which belongs to the first decile of consumption, that percentage is approximately 90%. According to (Glavonjić B. at all, 2010), in 2010, 40.9% of households in Serbia used solid fuels, such as fuelwood, briquettes and pellets, agricultural residues, for heating, or combined these fuels with other solid fuels. Both of the above mentioned sources emphasize the essential role of solid fuels in meeting the energy needs of households in Serbia.

This type of energy is the most economically acceptable for the population. They use wood from their own forests, do the logging themselves, process and transport wood, so that the costs are minimal.

If we take into account the fact that in Serbia, according to estimates (Gluk Peter et.al., 2011), there are over 0.5 *million* forest owners, then it becomes clear of how great energy and social importance the use of fuelwood is. For a huge number of owners it represents not only a source of energy for heating and cooking, but also a source of additional income, which is especially important in rural areas.

Private forests are the main source of wood for energy needs. However, the real volume of production, logging and consumption of fuelwood in private forests is not sufficiently known. With the complete control and evidence of companies giving support to private forest owners, the annual registered logging amounts to 0.7-0.8 *million m³* of wood. The official statistics for 2011 registered the total amount of logging in private forests of only 696,028 *m³* gross . Assortment structure of produced wood is mainly bad, so 90.3% of it is fuelwood (Republički zavod za statistiku, 2012).

The remaining quantities of fuelwood are produced in state owned forests. The official statistics noted the average annual fuelwood production from state forests of 928,050 $m³$ for the period 2008-2011 (865,325 to 995,008 $m³$ annually in the period 2008-2011)[33].

The total registered production of fuelwood in 2011 was only 1.513 *million $m³$* (Republički zavod za statistiku, 2012).

However, many studies dealing with the consumption of fuelwood point to the fact that the actual production and consumption of fuelwood is much higher than the officially registered. Several studies have attempted to determine the actual volume of fuelwood consumption on the bases of the analysis of consumption, or surveys.

According to the study of evaluation and financing of forests (FAO, Ministarstvo PŠV, 2007), based on the surveys, the amount of fuelwood consumption was 8.72 *million $m³$*.

Another study, also dealing with the consumption of fuelwood in Serbia (CESID, 2008) concluded: *''Fuelwood is still the most widely spread source of energy for households. Surveys of households show that about 11-12 million $m³$ of wood is spent for heating during winter in Serbia.''* According to the surveys (Kovačević, 2008) ''the most commonly used appliance for heating in Serbia is the stove on solid fuel. More than half of the households in Serbia (53%) possesses one (95% uses it)''.

According to (Glavonjić, 2011), based on the results of TCP / FAO project "Energy based on wood for sustainable rural development in Serbia" (FAO, 2011), the total consumption of fuel wood for heating in households in 2010 was 6,360.79$m³$. In addition to the stated amounts of fuelwood, an additional amount of 55,905 $m³$ in the form of large wood residue from wood processing was spent for the same purpose. The research within the mentioned project has been the most comprehensive survey conducted in Serbia so far, in terms of consumption of woody biomass, which suggests that the results have a high level of relevance.

According to the same author, the total woody energy consumption during the heating season of 2010/2011. amounted to 14,941,399,838 kWh and 53,789 TJ (Glavonjić, 2011). Detailed review of the expenditure in relation to sources is given in Table 11.

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[33] Republički zavod za statistiku Srbije, Izdanja šumarstvo u Republici Srbiji (za 2008, 2009, 2010, 2011. godinu).

Table 11. Collective overview of energy value of consumed wood fuels in the heating season 2010/2011. In Serbia

Wood fuel type	Measurement unit	Consumed amount	Inferior calorific value in kWh/mes.unit	Total energy value in kWh	Total energy value in toe
Fuelwood	m^3 solid wood	6,360,788	2,311	14,699,781,068	1,263,954
Solid residues of hard non-coniferous wood	m^3 solid wood	34,661	2,609	90,430,549	7,776
Solid residues of soft non-coniferous wood	m^3 solid wood	11,553	2,007	23,186,871	1,994
Solid residues of coniferous wood	m^3 solid wood	7,382	1,904	14,055,328	1,209
Solid residues (mixed coniferous and non-coniferous wood)	m^3 solid wood	2,309	2,027	4,680,343	402
Sum of fuel wood and solid residues	m^3 solid wood	6,416,693		14,832,134,159	1,275,335
Wood briquettes	tonnes	13,189	4,550	60,009,950	5,160
Wood pellets	tonnes	7,722	4,680	36,138,960	3,107
Sawdust (mixed coniferous and non-coniferous)	tonnes	4,172	3,144	13,116,769	1,129
TOTAL				**14,941,399,838**	**1,284,731**

Source (Glavonjić, 2011), based on the results of TCP / FAO project "Energy-based panels for sustainable rural development in Serbia" (FAO, 2011).

Official source or statistical energy balance for 2011 (Republički zavod za statistiku, 2012) shows that, for wood consumption for energy needs, in that year, 795,865 t of fuelwood were spent, out of which 424,783.t for households, which, in energy equivalents gave 12,780 TJ (0.305 Mtoe), or only 6,709 TJ (0.16 Mtoe) was spent for households. This figure is 4.2 times lower than the consumption, which was determined by the previously mentioned study (53,789 TJ or 1.284 Mtoe). Taking into account other studies and estimates analyzing the consumption of fuelwood in Serbia, it can be concluded that the officially stated consumption of fuelwood in Serbia is undervalued and that its real value is significantly higher.

Comparing the total final energy consumption in Serbia, which is expressed in a statistical energy balance in the amount of 363,080 TJ (Republički zavod za statistiku, 2012), with the consumption in Table 11 (based on (Glavonjić, 2011)), it can be found that **the energy obtained from wood accounts for 13.3%[34] in final energy**

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[34] The difference that was determined by FAO study was added to the total consumption of 363.080TJ, so that the total energy calculation was taken as 404,089 TJ

consumption in Serbia. This shows that the share of wood energy is significantly higher compared to its share that is accounted for in the official statistical balance, and which was only 3.52% for the year 2011 .

As a result of numerous domestic and international activities that have contributed to the increasing importance of the woody biomass in energy production[35], The Ministry of Energy, Developmentand Environment, in its proposal of energy balance for 2013, offered by far more realistic plan for production and consumption of energy obtained from wood and biomass. The planned production of the solid biomass[36] in 2013, according to this balance, was 1,068 Mtoe, which is only 17% lower compared to the data obtained from the study (FAO, 2011), or 3.5 times higher than the official consumption for 2011 in statistical energy balance. Also, using this energy balance the social importance of the biomass in Serbia is stated in the appropriate way "Consumption of solid biomass occurred predominantly within the widely consumers, to the households sector and partly in public and commercial sectors for heating. The use of fuelwood for heating is characteristics of rural areas and peripheral parts of the suburbs. As a rule, rural regions gravitate to areas with high production of wood, they are away from other sources of energy supply, and households have a low purchasing power, so that fuelwood is the most appropriate and has no alternative.". „The total amount of primary energy needed for consumption in 2013 amounted is 16.739 Mtoe, which is 5% more than the estimated total amount of primary energy consumption in 2012, which is amounting to 15.992 Mtoe." "In the structure of primary energy, coal accounts with 69%, oil 11%, natural gas, 4%, 7% hydro potential, **fuelwood with 9%**, and geothermal, solar and wind energy and biogas from less than 1%."(Ministarstvo energetike, razvoja i zaštite životne sredine, 2013).

Based on the above elements it can be concluded that the actual consumption of fuelwood in Serbia is undoubtedly higher than the officially published figures and that fuelwood is an important energy resource. Therefore, it is essential that wood and

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[35] Biomass Action Plan for 2010-2012, the Government of RS, the Regulation on Incentives for the privileged power producers, results of the TCP / FAO project "Energy based on wood for sustainable rural development in Serbia," the obligations that the Republic of Serbia has according to the Contract on Energy Community and others.

[36] Production and consumption of solid biomass include the production and consumption of fuelwood, pellets and briquettes for energy needs (for heating purposes).

woody biomass obtain adequate importance, not only in the energy balances and official analyzes of consumption, but also in the application of methods for the assessment of its consumption. Methods of consumption of fuelwood have to be comprehensive and detailed, based on recognized scientific and statistical methods. Also, data authentication should be two sided, from the side of wood production and from the side of its consumption. When in independent processes of data collection and processing these two values come closer to each other, then the data can be accepted as considerably reliable.

The significance of fuelwood, according to what has been said so far, undoubtedly grows. It should be borne in mind that the Republic of Serbia has committed to reduce the consumption of final energy to 9% by 2018 compared to 2008, as well as to increase the part of renewable energy sources in final energy production to 27% by 2020 (Macura, 2012). In the structure of planned domestic production of primary energy for 2013, the share of renewable sources of energy is 1.835 Mtoe, which is 16% of domestic production of primary energy. In this structure the largest share of 58% belongs to the solid biomass, 41% to hydropower, while biogas, wind, solar and geothermal energy participate with less than 1% (Ministarstvo energetike, razvoja i zaštite životne sredine, 2013).

Taking fuelwood as an important resource for achieving the set goals in energy, it must be taken into account that, at present, the fuelwood has a developed market and consumers who spend almost all produced quantities. Consequently, the social component of usage of fuelwood is very pronounced, and, for much of the population, it is the only available power source. Diverting fuelwood market from current consumers to other types of consumption (central heating system, pellets, wood panels, pulp and other products) could cause either social problems (due to the reduced supply of fuelwood) or to increased volume of forest usage (over allowable annual cut), i.e. the social and environmental components of forest management could be considerably undermined. For these reasons the fuelwood, consumed in the current consumption mode, cannot contribute to the provision of the additional quantities of biomass in Serbia.

However, the use of wood as the energy source in households is extremely irrational, it is used in a traditional way in outdated and inadequate stoves. Thus, it can simply be concluded that by raising the degree of efficiency of the usage of fuelwood, some quantities, contributing to the increase of consumption in other areas (wood

biofuel industry, wood based panels),can be ''liberated''. Practically, the transition from a traditional to a modern way of using biomass can create space for the substitution of other energy sources without increasing the volume of logging. Other additional amounts of woody biomass for energy needs can be provided by using wood residue after logging, sawmill residue, the targeted production in plantations with short tending, in the reclamation of degraded forests, revitalization of abandoned agricultural land and others.

The present situation in consumption (as well as production) of fuelwood and woody biomass must not be regarded as static and unchanging. Numerous activities from the field of renewable energy sources, and commitments to the EU, indicate the possible considerable increases in the field of wood energy production, first of all in the following:

- According to the statements of domestic manufacturers, the consumption of pellets is permanently rising. Favorable conditions for production (low cost of raw material and electric energy), a steady increase in demand and price of wood pellets affect new investments in this area. If the total current production, which is getting closer to the amount of 0.1 *million t/year*[37], is used for domestic consumption, an increase in the consumption of energy from biomass for 1800 *TJ* will take place.
- Studies to assess the potential conversion of existing heating systems, by switching from coal to wood biomass, predict the construction (reconstruction) of heating plants in about 14 municipalities, and the plan is being prepared for another 6 municipalities[38]. So far, the estimated amount of biomass needed to supply these heating plants is 0.1 *million t*.
- Adoption of a new tariff system for Feed-in tariffs[39], which subsidizes electricity production generated from biomass in the amount of 13.26 to 8.22 / 15.66 to 12.31

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[37] According to the statements of manufacturers the production of pellets in 2011 was 70 000t, of which 50.500t were exported.

[38] The study of the USAID „Biomass Cost and Availability Study", 2011, for Majdanpek, Bor, Knjaževac, Trstenik, Zaječar, Bajina Bašta, Kosjerić, Nova Varoš, Novi Pazar, Priboj'municipalities . The study of CESID „Quantification of potential biomass for supply the systems of district heating in selected cities in Serbia" for Pirot, Zrenjanin, Vrbas municipalities.

[39] Regulation on the conditions and procedure for acquiring the status of the privileged power producer ("Off. Gazette of RS", no. 8/2013), Decree on Incentives for the privileged power producers ("Off. Gazette" 8/2013).).

$c€/kWh^{40}$ depending on the installed capacity, makes a significant stimulus for investment in this area.

- The rise in prices of other energy sources, as well as the impact of the economic crisis, will further stimulate consumption of fuelwood by local population.

In addition to these effects, the contribution of wood energy to reducing energy dependence of Serbia is quantified in financial and environmental terms. According to (Glavonjić, 2012) the total consumption of wood energy in 2011 contributed to the decrease in fuel oil import in the amount of €1.3 billion or €650 *million* in the case where, instead of wood energy natural gas from import was used (calculation made on the basis of an average price of heating oil by 0.9 € / liter and 0.47 € / m^3 of natural gas). According to the same author the use of wood energy in 2011 contributed to the savings of about 7 *million* tons of $CO2$ in the case where instead of wood energy fossil fuels were used.

3.1.5 Fuelwood consumption per capita in Serbia

In the chapter "Wood Flows in Serbia", the internal flows of wood in Serbia are shown in tables and charts. They point out the fact that the relations between the consumption and production are not always synchronized on local level. This can be confirmed by the data about the consumption of fuelwood in Serbia obtained by the research (Glavonjic,2011), whose results are additionally processed and placed in relation to the number of inhabitants, and condition in forests within a district, as shown in table 12.

From the data in table 12 it can be seen that the regions with the higher percentage of forest lands are, as a rule, less populated and, accordingly, have a larger area of forest per capita. Regions with the largest areas of forest per capita are situated in the east and south of Serbia. In Zajecar, Bor, Pitrot and Toplica districts, there is a little more than 1 ha of forest per capita, which is significantly more in comparison to 3 ha per capita, which is the average for the Republic of Serbia. The consumption of

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[40] The system of Feed-in tariff means a system of state subsidies for energy producers, who use renewable sources (in this case, biomass) for production, by which the price of energy produced per kWh is higher than the regular price, depending on the technology applied.

fuelwood in these districts is in concordance with the production capacities of forests, so the highest consumption of fuelwood per capita has been registered in these districts.

On the other hand, the lowest consumption of fuelwood per capita is in districts where there are large cities having district heating systems, or other sources of energy for heating (gasification), and districts with smaller percentage of forest land as well.

The ratio of forest growth (or felling) and wood consumption on a certain area indicates the possibilities of the area to independently and continuously satisfy its needs for wood. The ratio is good in Zlatibor, Raska, Moravica, Zajecar, Bor and other regions with higher percentage of forests. The region of Vojvodina (except Srem district) and Podunavlje district have to satisfy their needs for wood from other regions.
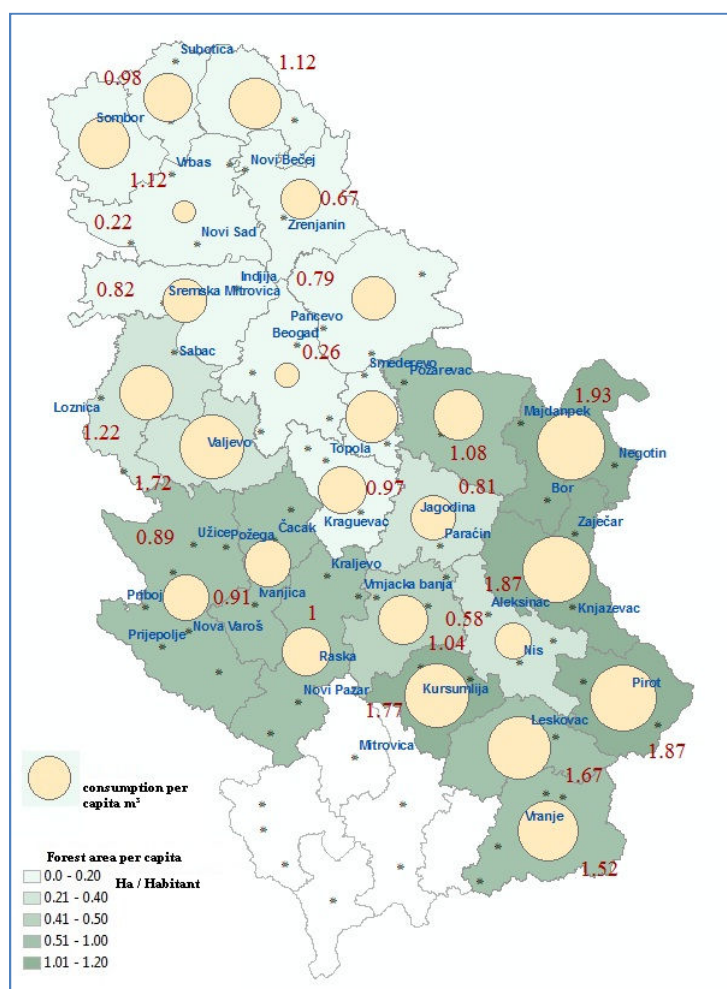
Picture 9. Forest area and consumption of fuelwood per capita in the districts
(Source: Data from Table 16)

Table 12. Wood consumption and percentage of wood area per capita (shown by districts)

District	Number of residents	Number of households	Consumption of fuelwood		Forest area (ha)		Forest volume		Increment (Zv) m^3*10^3	Zv / Consumption
			Total m^3	m^3 per capita	total	per capita	total m^3*10^3	m^3 per capita		
1	2	3	4	5	6	7	8	9	10	11
Zlatiborski	313,396	97,305	280,301	0,89	258,800	0,83	49,104	156.68	1.405	5,0
Raški	291,230	87,894	290,575	1,00	199,600	0,69	30,834	105.87	762	2,6
Zaječarski	137,561	46,946	257,527	1,87	162,800	1,18	23,305	169.41	590	2,3
Borski	146,551	50,743	283,396	1,93	162,800	1,11	25,420	173.46	548	1,9
Pčinjski	227,690	64,668	344,976	1,52	139,600	0,61	26,338	115.68	543	1,6
Jablanički	240,923	73,604	401,399	1,67	132,400	0,55	18,972	78.75	432	1,1
Braničevski	200,503	63,072	215,753	1,08	126,000	0,63	21,929	109.37	524	2,4
Moravički	224,772	74,556	204,104	0,91	124,800	0,56	26,667	118.64	624	3,1
Rasinski	259,441	81,270	268,937	1,04	122,000	0,47	16,722	64.46	404	1,5
Pirotski	105,654	38,481	197,553	1,87	115,600	1,09	11,718	110.91	309	1,6
Toplički	102,075	35,073	180,677	1,77	109,200	1,07	15,770	154.49	368	2,0
Mačvanski	329,625	104,159	403,316	1,22	98,000	0,30	15,985	48.50	409	1,0
Nišavski	381,757	130,441	221,163	0,58	91,200	0,24	9,077	23.78	258	1,2
Kolubarski	192,204	62,818	330,975	1,72	72,800	0,38	12,120,	63.06	308	0,9
Pomoravski	227,435	75,006	184,845	0,81	71,600	0,31	14,305	62.90	337	1,8
Sremski	335,901	110,528	276,404	0,82	61,200	0,18	15,810	47.07	344	1,2
Šumadijski	298,778	101,093	290,778	0,97	54,400	0,18	6,758	22.62	187	0,6
Grad Beograd	1,576,124	566,028	406,209	0,26	50,800	0,03	7,320	4.64	189	0,5
Južno-Banatski	313,937	106,234	246,591	0,79	32,800	0,10	3,055	9.73	142	0,6
Južno-bački	593,666	207,679	127,736	0,22	29,200	0,05	5,544	9.34	146	1,1
Zapadno-Bački	214,011	74,475	239,585	1,12	17,200	0,08	2,727	12.74	137	0,6
Srednje-banatski	208,456	73,865	140,143	0,67	6,400	0,03	1,279	6.14	50	0,4
Podunavski	210,290	66,874	242,326	1,15	6,000	0,03	1,061	5.04	27	0,1
Severno-Bački	200,140	74,402	196,263	0,98	4,400	0,02	455	2.27	15	0,1
Severno-Banatski	165,881	61,080	185,161	1,12	2,800	0,02	213	1.28	23	0,1
	7,498,001	2,528,294	6,416,693	0,86	2,252,400	0,3	362,487	48.34	9.080	1,4

Source:1. *(Glavonjic, 2011); 2. (Nis,2008); 3.(the Statistical Office of the Republic of Serbia)*

Analysis of data on wood consumption per capita, which is given in table 12, indicates that the current consumption of wood per capita is significantly influenced by conditions (percentage of forest area), population density and the existence or non-existence of district heating systems that use other types of fuel. Such or similar state has existed for decades. However, keeping in mind the trends that are related to modern ways of using biomass and plans to convert the fuel in some remote heating systems and switching from coal and fuel oil to biomass, we can expect an increase in wood consumption per capita, especially in urban areas. Changes in the value of this indicator may, among other things, indicate the effectiveness of the measures implemented to encourage the use of biomass as an environmentally justifiable and renewable energy source. In the realization of investments for biomass the priority should be given to districts with a higher percentage of forest areas, or where the relationship between growth and consumption is higher (column 11 of table 12). In these districts, certain effects can be achieved in short terms, without major problems with securing the necessary biomass. In other districts, where the values of the coefficient are small, first, it is necessary to implement activities that will ensure growth and increase the percentage of forest areas by lifting dedicated crops or by conventional reforestation.

3.1.6 Employment (direct and indirect employment) in wood sector in Serbia

Employment in the wood sector is an important indicator of social benefits generated by forests, especially for Sustainable Rural Development (MCPFE, 2007). Stable employment is an important indicator of sustainable economic welfare of individuals and communities. Employment in the wood sector is particularly important for communities in rural areas, which are dependent on forest resources a great deal.

Employment can be divided into direct, indirect and induced employment. The direct employment covers all jobs within the wood sector where goods are produced and services offered. As a result of the direct employment many jobs relating to supply of goods and services for wood sector, and belonging to the category of the indirect

employment, are generated. The induced employment is a result of spending generated by earnings and profits made in the sector[41].

Within the wood sector, there is considerably higher employment and profits than what can be seen in conventional statistics. The traditional definition of employment in terms of participation in the labor market is not adequate in relation to the reality, where, for many people, wood is an important source of income. For these people the difference between employment, self-employment and work for the sake of survival is not essential (Poschen, 2004).

3.1.6.1 Employment in the wood sector in Europe

According to (MCPFE, 2007) employment in the wood sector reached the number of almost 4.3 *million* people in 2005, which was 1,1% of an overall employment in MCPFE field[42]. Forestry and forest utilization participated with 29% in the wood sector, wood industry with 48%, pulp and paper with 23%. In addition, 1,3 *million* people were employed in furniture industry. However, the number of the employed in the wood sector in the MCPFE countries recorded a steady decline, which was approximately 2.7% a year during the 1990s and 1,3% from the 2000s. The decline in the employment was present in all sub sectors of the wood sector.

In countries belonging to the MCPFE region the employment per forest area is one person per 1000 ha in average (the decline was recorded, because in the early 1990s there were 2 persons). The employment in Europe, in relation to the area, varies depending on the regions and countries (*figure 10*). The lowest number is in the Scandinavian countries and the Russian Federation, where fewer than 1 person is employed in 1000 ha of forest. The number of employees in northwestern and central Europe is 3-6 people. Turkey, central and south-eastern Europe have the highest employment rate in relation to the forest area.

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[41] Definition taken from ''Criteria and indicators for sustainable forest management in Canada, Indicator- Direct, indirect and induced employment'', http://www.ccfm.org/ci/rprt2005/english/pg89-115_5-3-5.htm

[42] MCPFE conference includes 46 European countries
http://www.foresteurope.org/about_us/signatories

Country	Area	Forestry and logging	Wood processing	Total	Forestry and logging	Wood processing	Total
	(10^3 ha)	(10^3 workers)			(workers / 10^3 ha)		
Germany	11,076	42.5	146.9	189.4	3.84	13.26	17.10
Sweden	28,605	26.1	38.9	65.0	0.91	1.36	2.27
The Russian Federation	809,090	74	340.5	414.5	0.09	0.42	0.51
Austria	3,857	11.2	44.7	55.9	2.90	11.60	14.50
Switzerland	1,240	4.9	36.6	41.5	3.95	29.52	33.47
Finland	22,084	23.4	25.8	49.2	1.06	1.17	2.23
Czech Republic	2,657	18.0	67.4	85.4	6.76	25.38	32.14
Romania	6,573	43.7	127.9	171.6	6.65	19.45	26.11
Norway	10,250	4.2	16.5	20.8	0.41	1.61	2.03
Latvia	3,354	23.8	30.5	54.4	7.10	9.10	16.21
Hungary	2,039	13.77	37.73	51.5	6.75	18.50	25.26
Slovakia	1,938	24.0	34.1	58.1	12.38	17.60	29.98
Estonia	2,203	5.3	16.6	21.9	2.41	7.53	9.94
Slovenia	1,253	2.7	14.9	17.6	2.18	11.89	14.07
Croatia	1,920	13.5	19.5	33.0	7.05	10.14	17.19
Serbia	**2,252**	**7.2**	**11.1**	**18.3**	**3.22**	**4.93**	**8.14**
Macedonia	998	4.2	2.8	7.1	4.24	2.82	7.07
Bulgaria	3,927	22.9	27.0	49.9	5.83	6.88	12.71

Source: MPEFE database (for Serbia, according to the data from table 18)
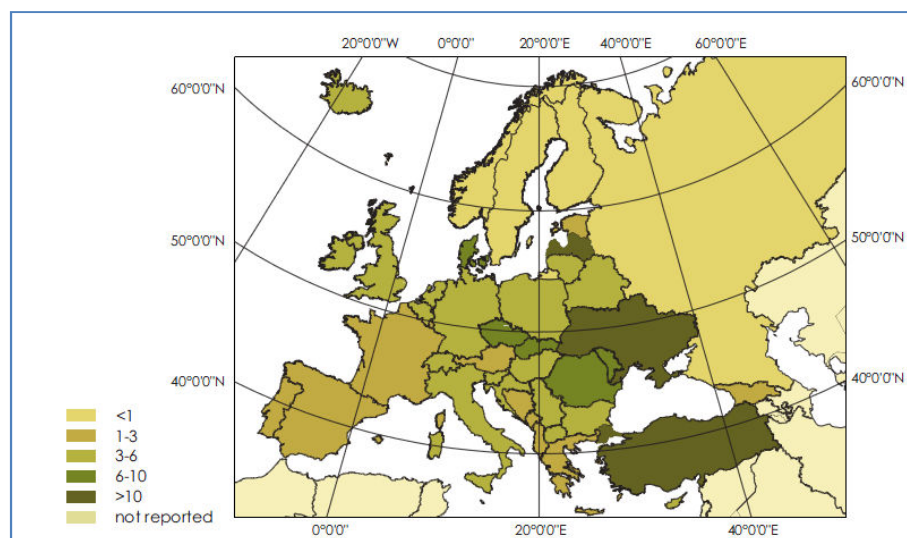
Picture 10. Employment in wood sector in Europe, Source: (MCPFE, 2007).
Table 13. Overview of the number of employees in the wood sector in Europe by countries for 2010

The study on employment and trends in Europe (Blombäck, et al., 2003), predicted that, between 2000 and 2010, there would be 270,000 job losses in the wood

sector: 120,000 in forestry and utilization of forests, 60,000 in wood industry and 90,000 in pulp and paper industry.

According to MCPFE, the real trends, recorded in the period 2000-2005, indicate that almost 290,000 jobs were lost, or, more than it had been predicted. The rate of decline is considerably higher than the predicted one, for all three subsectors (forestry and logging, wood industry and pulp and paper industry) (MCPFE, 2007).

According to other authors too (Poschen, 2004), employment in the wood sector has been declining in most industrialized countries. Productivity growth and the opportunities provided by globalization in terms of relocation parts of the company belonging to wood industry from developed countries to developing countries are likely to limit the growth of employment, even in developing countries where production is rising.

In industrialized countries the use of harvester and other modern machinery in the business of logging has considerably reduced the engagement of labor force and caused changes in assortment structure (thinner assortments of larger and uniform length). In the countries of Central and Eastern Europe, due to the greater presence of deciduous forests and lower investment potential, the use of chainsaws is still widespread. Thanks to this the engagement of labor force in logging is still considerable.

According to the analysis (MCPFE, 2007), the loss of jobs in the wood sector was necessary in order to maintain levels of productivity and competitiveness as a result of growing competition, which was getting stronger parallel to the process of globalization. Countries in transition had to reorganize themselves regarding new requirements of the market and increased competition, leading to increased productivity and a significant reduction in the number of employees, particularly in the nineties. Relocation of production and investment from Western to Eastern Europe increased employment in some countries, mainly in rural and underdeveloped areas. In the current situation, without a significant increase in demand and price of wood it is not realistic to expect that there will be a significant increase in employment.

3.1.7   Direct employment in the wood sector in Serbia

According to the statistics, in 1990, in Serbia (without AP Kosovo), there were 18.870 fully employed workers in the wood sector[43] (table 14), (Savezni zavod za Statistiku, 1991). That year the structural and organizational changes started and the significant part of activities of the wood sector moved from state (social) into private ownership. Similar processes were recorded in almost all countries in transition, leading to the restructuring of state forest companies, privatization of the wood processing sector, reducing the number of workers and delegating logging jobs to private contractors (MCPFE, 2007).

Table 14. Number of workers in wood sector in 1990

	Srbia	Central Serbia	AP Vojvodina
Forestry	10,705	8,582	2,123
Production of lumber and panels	8,173	6,290	1,883
Total	18,878	14,872	4,006

Source: Statistical bulletin SFRJ no. 1892 (data without final processing and paper production)

In forestry of Serbia, which independently performed activities in management and utilization of state owned forests until that period, some changes took place relating to separation and privatization of the work in forest utilization. By applying structural changes, the organization was established, where, almost as a rule, private companies and entrepreneurs were performing business in utilization of forests. A small number of workers that remained in state companies for forest management, were kept for social reasons. The only example opposite to this practice is a forest estate "Sremska Mitrovica", which operates within PE ''Vojvodina šume'' that completely independently and using its own labor force, performs all the work of forest utilization.

The process of separating tasks in forest utilization was carried out slowly, by reducing the amount of labor force at the expense of service companies and by selling wood on the stump. Changes of participation of some types of wood production in PE "Srbijašume" since its foundation are shown in Figure 9.

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[43] Forestry and manufacturing of wood products, without final processing and paper production.

1000 m3	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Contracting	218	293	416	545	925	802	785	909	1,083	827	855	513	554	612	694	717	724	714	797	865	844
Sale on stump	208	196	309	281	320	361	336	411	361	277	384	440	427	379	350	257	373	352	345	320	333
Own production	1,265	848	675	825	534	475	442	447	381	336	343	124	73	46	32	24	34	27	29	30	30
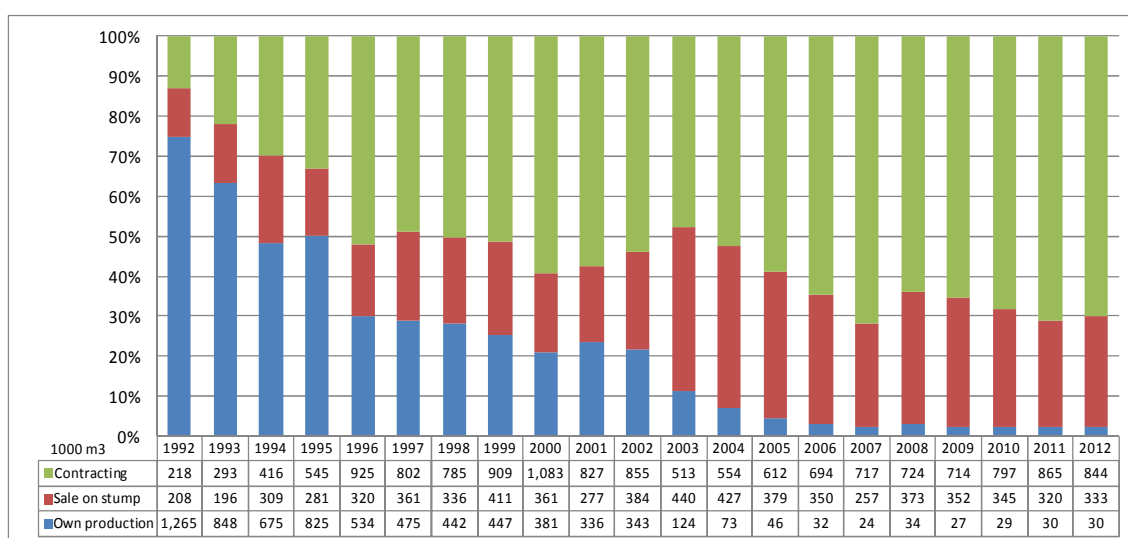
Figure 9: Presence of some types of wood production (harvesting) in PE "Srbijašume" *1992-2012. Source: Business report of PE* "Srbijašume"

Based on the presence of certain types of wood production, as shown in Figure 9, it can be seen that the process of transformation and restructuring of the forestry sector started immediately after the foundation of "Srbijašume" in 1991[44].

According to (Vučićević, 2008), the engagement of their own workforce in PE "Srbijašume" was 75% in 1992, 20% in 2000, and only 4% in 2005. During that period the scope of their own production was declining, but the scope of production made by offering services and selling wood on the stump was rising. Thus, in 2007, the scope of their own production was only 2 %, services 72% and sales on the stump 26%.

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[44] Data relating to the production of JP "Srbijasume", regardless of the organizational changes that have occurred in the reporting period. For the period after 1999, there are not included production of forests from AP "Kosovo and Metohija", and the period after 2002 are not covered forests of AP "Vojvodina". For this reason, the participation of certain forms of production is shown as a percentage distribution.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	12.9	21.9	29.7	33	52	49	50.2	51.4	59.4	57.4	54	47.7	52.6	59	64.5	71.9	64	65.3	68.1	71.2
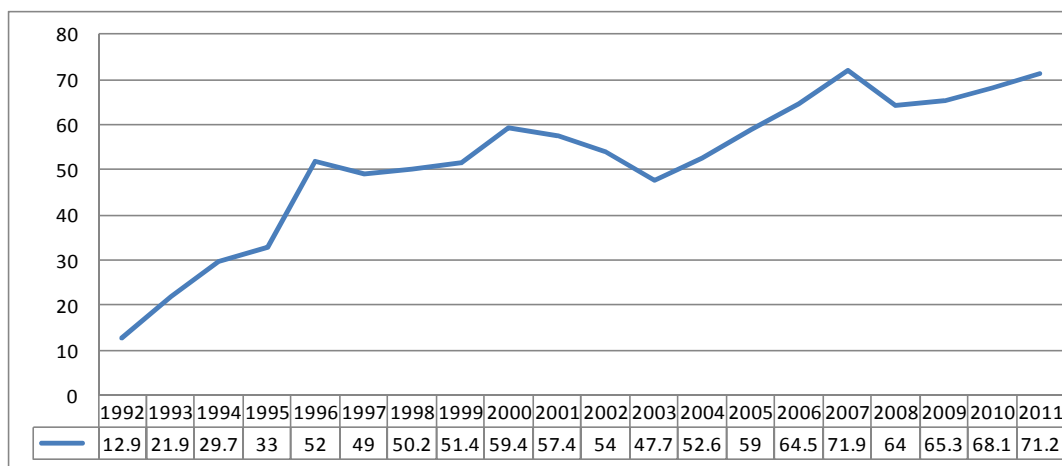
Figure 10: Changes in hiring service labor force in forest utilization In PE "Srbijašume" (%).
Source: Business reports of PE "Srbijašume".

Identical changes were noted with the number of unqualified workers in the company, which was 3,606 in 1992, and only 48 in 2007.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of employees	3,606	2,878	2,694	2,957	2,897	2,890	2,870	1,995	2,070	1,961	1,940	718	795	835
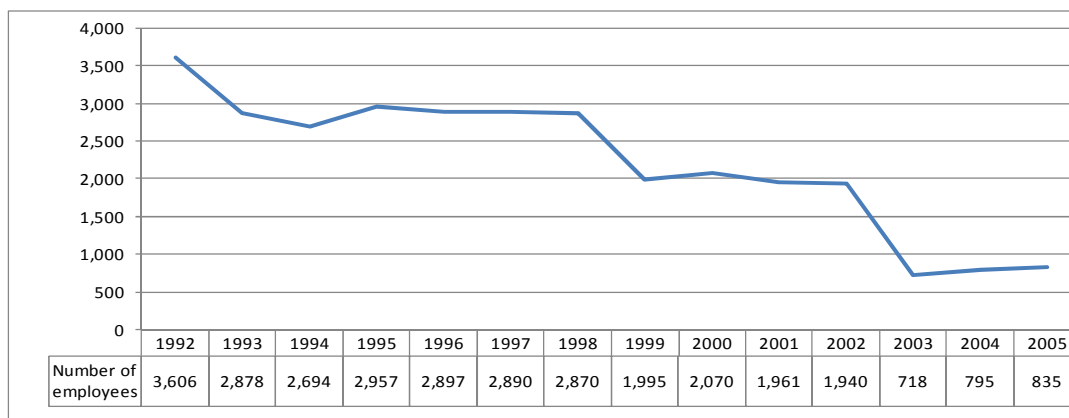
Graph 11: Changes in number of fully employed workers in PE "Srbijašume".
Source: Business reports of PE "Srbijašume".

If we take into account the way of production, the company with its own labor force produced 1.26 *million m³* of wood assortments in 1992. Work productivity was then 350.8 *m³* per capita. From then till 2005 it was continually declining, so, in 2005, it dropped for 6.3 times in relation to 1992, as shown on Figure 12.

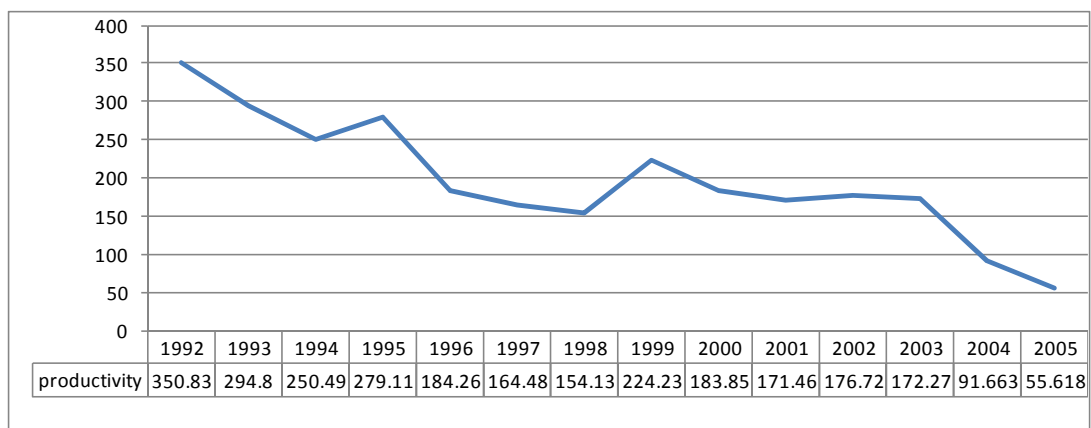|	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
productivity	350.83	294.8	250.49	279.11	184.26	164.48	154.13	224.23	183.85	171.46	176.72	172.27	91.663	55.618

Figure 12: Changes in productivity of production workers in PE "Srbijašume". Source: Business reports of PE "Srbijašume"

The drop in productivity in a company using its own labor force was just one reason to contract works on forest utilization out of the company (outsourcing[45]). This trend was completely logical because the policy of management and organization, which had been used to transform the former ''forest-industrial complexes'' into ''forest management companies'',also changed . Thus, the business objective of forest companies shifted from the wood and wood production to forest and forest management. "In such an established organization of forestry" preservation, protection and improvement of forests, using the full potential of forests and their functions as well as planting new forests in order to achieve optimal percentage of forest areas. "(Article 8, Law of Forestry), are defined as a framework for conducting basic activities of public forest companies, established to ensure the public interest. In these conditions, the organization of forest management means primarily the engagement of full-time employees and skilled labor.

Organizational changes that were implemented resulted in the change of the number of employees in state-owned companies. Employees of these companies remained "transparent" in the official statistical reports, unlike employees in the business of forest utilization (which will be explained in further analysis).

According to data of the Statistical Office of the Republic of Serbia[46], the number of employees in legal entities within the activity (02) "Forestry and logging" in the period 2001-2013. years was reduced to 2,934. The increase in the number of workers immediately after 2000 was the result of taking over workers who worked in

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[45] Outsourcing is the contracting out of an internal business process to a third party organization.

[46] SORS, database kd 2010.

Kosovo and Metohija. The trend in changes in the number of employees is shown in figure 13.
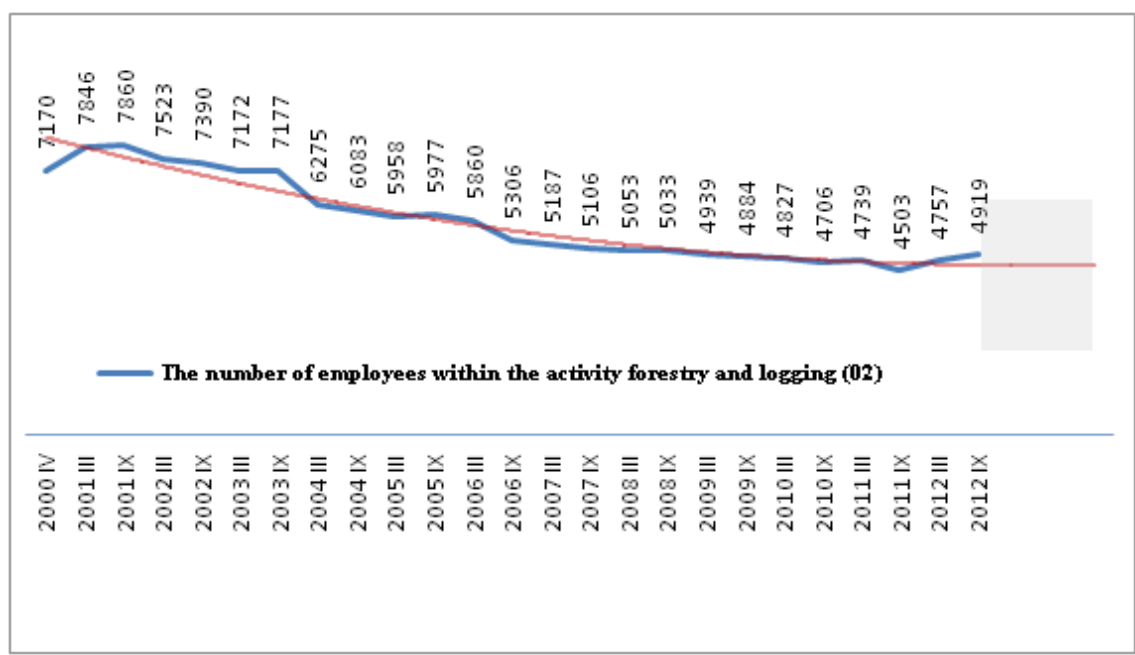
(Source: SORS kd2010)

By analyzing the trend of employees within the activity of 02 (for the period 2001-2012) it has been concluded that, in the regression model with a quadratic polynomial, the change in the number of employees is characterized by a high correlation coefficient (R = 0.97) and considerable significance (F-test). Continuous reduction of the number of workers, with an average rate of change of -1.51, is the result of privatization and outsourcing of operations on forest utilization, which is discussed later in this chapter.

On the bases of the resulting trend it can be predicted that, in the years to come, the number of employees within the activity 02 will be balanced at the level between 4,700 and 4,750 employees, and that in current economical and organizational circumstances further significant reduction of the number of workers should not be expected.

	quadratic polynomial $y = a1 + a2 * X + a3 * X^2$	a1 =8404.47883583179 a2 =-297.454108651952 a3 =5.97289705276489
1.	Number of pairs of series	N=26
2.	Mean	Ya=5813.385
3.	Minimum	Ymin=4503

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4.	Maximum				Ymax=7860	
5.	Standard deviation(Ya)				S(Ya)=1120.72	
6.	Level of function				R=2	
7.	Degrees of freedom of				N-R-1=23	
8.	The standard error of estimate				Sd=290.292	
9.	The average rate of change of				Sp=-1,513	
10.	The coefficient of determination				R^2=0.938	
11.	The correlation coefficient				R=0.969 (visoka povezanost)	
12.	The coefficient of determination (corrected)				R^2=0.933	
13.	Fisher's F-test				F=174.81 (+)	

According to the Agency for Business Registers data, which are partly different from the data of the Statistical Office of the Republic of Serbia, in 2011, the activities within "0210 - Silviculture and other forestry activities" there were 5,296 workers employed.

According to data collected from the companies for forest management, the total number of employees at the end of 2012 in this sector amounted to 5,307 workers, which is shown in Table 15, by educational structure.

Table 15. Number of workers in forest companies that are present on the wood market, presented by educational structure in year 2012.

Company	Area	NK	SS i VS	VSS	Forestry technician	Forestry engineer	Total	Workers /1000 ha
"Srbijašume"	917,318	1.011	505	171	952	529	3,168	3.5
Vojvodinašume	114,266	790	239	66	305	171	1,571	13.7
National parks	120,525	154	132	15	98	83	482	4.0
Faculty property	5,900	21	0	0	9	6	36	6.1
Other	38,300	0					50	3.0
Total	1,196,309	1.976	876	252	1.364	789	5,307	4.4

Source: Reports of companies

The data presented in Table 15 show that the highest number of forestry workers is employed in state-owned public companies[47], 5,221 or 98.4% of the total in this sub-sector. The remaining part is employed in municipal utility companies ("Borjak" Vrnjačka Banja, "Kraljevica" Zajecar), experimental properties of Faculty of forestry, forest management companies belonging to religious communities, and others. Given by the qualification structure, the most common are unskilled workers (37.2%),

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[47] Public forest enterprises and national parks.

followed by forestry technicians (25.7%). In the total number of employees in enterprises for forest management, forest engineers are represented with 14.9%.

Forest utilization activity is very important for the wood sector and the supply of industrial and fuel wood. Within this activity, some 3,606 forest workers were evidenced in PE "Srbijašume" in 1992. If we add the number of production workers from National parks to this number, the total number of such workers was 3,800. After that period this activity was outsourced from forest management and became entrepreneurial activity. According to the BRA data, which were obtained from annual accounts of companies and entrepreneurs for the activity ''forest utilization (0220-Logging)'', the total number of workers in those companies was only 11. If we add companies and entrepreneurs registered for ''0240- Support services to forestry'' to this number, there are 72 additional workers. The remaining, officially registered workers on works related to forest utilization,have been evidenced in Public forest management companies within the activity 1210, primarily PE ''Vojvodinasume'' (where the number of workers in forest utilization is 330) and, in a smaller number, in PE''Srbijašume'', so we get the total number of only 488 workers, which certainly does not correspond to real situation.

The data of public forest management companies, which are related to the number of workers needed for the production of wood products, based on the norms of performing plans, differ significantly from official data. For example, the data of professional services of PE "Srbijašume" show that it was necessary to engage the following people (in 2012):

1. For logging of 873,542 m^3, of which 161,578 m^3 is technical wood, 161,578 m^3 extended fuelwood and 332,652 m^3 fuelwood, it was necessary to hire 573 forest workers for a year, in accordance with norms and conditions on the field

2. For dragging technical wood and the extended fuelwood on the area of 540,893 m^3 it was necessary to engage 62 more powerful tractors. In organization 1+1, it asks for 124 workers.

3. For the removal of fuelwood in the amount of 332,650 m^3 it was necessary to hire 608 horses, with 178 workers.

In practice, for the amount of 873,542 m^3, which was realized through service companies, it was necessary to engage 849 workers. By analogy, for the remaining

quantity of 333,432 *m³* of wood, which had been realized by sales on the stump, it was necessary to engage additional 334 workers, making the total of 1,208 workers for the activity of forest utilization in the function of realized production in PE "Srbijašume". Taking into account that, in 2012, the production in PE "Srbijašume" was 62% of the total production in the state owned forests, proportion leads to approximate estimates of the necessary involvement of about 1,948 workers to perform work on logging and dragging (disposal) of wood in state forests. This information, although approximate, suggests that the number of workers required for the forest utilization, compared to 1992, have decreased, but also that it is several times higher than the number of officially registered workers.

In the previous analysis based on the data of the Statistical Office of the Republic of Serbia (Figure 13) it is shown that the number of employees in companies for forest management in the period 2001-2012 decreased by 2,934. It shows that there was ''transfer'' of production workers to private sector and that they were not presented in the official records.

"Lack of transparency" of workers in the business of forests utilization is the result of hiring part-time workers, underreporting workers performing activities through registered entrepreneurial traders that do not have the obligation to make balance, and other activities. Hiring part-time workers or hiring unregistered workerswith undefined length of their engagement[48] prevents the recording of the actual number of workers in these activities.

On the bases of the above data, relating to the number of workers, it could be concluded that the transition period in forest utilization activities, which is characterized by transfer of business from state companies for forest management to the private ones, hasn't finished yet in the way it was expected. A large number of small contractors that do not have the opportunity for serious investment in equipment, do their business in the way that cannot secure the necessary development of work. The number of such companies should be reduced in the following years and give space to companies whose capacities can provide higher productivity and competition. During that process one should not expect the reduction of labor force in order to increase productivity, but can expect higher engagement of full time and legally registered employees. It is undisputed that without some serious investment s in the exploitation of forests, which in current

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[48] Only during the season or during the duration of works contract.

circumstances are not realistic, it is not possible to reduce the number of workers in these occupations. The expected increase in demand, especially energy wood (timber, fuelwood, etc.), can affect the growth of the number of direct and indirect employees. The change that is certain and necessary relates to the way the workers are hired. The Increase in the number of permanent employees in relation to the temporary ones must be set as a sectoral goal.

Organization and capacity of forest utilization activities are very important for the wood market and the provision of the necessary raw materials for further processing. Full realization of the plans for forest utilization, the dynamics and quality of supplied materials, are extremely important for companies in the field of wood and wood products. With this in mind, it can be concluded that the changes that have been implemented within the section (02) "Forestry and logging" haven't had negative effect on the market and wood supply. As in chapter "Wood trade in Serbia" is displayed, the volume of production and sales of wood was even in the period 1992-2012, with a slight increase. Forest management companies have kept the sales of wood products as their own business activity, securing the dominant place on the market of technical wood.

Within the section 16 "processing of wood and products made of wood, cork, straw and plating materials, excluding furniture", in 2011[49], the BRA registered 10,380 employees based on business balances of the companies (8,878 in companies and 1,430 in entrepreneurship). In the same year, the SORS registered only 7,926 workers in this sector on the bases of conducted research and surveys. Both data are related to the average number of employees hired on either fixed or indefinite period of time.

In further analyses the data of the BRA have been accepted as relevant, considering the comprehensive methodology of collecting and processing data. The data include all companies and entrepreneurs that have submitted their business reports for 2011. However, the BRA data cover only companies registered to carry out activities from the section 16. The companies that have been registered for other activities, but conduct activities from the section 16 are not included in the BRA report. In order to complete the data, the analysis on the number of employees in these companies has beenconducted and some 743 additional workers have been identified[50], which raises

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[49] The BRA database which was formed on the basis of business reports of companies. The data relate to the average number of employees at the end of the month (AOP 605).

[50] Tarkett D.O.O. floor production in Backa Palanka and others.

the total number of the employed in wood processing and products of wood to 11,051, as shown in table 16.

Table 16. The number of employees in 2011 in processing of wood and products made of wood, cork, straw and plating materials in Serbia (companies and entrepreneurs)

Activity	Number of employees	%
1610 - Sawmilling and planing of wood	3,945	35.7
1621 - Manufacture of veneer sheets and wood-based panels	1,321	11.0
1622 - Manufacture of assembled parquet floors	745	6.7
1623 - Manufacture of other builders' carpentry and joinery	2,231	20.2
1624 - Manufacture of wooden containers	1,132	10.2
1629 - Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	1,677	15.2
Total 16	11,051	100

Source: BRA, the internal database.

The situation in relation to the spatial distribution of employees according to statistical regions NTUS-2[51] is given in table 17. It can be seen that the largest number of workers in the wood sector is engaged in the area of Šumadija and Western Serbia (35.3%), where most of them are employed in jobs in the primary processing of "Cutting and wood processing." The second area by the number of employees is Vojvodina (24.1%), where most workers are employed in the primary processing and production of floors. 19.6% workers are employed in this field in Belgrade area.

In fact, 43.7% of employed workers in the section "16 –Processing of wood and products of wood, cork, straw, plaiting materials, excluding furniture'' are located on the territory of Belgrade and Vojvodina. Such a high percentage of employees in these areas with low percentage of wood areas and supply of technical wood, points out that the supply of technical wood has initiated the establishment of new companies and "unnatural" concentration of the number of employees. For instance, the number of employees in the area of South and East Serbia was 2.1 times lower than in Vojvodina and Belgrade.

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[51] National statistical territorial units (NTUS2) according to the Rules of Nomenclature of Statistical Territorial Units "Fig. Gazette of the RS ", no. 109/2009. and 46/2010.

Table 17. The number of employees in 2011 in processing of wood and products made of wood, cork, straw and plating materials by regions.

Region NTUS – 2	Activity	Number of employees	%
Region Belgrade	Sawmilling and planning of wood	542	
	Manufacture of veneer sheets and wood-based panels	268	
	Manufacture of assembled parquet floors	16	
	Manufacture of other builders' carpentry and joinery	661	
	Manufacture of wooden containers	227	
	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	450	
	Total	2,164	19.58
Southern and Eastern Serbia	Sawmilling and planning of wood	778	
	Manufacture of veneer sheets and wood-based panels	705	
	Manufacture of other builders' carpentry and joinery	346	
	Manufacture of wooden containers	127	
	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	369	
	Total	2,325	21.03
Šumadija and Western Serbia	Sawmilling and planning of wood	2,014	
	Manufacture of veneer sheets and wood-based panels	302	
	Manufacture of other builders' carpentry and joinery	776	
	Manufacture of wooden containers	327	
	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	477	
	Total	3,896	35.25
Vojvodina	Sawmilling and planning of wood	611	
	Manufacture of veneer sheets and wood-based panels	46	
	Manufacture of assembled parquet floors	729	
	Manufacture of other builders' carpentry and joinery	448	
	Manufacture of wooden containers	451	
	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	381	
	Total	2,666	24.12
Total		11,051	100

Source: BRA, the internal database

Looking at the number of employees in 2011 within the section 16 (11,051 employees), it can be concluded that the wood processing sector hired a significant number of employees, despite changes in ownership and organization that had been going on since 1990. According to the statistics shown in Table 14, the number of employees in Serbia (without Kosovo) who were engaged in lumber and panel production was 8,173 in1990. The data indicates the state in 1990, but cannot be used for direct comparison with the present state because the business activities were, in that period, partly evidenced within forestry and forest-industrial complexes of that time.

These figures will be additionally analyzed in relation to the total number of employees in the wood sector.

The flow of the change in number of employees in companies (without entrepreneurs) from the section "Processing of wood and products of wood, cork, straw and plaiting materials, except furniture" is possible to observe for the period from 2000 to 2012, based on the data of the Statistical Office of the Republic of Serbia, which is displyed in Figure 14. The BRA does not have the data for longer time periods, in order to analyze the change in the number of employees, the data of the SORS are used, since they have been collected by identical methodology for the given period of time. Although there are some discrepancies in the number of registered workers by the BRA, the data collected by the SORS are sufficiently reliable for the analysis of the number of workers, since the data o the SORS for the period 2001-2001 were collected using the same methodology (surveys in companies, including small companies with 50 employees). The results of this analysis are shown in the Figure *13*.
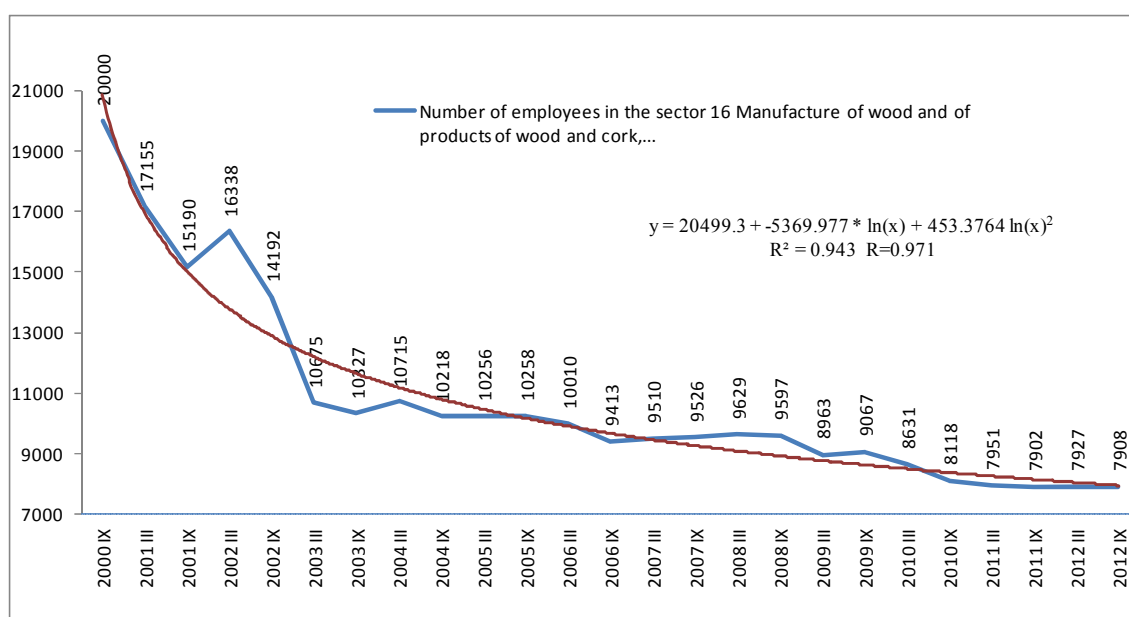
Figure 13. The trend of change in the number of employees in section 16 in the period 2001-2012, on the basis of official statistics. (*Source: SORS, database KD2010[52])*

On the basis of the data, regression analysis was done and the following statistical parameters were obtained:

The selected function of the trend (Henriksen) $Y = B1 + B2*\ln(x) + B3*\ln(x)^2$

		B1=20499.3085
	The parameters	B2=-5369.977
		B3=453.376
1.	Number of pairs of series	N=26
2.	Mean	Ya=10669.54
3.	Minimum	Ymin=7902

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[52] http://webrzs.stat.gov.rs/WebSite/public/ReportView.aspx

4.	Maximum	Ymax=20000
5.	Standard deviation(Ya)	S (Ya)=3196.83
6.	Variance(Ya)	$S^2=1,021973E+07$
7.	Level of function	R=2
8.	Degrees of freedom of	N-R-1=23
9.	The standard error of estimate	Sd=793.449
10.	The average rate of change of	Sp= -3.632
11.	The coefficient of determination	$R^2=0.94$
12.	The correlation coefficient	R=0.971 (visoka povezanost)
13.	The coefficient of determination (corrected)	$R^2=0.94$
14.	Fisher's F-test	F=191.41 (+)

By analyzing trends of the employees in section 16 it was found out that the number of employees was constantly dropping in September of 2000 when the maximum number of employees was 20,000, which, at the end of 2012 decreased to 7,908 . The minimum number of employees was recorded in 2011. The average rate of change in the given period was -3.6. By regression analysis of the number of employees, using Henriksen's functions, high value of correlation coefficient (R=0.97) was obtained as well as a considerable significance based on Fisher's test. By applying the resulting trend, it can be predicted that the number of employees in the following years will not significantly change, and their number will not increase. The increase in the number of employees can occur in conditions of increased demands on international markets and export growth, which has been explained in section "Participation of the wood sector in the export and import in Serbia".

In Figure 14, for the relevant period, three phases of the change in number of employees can be seen. During the first period, from 2000-2003, when the process of privatization in the sector was being completed and when the state owned companies were closing down, the number of workers dropped by 51.9%, or 9,628 workers. After that, until the beginning of the economic crisis, from 2004 to the end of 2008, the number of workers within the section 16 was pretty even, with a slight drop in the number of employees. At the beginning of the economic crisis, from 2009 to 2011, a more intensive decrease in the number of employees occurred, which has stopped recently. Considering other indicators (supply of technical wood, export of wood products, and others) we can conclude that in the given period the drop in the number of employees was not the result of changes on the wood market, but shutting down social companies, increasing productivity and adapting business activities to the conditions of economic crisis.

When the total number of directly employed workers is added by the number of workers employed in entrepreneurial firms dealing with the forest utilization (for entrepreneurs and companies dealing with logging, producing and dragging), the data shows that there were 18.293 directly employed workers in the wood sector in 2011 (table 18).

Table 18. Total number of workers in the wood sector (2011)

	Oblast	Broj radnika
1.	Forestry and logging (section 02)	5,296
2.	Forest utilization (section 02)	1,948
3.	Processing of wood and wood products – companies (section 16)	9,601
4.	Processing of wood and wood products – entrepreneurs (section 16)	1,450
5.	Total	18,295

Sources: 1, 3, 4. BRA. 2. Author's calculations [53].

The total number of employees in Serbia in 2011, according to the official data of the BRA, obtained on the basis of the financial reports of business associations, was 1,011,531 workers. Using the same methodology, the same source states that the business associations employed 15,476 workers from the wood sector, which was 1.52% of the total number of employees in Serbia. However, if we take into account the data from Table 8, than the participation of the wood sector in the total number of employees in Serbia in 2011 was 1.81%.

Viewed by sectors, the largest number of employees were in business associations dealing with the sector "Manufacturing industry" 319,479 or 31.6%, then "Wholesale and retail", 199,718 or 19.7%, and "Transport and storage", 93,844 or 9.3%. The share of processing of wood and wood products was 3.36%.

According to (Republički zavod za statistiku, 2012), by applying the methodology which besides business associations included cooperatives, institutions and organizations, the total number of employees in Serbia in 2011 was 1,735 *million*. In relation to this number, the share of the wood sector was 1.05%.

Comparative analysis on the number of employees in 1990, when there were 18,878 registered workers (Savezni zavod za Statistiku, 1991),, leads us to the

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[53] Workers fully employed in forest management companies thst perform tasks in forest utilization, are displayed in the secton "forest management" under number 1

conclusion that the total reduction of the number of employees in the wood sector in the period 1990-2011 was only 585 workers or 3.1%. This percentage of the decrease in the number of employees in the wood sector was significantly lower in relation to the decrease in the total number of employees in Serbia, which was 30% (2.48 *million* employees in 1990) for the period 1990-2011. However, without the detailed comparative analysis of the methodology of data collection applied by the SORS to the data shown in Table 18, this statement must be accepted with considerable caution.

On the basis of the given analysis it can be estimated that, despite transitional changes in the wood sector that have been going on since 1990, the ratio of the supply of technical products in Serbia was relatively stable, in amounts of 2.19 to 2.94 million m³ (Table 2), except that these extreme values were recorded in the initial years (highest in 2000 and lowest in 2001) (see Table 2 and Figure 2). A steady supply of raw materials has created conditions for the production and hiring workers in jobs of wood processing.

Correlation analysis of the relations of production of industrial wood and the total number of employees in the wood sector is shown in the following chart.
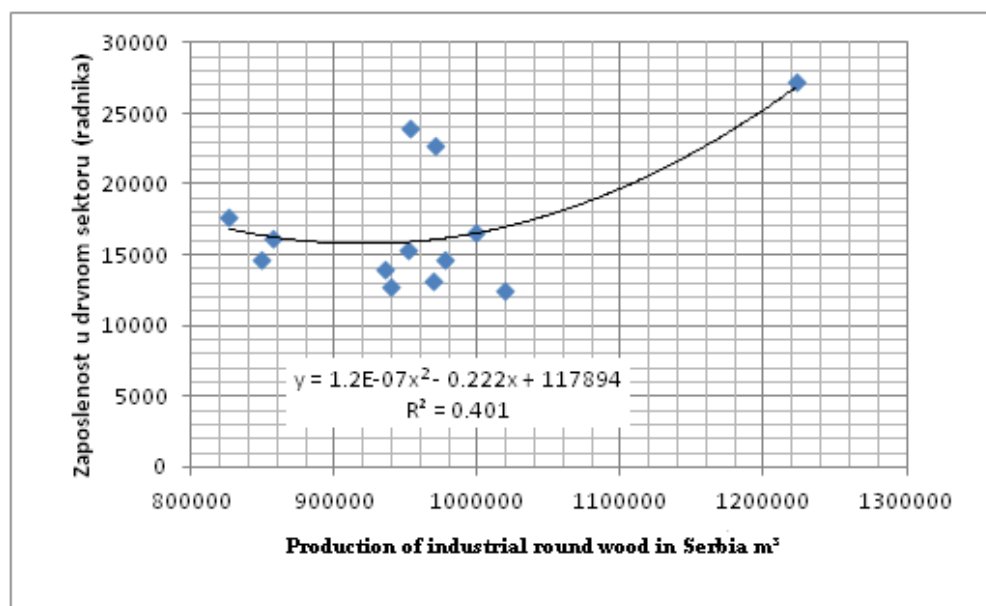

Figure 14. The ratio of industrial wood production and employment in the wood sector in Serbia

The parameters that were obtained by correlation analysis of the relationship of industrial wood and the number of employees in the wood sector using the quadratic model are as follows:

$$y = a1 + a2 * X + a3 * X^2$$

1.	Parametri	a1 =117894.19076 a2 =-0.222033 a3 =1.2068087E-07
2.	Number of pairs of series	N=13
3.	Mean	Ya=17034.46
4.	Minimum	Ymin=12547.5
5.	Maximum	Ymax=27170
6.	Standard deviation(Ya)	S(Ya)=4679.089
7.	Variance(Ya)	S^2=2,189387E+07
8.	Degrees of freedom of	N-R-1=10
9.	The amount (sum) of deviation(Yi – Yr)	S=1,57264E+08
10.	The standard error of estimate	Sd=3965.653
11.	The coefficient of determination	R^2=0.401
12.	The correlation coefficient	R=0.634 (significant correlation)
13.	Koeficijent deter.(corrected)	R^2=0.282
14.	Fisher's F-test	F=3.353345**(-)**

Based on the analysis of relation of technical wood supply to the total employment in Serbia, it was not possible to determine the impact of the supply on the employment in the wood sector in Serbia. By applying correlation analysis of the impact of the amount of production of wood for further processing (shown in table 2) on the number of employees in the wood sector it was found that there was a connection (the value of the correlation coefficient R=0.63). However, a small value of the coefficient of determination was obtained (0.4), as well as the value of F-test t indicating that there was no significance. This occurrence may be explained by transition changes that dominantly influenced employment. In fact, in the period after 2000, the privatization of wood processing was done, which by definition should bring greater productivity and changes in employment. In the process of ownership and structural changes of the sector, the increase of the level of finalization of wood products hadn't been achieved yet (meaning the increased engagement of labor force), so that in conditions of a steady supply of technical wood, the number of workers decreased as a result of other factors. A similar phenomenon was noticed in the analysis of the impact of exports on employment in the wood sector (paragraph 3.2.3).

Although the impact of the supply of technical wood on the number of employees in the wood sector in Serbia wasn't possible to prove by the presented analysis, it could be estimated that there was a significant effect of supply and demand

of wood on employment in certain areas (eg. Vojvodina and Belgrade), which is shown in Table 17.

Looking at future trends when it comes to hiring people, the importance of the wood sector in the coming years is likely to be more pronounced in the maintenance of existing jobs rather than opening new ones. One of the limiting factors is the limited possibilities of forest resources. Also, forest usage and primary wood processing, today, are faced with the necessity to increase productivity and reduce costs of labor. On the other hand, the activities on the production and processing of forest biomass, to some extent, may compensate eventual loss of jobs. Forest biomass as a renewable energy source provides opportunities for the creation of sustainable jobs and income diversification in rural areas (COMMISSION, 2013).

Vitality and sustainability of the sector in the field of employment will play a special role in preservation of rural households and facilities in under developed regions. The issue of the wood sector may be an important issue for the rest of population in a large number of rural communities whose activities are mainly based on wood.

Generating new jobs can be provided through the development of the final wood processing and furniture manufacturing, as a logical extension of business activities of the wood sector. Also, by the diversification of activities in the wood sector, many other potentials from the field of non-wood forest products can be activated. The boost of production of charcoal and similar products that the population in rural areas are engaged in may have a positive impact on their standard of living.

3.1.7.1   Self-employment in the wood sector in Serbia

Compared to the wood sector, the traditional definition of employment as the participation in the labor market is not fully adequate and does not fully cover all the employed for whom the forest is the main source of income. For most employees the difference between employment, temporary employment, self-employment or subsistence is of no importance. They are just different ways of earning a living that can often be replaced or supplemented. The same person can, for example, produce wood for domestic consumption, wooden furniture for sale as a self-employed, or work for a daily wage on reforestation. These forms of employment can occur simultaneously,

rotate during the season, or represent different stages in the working life of a person. Individuals can be directed to other activities in response to changes and economic constraints and opportunities (Poschen, 2004).

Self-employed people in forestry, in some western European countries (Austria, Belgium and Great Britain), account for more than a half of the workforce in forestry. In other countries, the employees that receive a salary make the majority (70-90%). However, a constant increase in self-employees in forestry has been noticed in all European countries (MCPFE, 2007).

The statistics of the employment in the wood sector is not quite reliable for many reasons. One of the reasons is the nature of the work, which is seasonal, often with part time engagement, which makes it impossible to make calculation of full time. Also, numerous activities in the forestry sector are conducted in the area of private forests, which, by analogy of agricultural production, are unregistered activities carried out within the framework of rural households. For these reasons, a large number of self-employed workers are not included in national statistics and are classified in other work categories.

The wood sector hasn't been paid much attention to and in the amount that it has been paid to agriculture. The attitude that agriculture is primary for the development of rural areas and employment of rural population has resulted in the development of methods and institutions dealing with monitoring of agricultural activities. The wood sector, where most jobs are performed outdoors, in rural areas, which generates considerable quantity of self-employment and work engagement, is not adequately covered by the appropriate statistical analyses and data. In most cases, only formal employment is registered in the appropriate way.

If an assessment of workforce engagement in the production of fuel wood in private forests, which is not included in the statistical data on the involvement of the workforce in forestry is done and, bearing in mind the estimated average volume of consumption and the rates of logging, preparation, taking out and transportation, the data will estimate that it takes the engagement of 2.69 *million* working days to produce the amount of 5.42 *million m³* of consumed fuelwood (Table 19).

Table 19. The calculation of the required workforce engagement for the production of fuel wood in private forests in Serbia

| Type of work | The calculation of the required number of days for production 5.6 million m³ of fuelwood | | | | | |
	Norm m³/daz	Needs of working days	Months	Monthly net earnings *din.*	The total value of earnings 10^3 *din.*	The total value of wages in $10^3 €$
Logging and production of fuelwood	7	775,171	36,913	17,952	662,660	5,970
The removal of the wood from the forest to the road (agri. tractor)	12	452,183	21,533	17,952	386,552	3,482
Loading and unloading	25	217,048	10,336	17,952	185,545	1,672
Transportation (distance 25 km)	34	159,594	7,600	17,952	136,430	1,229
Shortening, splitting, etc.	5	1,085,239	51,678	17,952	927,725	8,358
TOTAL		2,689,235	128,059		2,298,912	20,711

Source: The author's calculation based on norms of PE "Srbijašume""

In the calculation shown in table 19 the amount of 5.43 *million m³* of fuelwood produced in private forests was used, This amount obtained is a difference between 6.36 *m³* of fuelwood, which is the evidenced consumption for the heating period of 2010-2011 (Glavonic, 2011) and the production of fuelwood in state owned companies, in the amount of 934,591 *m³* ([54]), as recorded by the official statistics. Norms that are applied are approximate standards of technical norms (Nikolić, i drugi, 1993) for the conditions and equipment to match the condition of private forests. For a monthly value of wages, a net minimum wage in the Republic from September 2011 has been taken. The mean value of the euro has also been calculated for the same month . Based on the elements that have been used in the calculation, it can be concluded that the involvement of labor force in the production of fuelwood is equivalent to permanent hiring of **12,224 workers[55]**. Productivity in hiring workers for production in this case would be 444 *m³* of wood that is stored for heating per capita for 220 effective working days, which is a pretty high standard in relation to forest conditions, equipment, road networks, etc.

If we use the same elements to make calculation with the official statistical data, which registered logging of only 696,028 *m³* in private forests in 2011, we get the

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[54] SORS, bulletin 534, Forestry in the Republic of Serbia, 2010.

[55] On the basis of 220 effective working days in a year.

calculation that the required engagement of labor force is equivalent to full time engagement of 1,567 workers.

Breeding works in countries where afforestation is an important activity or where planting is the dominant form of forest regeneration, may represent a half of work engagement in forestry (Poschen, 2004). The labor force for this type of work is usually engaged through service contracts or contracts for temporary and part-time jobs.

On this basis, for the compensation of individuals (AOP 654, gross value) it was spent €3.55 *million* (for the engaged labor force) in the wood sector in Serbia in 2011,. € 2.6 *million* of that sum was spent within the section "02-Silviculture and other forest activities". The accurate evidence on types of jobs these workers were engaged in does not exist, but, on the basis of average incomes, it can be concluded that the sum spent was enough to engage 790 temporary workers during the year, where more than 75% of them were engaged in forestry.

3.1.7.2   The contribution of the wood sector to indirect employment in Serbia

Considerable research concerning the relationship between direct and indirect employment in the wood sector hasn't been made. Conway (Conway, 1994) developed a regional econometric model (WPSM) in order to estimate the number of directly and indirectly employed in the production of wood in Washington. Results obtained showed that for every directly engaged worker there were another 4.2 workers indirectly employed. This fact certainly cannot be accepted as universal and applicable to all other conditions, but it indicates a significant proportion of indirect workers engaged in the wood sector. It also cannot be universally applied because the definition of "direct" and "indirect" jobs in the wood sector varies depending on the organizational model and the characteristics of the economy.

It is undisputed that the wood sector generates substantial indirect employment. However, for its full understanding, it is necessary to conduct a detailed and comprehensive analysis, which is not the subject of this thesis. Only the activities that generate most jobs, with the intention to highlight the importance of the wood sector through indirect employment, is the purpose of this analysis.

The most important economic activity, which is not included in the activities of the wood sector and direct employment is the transportation of wood and wood products. Until the nineties the transport of wood products was implemented in considerable percentage within the forest companies, as a part of forest utilization.

After the separation of forest utilization, the transport of wood products has been carried out through service companies. For this reason, the data relating to the transport of wood are no longer contained in the reports of companies in the wood sector.

In a part of state-owned forests during the year about 2 *million m³* of wood are produced and transported. The transport is, by rule, done by entrepreneurs and companies that are specialized in providing these services. In practice, there are differences only in that who organizes the transport - the seller or the company that manages the forests, or the buyer.

According to the analysis of business databases of PE "Srbijašume", it has been recorded that in 2011 the average fee paid for transport of 1 *m³* of fuelwood was €9,3 and €11.7 for the transport of technical roundwood. This average amount was calculated on the basis of 70,853 *m³* of fuelwood and 13,489 *m³* of roundwood which the company had realized hiring service companies for transportation. Based on average fares obtained in this way, the price of transportation of wood from state forests in the amount of €20.64 *million*, was calculated. Based on the average standards of transport and 200 effective working days[56] in a year, the results showed that, for the realization of transport of wood from state forests, it was necessary to recruit 498 trucks and drivers.

The situation in private forests is significantly different compared to the state ones. In this area there are no sufficiently reliable indicators to assess the actual involvement of workers and vehicles. A characteristic feature of forest owners is to use their own agricultural tractors to transport wood to their own houses or nearby customers. In cases of transportation to remote distances, transportation firms or private transport workers from areas where the demand for fuelwood is large (Vojvodina, Belgrade, etc) are engaged and they buy and transport fuelwood through so called "return tours". This suggests that the transport is, to a large extent, organized and performed outside legal flows of market traffic, and that, most often, the taxes haven't been paid. By applying the same methodology of calculations and prices as in the example of state owned forests, the price of transportation of wood produced in private

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[56] The number of effective working days, besides official non-working days, is influenced by bad weather conditions that hinder the performance of field work, including wood transport.

forests (according to SORS 0.63 *million m³*) is €7.09 *million*, with the engagement of 160 vehicles. These values should be taken as rough estimates because there is a big discordance compared to officially published data, as well as other data on the volume of wood consumption from private forests, and because it is difficult to consider all modes of transport and sales.

Transportation of goods in the wood processing sector is more complicated. Considering that the realization of products is mainly done on foreign markets, distances and value of transport are significantly higher. The transport, on domestic and to foreign markets, is performed by domestic transport companies and carriers. Although the goods for foreign markets is usually sold at parity EXW (Ex Works), the transport is generally exercised by domestic truckers engaged by the buyer himself, the seller, or through forwarding companies. The share of transport costs in relation to the value of the products depends primarily on the distance, quality and value of the goods and other factors. According to the manufacturers, the cost of transport to European markets amounts to 3-8% of the value of the goods. Based on the information that in the wood sector, in 2008-2012 period, the annual average of exported goods was € 146 *million*, the value of the transport of this goods ranged from 4.38 to € 11.68 *million* in exports.

If we look at the total transport of raw material and export of semi-finished and finished products within the wood sector, based on this calculations, there is the data that within the sector the transport of goods whose value is about € 32.1-39.44 *million* a year[57] can be generated . Assessed in this way, the value of transport, which is generated by the wood sector, is incomplete and does not include the inner transport of goods within section 16, as well as the transport of raw materials, and others. This data aims to highlight the importance of the wood sector in relation to transport of goods in Serbia, as only one of the activities which generates substantial indirect employment.

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[57] The data that is determined according to the transport of wood from state forests (€ 20.64 million), private forest (€ 7.09 million) and exports of finished products.

3.1.8 Earnings of employees and their contribution to local and public revenue Serbia

Earnings of the employed in the wood sector in Serbia were below the republic average in 2011 which was 37.976 dinars net. This conclusion was made on the basis of annual account reports of the BRA[58] which stated that the net earnings in the wood sector in the same period were 25,907 dinars. Within the sector "forestry and logging" the average earning was 35,857 dinars, while in the sector "Processing of wood and wood products excluding furniture" was 20,499 dinars.

According to the data of the SORS[59], the average net earnings within "Forestry and logging" was 36,558 dinars, while in "Processing of wood and wood products, excluding furniture" was 18,490 dinars.

The data on average earnings from the two different sources have been obtained by using methodologically different approaches of data processing, but they show considerable compatibility. In further analyses the data of the BRA are used because they contain more details and enable insight by regions, subsectors and organizational form.

In 2011, the highest earnings were realized in the sector "Silviculture and other forestry activities", in the amount of 36,584 dinars, which is close to the average of the Republic.

The minimum earnings in the Republic was 16,530 dinars in the first half of the year and 17,748 dinars[60] in the second half, so that the average earnings in the wood sector was over, but very close to the guaranteed minimum earnings.

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[58] The report of the BRA on demand "Cumulative data from registered regular financial reports for the year 2011 for business associations". Based on the obtained data on gross earnings by economic activity, recalculation of the total gross earnings in net income per employee was performed.

[59] The SORS, announcement ZP11, number 16 from January 25 2012.

[60] Minimum earnings for the period January-March 2011 was 16,530 dinars, and for the period June-December 17,748 dinars, "Fig. Gazette of the RS ", 35/11.

Table 20. Earnings in 2011, according to the prevailing activities and organizational form

Activity	organizational form	workers	Total gross 1		Net per worker	
			din *10³	€*10³	din	€
Silviculture and other forestry activities	company	5,235	3,213,041	31,899	36,584	363
Silviculture and other forestry activities	entrepreneur	40	10,003	99	15,339	152
Logging	company	11	2,070	21	11,723	116
Gathering of wild growing non-wood products	company	86	29,331	291	20,654	205
Support services to forestry	company	61	18,585	185	18,528	184
Support services to forestry	entrepreneur	11	2,138	21	12,085	120
Sawmilling and planning of wood	company	3,521	1,101,134	10,932	18,999	189
Sawmilling and planning of wood	entrepreneur	320	85,028	844	16,253	161
Manufacture of veneer sheets and wood-based panels	company	1,314	540,018	5,361	24,738	246
Manufacture of veneer sheets and wood-based panels	entrepreneur	3	1,011	10	20,417	203
Manufacture of assembled parquet floors	company	1	252	3	15,452	153
Manufacture of other builders' carpentry and joinery	company	1,712	625,649	6,211	22,079	219
Manufacture of other builders' carpentry and joinery	entrepreneur	434	122,522	1,216	17,222	171
Manufacture of wooden containers	company	999	318,149	3,159	19,334	192
Manufacture of wooden containers	entrepreneur	106	31,629	314	18,161	180
Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	company	1,331	488,493	4,850	22,170	220
Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	entrepreneur	291	80,969	804	16,985	169
Forestry and logging		5,479	3,275,168	32,516	35,875	356
Manufacture of wood and of products of wood		10,308	3,394,854	33,704	20,499	204
Total		15.787	6,670,022	98,736	25,908	257

Source: The report of the BRA on demand. The data on net earnings calculated on the basis of the total gross earnings (value of 1€=100,725 dinars). The data refer only to companies and entrepreneurs registered with the BRA for activities within the wood sector.

The difference in average values per capita between earnings in the sector of forestry and wood processing was considerable and amounted to 16,085 dinars. One of the reasons for such a considerable difference was the qualification structure of workers. In fact, workers with secondary and tertiary education prevail in Public companies for

forest management, while the percentage of unqualified workers (after the sourcing of jobs in forest utilization) has been considerably reduced. The companies or entrepreneurs dealing with forest utilization, who, as a rule, engage labor force of lower education, are not included in this overview.

Contribution to the public revenues that is connected to the payment of earnings is related to the obligation of tax and contribution payments. The tax on earnings in the wood sector was calculated in the amount of €7.95 *million* for 2011. The payment of contributions is regulated by the Law on Contributions for Mandatory Social Insurance[61]. Contributions in the period analyzed, were calculated at the rates of 11% for pension and disability insurance, 6.15% contribution for health insurance and 0.75% contribution to protection against unemployment. The total amount of the calculated contributions paid by the employer was €11.85 *million*, and in the same amount paid by the employee, which, together with taxes, made the total allocation from the wood sector in the amount of € 31.7 *million*.
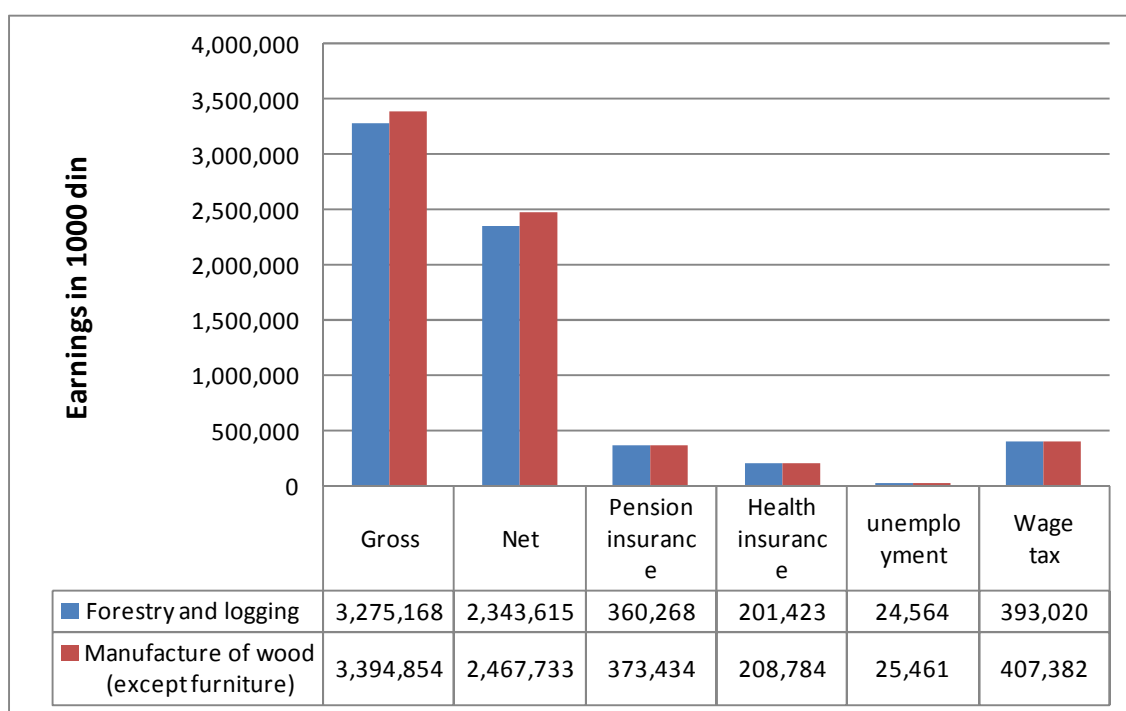
	Gross	Net	Pension insurance	Health insurance	unemployment	Wage tax
■ Forestry and logging	3,275,168	2,343,615	360,268	201,423	24,564	393,020
■ Manufacture of wood (except furniture)	3,394,854	2,467,733	373,434	208,784	25,461	407,382

Figure 15. Distribution of gross earnings within the wood sector in 2011.
(Source: The report of the BRA)

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[61] "Fig.Gazette of the RS ", 84/04, 61/05 and 62/06.

In the graph (Figure 16) of the distribution of earnings and contributions, separately for the forestry and wood processing, it can be seen that the total amounts of earnings and contributions were very consistent, despite the fact that the number of direct employees was significantly lower within the forestry.

3.1.9 The contribution of the wood sector to the reduction of the costs of unemployment in Serbia

Observing unemployment in Serbia in the period after 2000, negative trends from the 1990'ˢ have continued, even in the years of the greatest growth of economy. Benefits of the economic growth have affected the population through the rise of earnings, but not through the increase of employment. The spreading of the private sector could neither absorb labor force that got fired from state and social companies in the process of restructuring, nor generate enough jobs on the labor market for other unemployed (Vlada Republike Srbije, 2011).

The last wave of unemployment started in 2008 as a result of the impact of the global economic crisis on labor market. According to the National Office for Employment, the total number of unemployed people capable of working was about 735,000 (26.1%) in April 2012, which was an increase by 3.2% compared to April of 2011. The lower rate of unemployment than general was in Belgrade region (22.8%). The regions of Smadija and Western Serbia (26.1%) had the rate which was the same as general, while the highest rate of unemployment was recorded in regions of South and East Serbia of 27.7% (Ministry of Labor and Social Policy, 2012). These data indicate that the negative trends that have been established by analyzing traffic of the wood and the number of companies in the wood sector (presented in section 3.1.2.3), especially in the area of Southern and Eastern Serbia, obviously are not the feature of the wood sector only.

Unemployment in Serbia was partly softened by employment in the informal economy[62], which, according to the latest data from the Survey on Labor Force, being conducted regularly by the Republic Statistical Office, amounted to 17.2% of total

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[62] The term "informal economy" refers to activities that are not registered at the side of the formal labor market.

employment, mainly absorbing unskilled labor force (Vlada Republike Srbije, 2011). This statement, set forth in the "National Employment Strategy 2011-2020", can find its confirmation within the wood sector, primarily in the area of private forests and forest utilization in general. Jobs in the sector of forest utilization represent one of the possibilities given to people without formal education, or the opportunity for the employees to supplement their incomes. In the previous chapter, the data showed that, in this way, informally, only in jobs of forest utilization, over 13,970 workers were engaged[63]. This type of employment obviously has an impact on softening the consequences of the economic crisis and unemployment, but, on the other hand, in cases of uncontrolled increase of wood demand it may pose a threat to forest resources.

Unemployment and lack of incomes are the main factors that lead to illegal logging and degradation (C.T.S. Nair and R. Rutt). In fact, the simultaneous increase in unemployment and the demand for fuelwood and biomass in general, will certainly cause the increase in forest usage, illegal loggings, as well as other activities that may have negative impact on woods and sustainable forest usage. Striking a balance between a very significant social requirement relating to employment and maintenance of the volume of forest usage within the allowed amount, is a complex social and professional task. To solve this task, taking only administrative, inspection, and similar measures is not possible.

Considering the contribution of the wood sector to the reduction of unemployment in Serbia, the relationship with the unemployed people whose qualifications are directly connected to the activities of the sector is very important. The unemployed have chosen forestry or wood processing as their life profession and their engagement is directly connected to the conditions and developing prospects of this sector. According to the data of the National Employment Office, on September 09, 2013, the number of the unemployed in the wood sector, having IV-VII degree of education, was 3,689 [64]. 57.7% of the number consisted of unemployed people with educational qualifications for professions within wood processing, predominantly the unemployed having IV-VI degree of professional qualifications. Engineers with VII degree of education made up 13.7% of the total number of the unemployed in this sector, predominantly forestry engineers (371) (table 21).

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[63] 12.636 on private forest utilization, and 1,746 as temporary labor engaged in state forests (Table 19).

[64] The National Employment Office data on September 09, 2013.

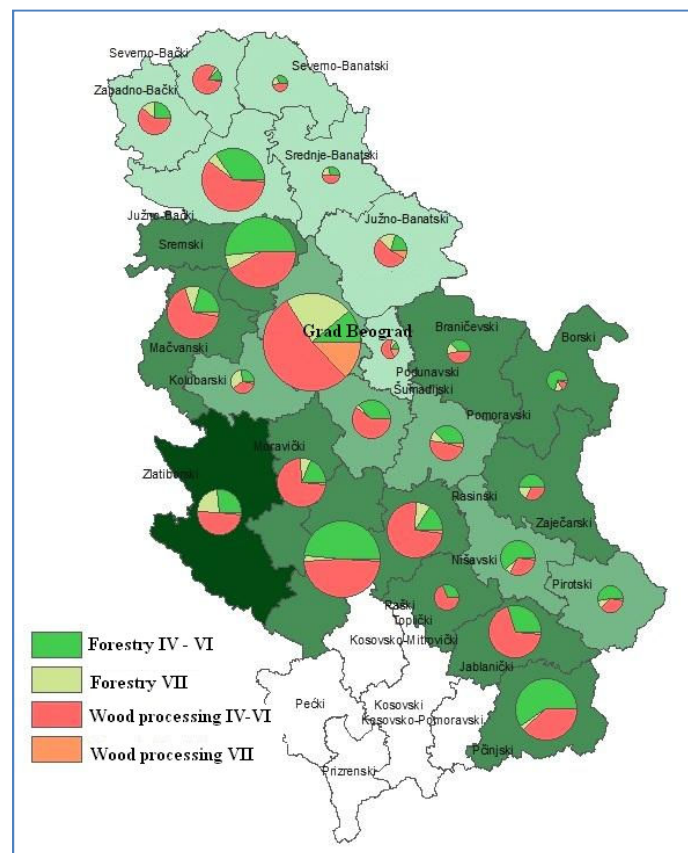Table 21. Unemployed people with educational profile within the wood sector [65]

District	Forestry		Manufacture of wood		
	Level of education				
	IV – VI	VII	IV – VI	VII	Total
Belgrade district	75	151	363	86	675
Borski	21	4	4	1	30
Braničevski	15	6	19	0	40
Jablanički	57	1	133	3	194
Južno-bački	93	15	158	4	270
Južno-banatski	15	13	40	6	74
Kolubarski	10	13	14	1	38
Mačvanski	41	17	131	5	194
Moravički	32	11	122	2	167
Nišavski	53	4	27	2	86
Pčinjski	157	7	101	1	266
Pirotski	25	5	17	1	48
Podunavski	3	2	14	4	23
Pomoravski	31	8	39	4	82
Rasinski	35	18	164	5	222
Raški	202	10	198	5	415
Severno-bački	7	2	51	1	61
Severno-banatski	6	3	8	0	17
Srednje-banatski	6	4	10	0	20
Sremski	182	23	149	1	355
Šumadijski	38	3	63	0	104
Toplički	13	0	30	0	43
Zaječarski	23	8	15	0	46
Zapadno-bački	19	11	47	0	77
Zlatiborski	38	32	69	3	142
Total	1,197	371	1,986	135	3,689

Source: The National Employment Office, 30.09.2013.

The total number of 3,689 unemployed people having IV-VII degree of education, and who belong to the wood sector according to their professional qualifications, is rather large and in the present situation their employment possibilities are rather small. Additional problem is the distribution of the unemployed by some districts, which significantly differs from the percentage of forest areas and production possibilities of forests in the district. The largest number of the unemployed is recorded in Belgrade administrative district, while there are very few unemployed in Bor and Zajecar districts. This situation is rather paradoxical because, the unused potentials in

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[65] The data do not include landscape architecture and horticulture, protection of land and water resources, only the professions from the sector of forestry and wood processing.

wood processing can be identified in these two districts. Representation of the unemployed by districts is given in figure 11.

Picture 11. Unemployed people with educational profile within the wood sector by districts *(on the basis of table 21)*.

The increase in the number of the employed is only possible in long term, by fostering the development of the sector and by increasing the production possibilities of forests.

Sustainable forest management could become an integral part of efforts to create jobs, and offers some unique advantages to achieve the economic, social and environmental goals. Targeted public investments can generate new jobs in reforestation, restoration, management of natural forests, establishment and management of urban green spaces, conservation of river basins, forest protection against fire and the construction of roads, pathways and recreational facilities. Such investments can contribute to the employment of a significant number of unemployed or laid-off workers, increase incomes and consumption, and thus provide additional economic benefits. Most of these activities are carried out in rural areas where the living standard can be risen (C.T.S. Nair and R. Rutt).

Some measures within the wood sector that can influence the reduction of the number of the unemployed follow:

- **Afforestation.** By afforestation and raising of biomass plantations, reconstruction of the existing forests, care of forests, with the support of the budget of the Republic of Serbia, a certain number of unqualified and qualified labor force could be engaged in the short term (in proportion to the amounts invested). In the long term, by increasing the amount of wood production and wood supply, opportunities for new production in the wood sector can be created.

- **Agroforestry.** Combining forest and agricultural production, machinery, labor force, equipment and other elements, additional effects for the increased number of indirect employment of people, as well as the increased yield of wood for further processing can be achieved.

- **Normative regulation in the field of forest utilization.** Insisting on competences in performing jobs in the fields of forest usage and wood processing, hiring stuff educated for these tasks (licenses, etc), may provide conditions for additional recruitment of people having IV-VII degree of education in the field of forestry.

- **Production of wood for energy needs.** It can be expected that the increase in the demand for wood for energy needs will cause the increase in employment in all phases, from plantation production, collecting and preparing raw material, transportation, combustion or production of wood fuels.

- **Strengthening the private forests**. Business and interest organization of private forest owners, through associations or companies which mediate between large buyers and forest owners, can create conditions for employment of professionals and bring order to the market of wood that comes from private forests.

- **Development of final processing**. Development of the final wood processing, instead of exporting semi-finished products, can greatly increase the number of employees in the wood sector. Under current conditions, qualified and cheap labor is a priority and should be the basis for the development of final processing. Solving this problem is certainly very complex, but it deserves the support and attention of many social factors.

- **Diversification of activities in forestry**. Forests of Serbia in an area of 2.2 *million* hectares, provide conditions for the development of many activities which belong to the so-called "non-wood production" in forestry. Impetus to the development of these

activities, as a support to employment of the rural population, may further activate the human and natural resources.

- **Urban forestry.** Further development of urban forestry, in the cities and suburbs, planting of new forest park and activities related to the forest management and maintenance of existing forests, can increase the employment of all educational backgrounds of forestry. Social and ecological importance of these forests is immeasurable and can justify investments.

The problem of unemployment is not only social, but the economic problem as well. The unemployed people registered with the National Unemployment Office receive financial compensationm, if they meet the requirements proscribed by the law[66], which is approved for the limited period of time and only upon release from compulsory insurance, according to the law. During the time of using the compensation they are covered by health insurance. Other unemployed people are entitled to the health insurance according to the Law on Health Insurance[67], and do not burden the budget of the National Employment Office. The funds for the unemployed are allocated from the wages of the employees at a rate of 0.75%. According to the data of the BRA, the allocations of employees in the wood sector amount to € 0.47 *million* annually.

3.1.10 Contribution of the market of wood and wood products to the development of the concept of corporate social responsibility in the wood sector in Serbiai

There is no unique, generally accepted definition of corporate social responsibility (CSR), but many definitions relating to CRS can be found in professional literature. Some of the generally accepted definitions come from policies of the European Commission and the Word Bank:

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[66] Section of the Law on Employment and Unemployment Insurance ("RS Official Gazette". 36/09 and 88/10).

[67] Law on Health Insurance ("RS Official Gazette", 107/2005, 109/2005., and 57/2011).

"Corporate social responsibility is a concept whereby companies integrate social and environmental concerns in their business operations and the interaction with stakeholders on a voluntary basis" (European Commission, 2002).

"The continuing commitment and contribution of business to sustainable development, working with the employees, their families, local communities and society at large to improve the quality of life, through process which brings benefits to the company and contributes to the overall development." (World Bank, 2003)

Corporate social responsibility has evolved from the idea that the obligation of the company is not only to make profit, but to have a positive impact on the environment in which it operates. Consequences of the activities of the company must be positive for customers, partners, employees and their families, and society which the company belongs to. For a better future of the society the support and partnership of companies from its environment are required. Companies do not operate in isolation from the environment in which they are located, but the environment is their integral part and their competitive ability depends precisely on the conditions and circumstances in which they work. By investing in the society companies create a healthy environment that will help them grow and develop. Many organizations realize that the care for society and the environment, if it fits into the business strategy, leads to significant innovations and provides the company with a competitive advantage.

Social responsibility means that, in addition to setting up job demands to their employees, companies secure future for themselves and for the employees, including respect for human rights, equal treatment of employees (customers and suppliers as well), responsible corporate management, environment protection, ethical business and overall contribution to society. Key components of CSR are social, environmental and economic responsibility, which leads to a synergetic effect on people, profit and planet as a whole.

When it comes to public forest management companies, the situation is further demanding, as the role of public companies is significantly different from that of companies that are exclusively market-oriented. Public companies, among other things, have the task to fulfill the "public mission" or be overall socially beneficial in order to provide the support of their founder (state), which is typically sensitive to social demands. This support, among other things, is provided by a positive feedback of the public on the activities of public companies, and they understand it very well, although the measures taken are not always satisfactory to the public. This relation is defined in a

well known statement of Jack Westoby's, 1967: "Ultimately, forestry is not about trees, it is about people; it is about what people want from trees " (Westoby, 1987)[68].

Marcello Palazzi and George Starcher (Palazzi et al., 1997 / rev.2006) highlighted six dimensions of corporate social responsibility, finding that, in Western Europe, Japan and North America, the number of companies that understand that their good business should be fully integrated with interests and needs of customers, employees, suppliers, communities and the entire planet into corporate strategy is growing. Over a longer period, this approach can generate higher growth and profit. Furthermore, there cannot be a social responsibility without profit.

CSR is mainly concerned with how to manage the six basic responsibilities (Palazzi et al., 1997 / rev.2006)

- **Customer**: ethical, environmental and social consciousness (good reputation)of companies make differences in decision-making on purchase; superior quality, reliability and service; long-term relationships with customers;

- **Employees**: The quality of life in the workplace;

- **Business partners**: long-term relationships (quality and reliability - not only the possibility of lower prices);

- **Environment**: a sense of management in accordance with the principles of sustainable environmental management; positive relationship between economic and environmental efficiency);

- **Community**: contribution to local, regional, national and global communities;

- **Investors**: increase in the number of investors who have more responsibilities than those who are looking for a quick return of investment.

The real contribution of the wood sector (as any other) in the development of the concept of CSR is not possible to express numerically. The calculation of funds that a company has invested in activities within CSR can be just one of indicators which it can be presented by. However, the amount of the money invested needn't always provide a real picture in relation to the actual social effects. Overview of expenditure for this purpose is included in the balance sheets of companies within the AOP 670 "Expenses for humanitarian, cultural, health, educational, scientific and religious purposes, for environmental protection and for sports." Expenditures of companies belonging to the wood sector in 2011 are shown in table 22.

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[68] *„Ultimately forestry is not about trees, it is about people; it is about what people want from trees"*, Westoby 1987.

Table 22. Expenditures for humanitarian, cultural, health, educational, scientific and religious purpose, for environmental protection and sports in 2011

Delatnost	Amount in €	% in total income
0210 - Silviculture and other forestry activities	251 258	0.245
0220 – Logging	0	0
0230 - Gathering of wild growing non-wood products	0	0
0240 - Support services to forestry	88	0.019
1610 - Sawmilling and planing of wood	123 048	0.115
1621 - Manufacture of veneer sheets and wood-based panels	2 968	0.005
1622 - Manufacture of assembled parquet floors	0	0.000
1623 - Manufacture of other builders' carpentry and joinery	53 770	0.079
1624 - Manufacture of wooden containers	43 157	0.091
1629 - Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	39 057	0.094
Total	514 142	0.117

Source: Extracts from annual balance for 2011 from the BRA, Belgrade

The data in Table 22 show that the total amount of funds spent for purposes that are, or are close to the CSR was € 0.51 *million*, or 0.12% of the total revenues of the company. Companies for forest management had the largest share in the amount of 0.25% of the total income, which is understandable since we talk about the public companies with the emphasized social function.

In order to direct activities of the company in relation to CSR, in addition to many others, the standards, by which we estimate the efficiency of the company's policy in relation to CSR, have been introduced. One of the standards developed for these purposes, in relation to CSR, is the standard ISO 26000. This standard was introduced in 2010 after five years of negotiation among many stakeholders around the world. Representatives of governments, NGOs, buyers, trade unions and other organizations were involved in developing this standard, and several years later, they reached consensus.

The aim of the standard ISO 26000 is not to set obligatory conditions to companies introducing it, but to guide the users and make recommendations on how they can improve their business activities from the aspect of the CSR. During the assessment on the basis of other standards the evaluator is obliged to draw attentionto and direct to necessary activities, but not to make judgments on the basis of this standard. This standard hasn't yet been implemented by a great number of companies in Serbia, although it was adopted by the Institute for Standardization in 2011.

Another very important standard, from the group of the ISO standards, which partly includes activities connected with the CSR, is ISO 9001:2008. Criteria and indicators covered by this standard, and connected to the policy of corporate social responsibility, relate to:

- Acquiring and / or improving business confidence in the known and, more importantly, potential clients;
- Focusing on achieving business goals and customers' expectations;
- Achieving and maintaining a stable level of quality of products / services to meet the demands and expressed needs of customers;
- Increasing the customers' satisfaction;
- Providing assurance that the desired level of quality has been achieved and is being maintained.

However, the number of companies in Serbia that have harmonized their business activities with the ISO 9001 is relatively small. According to the data of SGS[69] only 3000 companies have introduced this standard in Serbia. The real data of the number of companies in the wood sector are not available, since there is no unique register for these standards.

When the wood is concerned, certification of forests is added to the existing standards as a response to the demands of the market and consumers having a high level of environmental awareness. The increase in the demands for wood products that have the appropriate certificate for sustainable forest management has intensified the process of introducing certification of forests and chain of control of the wood raw material.

Forest certification is defined as a voluntary process, which it actually is, although the possession of the certificate is the condition to survive on some markets for the companies dealing with the wood procession. The procedure for obtaining certification has been established as a professional, responsible, impartial and transparent, so that each of the holders of certificates must meet the set criteria.This has provided practical implementation of sustainable forest management. Otherwise, the certificate holder is facing a loss of position in the relevant market.

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[69] Certification company that globally provides inspection, verification, testing and certification.
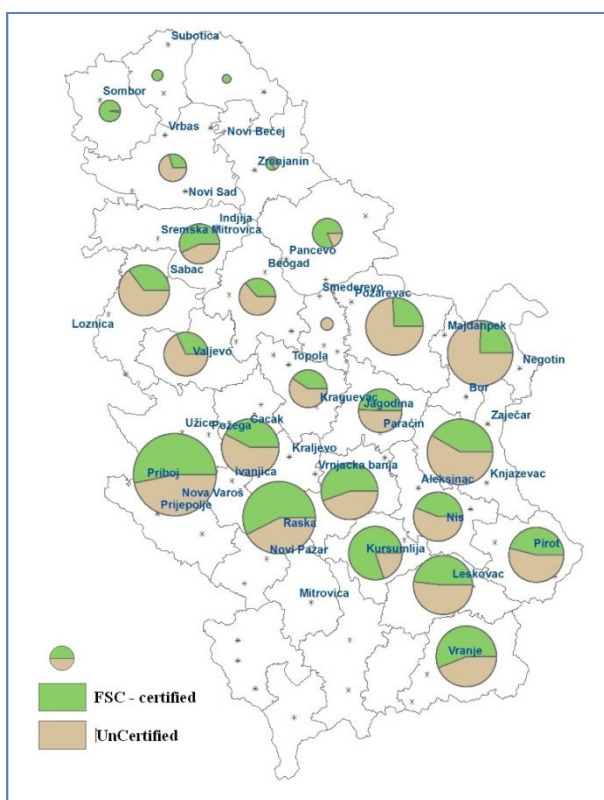
Picture 12. Representation of FSC certification of forest management by districts *(all ownership).*
Source: Companes

Major producers of wood products do not want to threaten their hard-obtained position on the market by using the raw material without the appropriate confirmation that it come s from the forests that are managed in sustainable manner. Their approach is very simple. The CSR which includes the use of wood with the appropriate certificate, is more worthwhile than the defense of the charges for complicity of deforestation and damage to the environment. Using certified wood, this risk is minimal because the third party shall certify that the wood raw material comes from forests that are properly managed. Practically, the companies which have some of the certificates for sustainable forest management (FSC, PEFC) received the confirmation by an independent body, that paying attention to the environmental and social demands, as well as to other aspects (not all) of CSR.
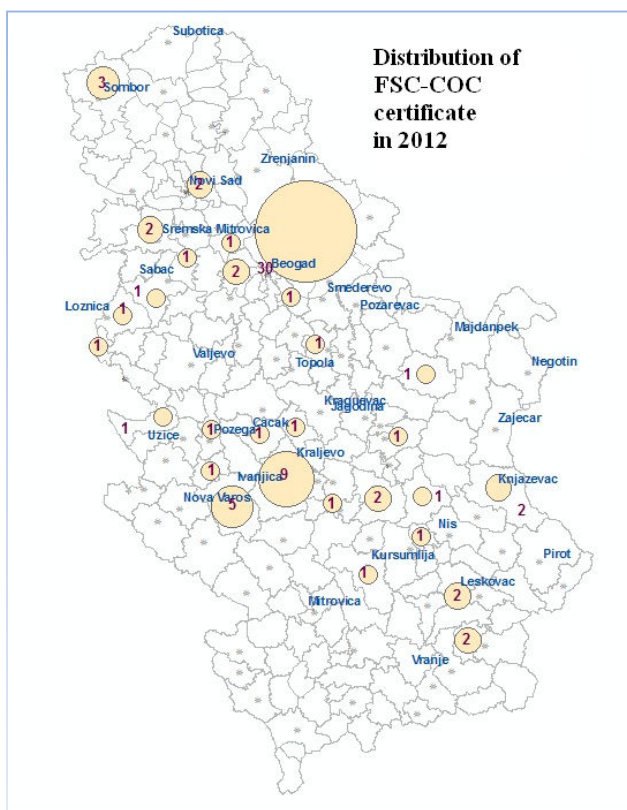
The principles and aims of forest certification come from the definition of sustainable management, therefore the forest certification represents one of the instruments in the achieving the aim. The basic components of sustainable forest management are included in the criteria and indicators of forest certification, which particularly applies to:

- Improvement and enlargement of forest resources,
- Biodiversity,
- Health and vitality of forests,
- Production functions of forests and forest resources,
- The protective function of forests and forest resources,
- Socio-economic functions of forests and
- Legislative and institutional framework.

Practically, forest certification has become an instrument used to verify compliance of forest management practices with global principles of sustainable management. Certification of forests and wood products, given that it is based on the principles of sustainable forest management, contains a significant elements that characterize the policy of corporate social responsibility of companies. This is primarily related to environmental requirements, respect for social functions of woods, participatory approach to decision-making, information about the work and others.

A high percentage of certified forests gives buyers the opportunity to choose between the certified wood and the one which is not. It refers not only to round wood, but to all wood products.The increase in the supply of certified wood raw materials is a significant factor that affects the sales and the price of wood on the market, and which will further gain in importance with the increase of the areas of certified forests. Therefore it can be expected that the sales of wood without the certificate will be a difficult task, and that the wood without a certificate will prevail only in case of a significant difference in price.

Picture 13. The spatial distribution of companies
with FSC COC certificate
izvor www.fsc.org.

Nowadays, a number of certified schemes which are globally accepted, have actually been applied in the process of wood certification. The most important schemes of wood certification which are being used in Europe are Forest Stewardship Council (FSC) and Pan-European (PEFC). The only certificate being used in Serbia is the FSC certificate.

There are two types of the FSC Certificate available to the FSC accredited certification bodies: Forest Management and Chain of Custody (CoC).

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Through the chain of custody the FSC encourages producers to organize their production processes in such a way that will enable consumers to buy products originating from forests which are being sustainably managed. By CoC certificate the company for wood processing or retail companies can assure their customers of the origin of their products. Chain of Custody certificate and other supporting documentation inform consumers about the participation of wood coming from certified sources in certain products. This means that the wood that enters the production process must have complete documentation guaranteeing its origin. Virtually, every wood product is controlled, which excludes the possibility of manipulation in terms of the use of illegally harvested wood.

FSC certified products may also be combined with other materials. Any material that is combined with FSC certified wood, cannot be derived from illegally harvested forests, forests where there is a social conflict, uncertified forests with a high protection value or from forests where genetically modified organisms are used.

Certification of forest management in the two largest public forest companies in Serbia ("Srbijašume" 850,752 ha and "Vojvodinašume" 129,752 ha) was fully implemented concluding with 2012, and the corresponding FSC certificates were obtained. It can be expected, although there are currently no official plans, that national parks will begin the process of forest certification in the future. When it comes to private owners a certification process has not been implemented yet. Fragmented properties in private forests prevent individual certification and they are instructed to obtain group certificates, which are possible to implement once the owner and the associations capable of carrying out the necessary activities are connected.

In Serbia, concluding with the end of 2012, 83 FSC certificates were allocated, 3 of them for forest management, while the rest were CoC certificates[70]. The trend of spreading FSC certificates is positive, and, as an example, in September 2010, there were only 35 certificates granted (Vasiljevic, and others, 2011). It is expected that, because of the increased demand on the market, the greater number of companies dealing with the wood processing will establish CoC certificates of chain of control of traffic.

Without much doubt it can be said that the development of CSR in Serbia was significantly initiated by the development of the market and the arrival of foreign

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[70] Based on a database of FSC, on the site www.fsc.org., accessed at 04/03/2012.

companies, which had established the practice of CSR in their corporate governance. On the global and especially European market, the application of CSR principles was often one of the indicators of the solvency of the company and provided it a better status on the market. Confirmation on the application of CSR principles In the wood sector today is usually expressed through demands for FSC, ISO and other certificates, without which it is difficult to do business with large retail chains and other reputable companies.

3.1.11 Analysis of the value chain, the role and importance of some of the participants in the chain, on the example of the company for the production of children's furniture

The chain of custody of the wood sector consists of a series of connected business activities taking place in forestry, primary and final wood processing, aiming to create added value and its valorization on the market. According to Porter (Porter, 2007) in related business processes added values are made and they represent the contribution to a business activitiy. Each step in the chain of activities adds a certain value to the final product. Added value can be expressed as a difference in production costs (material, etc) and the sales value of the product. If the value chain is more complex and if it engages more people, its social and economic importance is greater.

The current understanding of the term "value chain" means a set of related companies (sometimes defined as "vertical cooperation") that work together to achieve better and more rewarding position on the market. This means that companies are linked sequentially, on one side by the primary production process (eg forestry), through processing, possibly through the marketing and wholesale and retail trade (Teischinger, 2009).

Very different value chains can be indentified in the wood sector. In the production of wood fuels they are often very simple, as it is the case with the production of fuelwood. However, this value chain can be improved through further production of wood pellets, or wood chipping, but it is still relatively simple and doesn't call for many workers. More complex value chains can be found in technical wood processing,

especially in the production of joinery, furniture and other wood products with a high level of finalization.

Wood sector is rather complex and the boundaries in the sector haven't still been defined, which makes additional problems in making analyses. Three different divisions of the sector are used on different levels (the EU or national level), depending on whether furniture industry is the integral part of the wood sector, or not. Because of that it is difficult to integrate the necessary data (Teischinger, 2009).

Analyzing the export of wood products[71], it was found that the semi- products intended for final processing, such as sawmill products and "wood-based panels", and others, significantly participated in the total exports of the wood sector in Serbia. Thus, the value chain for these products continues abroad, with the involvement of foreign technical capacity and labor force. It is difficult to calculate and estimate how much domestic labor force and valorization of other local resources have been lost, considering very complex relations and circumstances. But, by analyzing the existing value chain, particularly those with completed cycle, from forest utilization to finished product, we can, at least partly, highlight the unused socio-economic potentials.

There are few wood processing plants with a rounded up production, from roundwood to the final product. They are particularly rare in the production of furniture. Consequently, opportunities to choose "representatives" for the analysis in this study were not large. In the analyzed case, as the subject of analysis of the value chain in the wood sector "Tina International Stock Company" or Stock Company "Tina" - Timok furniture industry of Knjaževac has been selected. Dominant share in the production of the company are products designed for children, primarily children's beds. Technical characteristics of these products have been harmonized with the national standards of the countries where they are exported. Due to the complex technological process, which requires the manual processing of individual elements of wood in the production, a significant number of workers were hired. Their employment is important to the local community, which was categorized as underdeveloped area. The company has a well regulated accounting which provides an overview into each stage of the business. An important fact is that the products are completely sold on the EU market.

Analysis of the value chain encompasses all phases of the business, the purchase of roundwood, transport, primary and final processing and, ultimately, sales of finished

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[71] Chapter "Export and import of wood and wood products."

products to the international market. The analysis was performed based on data from 2012 business year

Raw material for the mentioned company is supplied from PE "Srbijašume", on the basis of an annual supply contract. The amount of 5,290 m^3 of beech roundwood whose total value was €221,414 (25,644,170 dinars), or 41.9 €/m^3, was delivered for the purpose of the production in 2012. The assortment structure of the purchased round wood is shown in Table 23

Table 23. The assortment structure of the round wood for the needs of production in Stock Company "Tina" in 2012.

Aassortment name	Volume	%	din./m^3	€/m^3	Total dinars	Total €
Beech logs F quality class	3	0.1	12,402	107.1	38,176	330
Beech logs L quality class	267	5.0	8,023	69.3	2,144,556	18,516
Beech logs K quality class	300	5.7	6,639	57.3	1,989,802	17,180
Beech logs I quality class	1,654	31.3	5,410	46.7	8,947,044	77,250
Beech logs II quality class	1,674	31.6	4,422	38.2	7,402,280	63,912
Beech logs III quality class	1,392	26.3	3,680	31.8	5,122,311	44,226
Ukupno	5,290	100.0	4,848	41.9	25,644,170	221,414

Sources: 1. Business reports of the company 2. NBS average exchange rate 1 EUR= 115.82 dinars

Forest utilization, as an initial stage of the value chain, was carried out in the organization "Srbijašume" hiring companies that were specialized for these tasks. According to data from commercial and business database of the PE "Srbijašume", the average price paid for the logging of beech technical roundwood (calculated on the basis of accounting data for the amount of 214,956 m^3) was 3.3 €/m^3 (382 din./ m^3). Dragging expenses amounted to € 6.07 / m^3 (703.55 din./m^3). During this period, for this type of assortment, an average fee of 10.3 € / m^3 (1,191 din./$m^3$3) was paid for the transportation. Practically, the direct costs of production, and thereby the total income of the contractor and the carrier, for the mentioned 5290 m^3 of beech roundwood amounted to € 104,028 (12,048,537 din). The remaining amount from the selling price of "Tina" company were costs of forest management, administrative and other expenses, as well as the profit of the companyf or forest managements in the amount of €117,384 (13,595,648 dinars) for the quantity of 5,290 m^3

By processing 5,290 m^3 of beech roundwood, "Tina" company made primary production in quantities of 3,166 m^3, and PMD board of 41 m^3, with a total accounting value of € 421,675 (48,838,405 din), or, at this stage, the total value of the products

increased to € 200,261, with a coefficient of 1, 9, while the percentage of efficiency of roundwood amounted to 60.6%. The overview of the achieved primary production is shown in Table 24.

Table 24. The Achieved primary production in Stock Company "Tina" in 2012

	Amount	Average price		Total accounting value	
Type of product	m^3	din./m^3	€/m^3	dinars	€
Sawntimber beech – long	2,994	14,517	125	43,466,676	375,295
Sawntimber beech – short	172	12,502	108	2,144,866	18,519
PMD board	41	78,113	674	3,226,863	27,861
				48,838,405	421,675

Source: Business reports of the company "Tina"

With their own primary processing, the company made certain savings in relation to the price of the beech lumber on the market, but more importantly, their own primary production alone provided the necessary raw material for final production in relation to the required quantity and quality. The value of the produced goods from primary production, at that time, ranged from € 420,000 to 460,000, depending on the producer and prices during the financial year.

In the next stage, which was defined as the "final processing" in the system of bookkeeping, a series of technological processes are performed, ranging from production of elements, their drying, processing, gluing, joining, surface treatment, packaging, and other operations. The ultimate result of this production is the finished product of high level of finalization intended for export. By-products in the production process in this particular company were wooden pallets and wood briquettes. The carrying amount of all finished goods in 2012 reached € 1,200,354 (139,025,044 din.). Realizable value, based on the achieved price at parity FCO buyer, inclusive of transportation costs, amounted to € 1,247,797.

Table 25 shows the value indicators in certain manufacturing activities (stages). It is noticeable that the highest value of production was achieved in final processing, which, in total realized value of products, accounted for 58.6%. The remaining part of the value of 41.4%, belonged to the wood sector. From a total of 127 workers engaged, 59% worked within the final processing, while 41% of workers were employed in manufacturing, which belonged to the wood sector.

Compared to 1000 *m³* of roundwood, which were used in the production of final products, the total revenues generated from sales of goods amounted to *€* 235,893, with the involvement of 24.2 workers, or *€* 9,748 per worker. According to the analysis of employment in the wood sector in the EU 25 in 2005 (Teischinger, 2009), in the activity of wood processing the average gross added value per worker amounted to 27.3 thousand *€*, which is 2.77 times higher than the given case[72]. This is consistent with the statement by the same author that among the EU countries there were big differences in the values of this indicator. In some countries, the added value exceeds the amount of *€* 60,000 per worker (Belgium, Ireland, Austria, Finland, Sweden), while in others it is less than 10,000 *€* per worker (Bulgaria, Latvia, Lithuania, Romania).

Results which were obtained by the analysis of the value chain should not be accepted as optimal or as a model of good practice of wood sector in Serbia. This production chain is characterized by certain disadvantages, which are primarily related to the low average wages, reduced productivity and surplus of workers engaged in certain segments (which was not the subject of this analysis). This analysis shows the effects that can be achieved by a complete finalization of the starting raw material.

Table 25. Indicators of most important segments of the value chain in "Tina" in 2012

Activity		Unit of measure (MU)	quantity	Value				Engaged workers	
				din *10^3	*€*	*€* per MU	%	Number	%
1	Forest management	*m³*	5,290	13,596	117,386	22.2	9.4	14.1	11.1
2	Forest utilization	*m³*	5,290	5,744	49,597	9.4	4.0	5.1	4.1
3	Transport Of roundwood	*m³*	5,290	6,304	54,431	10.3	4.4	1.6	1.3
4	Forestry (1+2+3)	*m³*	5,290	25,644	221,414	41.9	17.7	20.9	16.5
5	Primary processing	*m³*	3,207	48,838	421,675	131.5	33.8	29.0	22.9
6	Final processing	pieces	38,124	59,048	509,823	13.4	40.9	75.0	59.1
7	Transport of finished products	pieces	38,124	10,990	94,885	2.5	7.6	2.0	1.6
Realized sales value at parity FCO buyer (4+5+6+7)				144,520	1,247,797		100,0	126.9	100.0

Izvor: Poslovni izveštaji preduzeća A.D. „Tina", Knjaževac

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[72] On the basis of the mentioned research (Teischinger, 2009), the average gross added value in the EU_{25} countries in the sector of wood processing was *€*27,300 per worker (chart 1).

As already pointed out in the previous chapters of this paper, sustainable development means meeting the needs of the local population, thus ensuring their support for the performance (and development)of the activities. Comparative analyses of the value chain of certain aspects of production, which are based on the use of local forest resources, can point out the advantages and disadvantages in relation to the level of meeting the socio-economic needs of a region. If the appropriate and expected socio-economic effects are absent due to dislocation of the most important links in the value chain, such as the finalization of the starting raw material, in children's beds in this example, to other regions (or countries), the sustainability of production may be endangered. In this paper, these kinds of problems have been observed in some areas, particularly in Bor, Zajecar, Pirot and Pomoravlje, where, despite significant production of technical wood, there is a distinct lack of processing plants for roundwood.

3.1.12 Flow of wood trade in Serbia in 2011

Analysis of the wood flow, as a method, is based on the methods of Analysis of Material Flows (AMF). The analysis of material flows is a systematic assessment of flows and stock s of materials within the defined system and time frame. It shows connection to the source, flows, semi-products and the ultimate consumption of the starting material. The results of this analysis may be simple balances obtained by comparison of all input, output and stock of final products as a part of a certain process. This makes the AFM method an attractive tool to support in decision making in the management of natural resources, waste management and environmental protection (Bruner, et al., 2005).

AFM can be applied in different ways, in different frameworks and levels, at national or regional level, the corporate level or the level of the cycle of production and consumption of a product. AFM is complementary to the analysis of the life cycle of a product or input-output model. Analysis of the flow of wood is based on AFM principles.

Strategic planning relating to the balancing the needs of the wood market, the volume of forest utilization and available felling, requires continuous monitoring of the wood flow, or the amounts spent between the stages of production, consumption and processing. By determining the actual situation in relation to the wood flow, we are

enabled to make strategic decisions that, on one hand, provide control of the level of use of forest resources, and on the other, direct the activity to the development of the wood energy sector or consumption of individual assortments.

In recent years such analyses have been made in many countries or regions, mostly to assess development opportunities, realize levels of illegal logging or consumption of wood in general, as, for example (Binder, et al., 2004), (Piskur, et al., 2007), (Steierer, 2010), (Mantau, 2013), and others. Therefore methodologies have been developed and some ecxperience gained. In most countries where this type of analyses was done it was concluded that there were no sufficiently reliable data in certain segments of the flow of wood, primarily in wood consumption in households.

Analysis of the wood flow is usually done in both directions, from wood production to processing (bottom up) and reverse (top down). In the case of a well-balanced flow and reliable data sources, the two approaches should give approximately the same results.

In recent practice in Serbia, wood consumption has mostly been presented as the sum of the production registered by the companies for forest management (SORS, 2012). The official statistics processes the data from these sources only. These data are reliable enough only for the wood production in state forests, which includes gross logging and net assortments, while the data for the private forest are partial, because they are based on logging registered by the professional services, and not on the real consumption, as already indicated in the chapter "Wood flow in Serbia".

For the purpose of analysis of the wood flow in this thesis, the data obtained from various sources have been used, aiming to bring more reliable data to the model.

Table 26. Tabular display of wood flows in 2011

Label	Name	Description	Quantity $10^6 m^3$
G0	Annual wood increment	The value of the total annual increment is taken from (NIŠ, 2008)	9.08
G1	Annual amount of logging in private forests	Based on data (Republički Zavod za statistiku, 2012) in private forest is felled 0.6962 m³ in gross amount. According to report from JP "Srbijašume" selection of trees for logging in private forests was made in the amount of 0.681 m³, while the amount of wood which were issued waybill was 0,523m³. PE "Srbijašume" practically perform the most of these tasks	0.70

		in the Republic, and data of SORS is accepted as officially registered amount of harvested wood in private forests.	
G2	Annual amount of logging in state ownede forests	The annual volume of logging in state forests (Republički Zavod za statistiku, 2012) was **2.136.981** *m³.* This value is consistent with the sum of the individual data of all public enterprises, and for that reason was adopted as the official value for further calculation.	2.14
	The official gross logged (harvested) volume **G1+G2 = 2,833** *million m³*		
L1	Net production of round wood in private forests	Production of round wood in private forests has not been officially registered by the SORS. However, based on indicators from the activities on marking trees for cutting, implemented by PE "Srbijašume", the percentage of technical wood in private forests is around 9-10%, compared to the net wood volume. The total amount is determined according to this percentage.	0.07
L2	Net production of fuel wood in private forests	Net production of fuel wood in private forests is calculated based on the gross amount.	0.556
L3	Wood residue in private forests	Wood residue in private forests is not possible to accurately calculate because the ratio of recorded gross and net of designated timber shipped assortments not comply. Percentage of wood residue is estimated at 10% and calculated on the basis of officially registered volume cutting.	0.07
L4	Net production of round timber in state forests	Based on the report of the National Bureau of Statistics for this assortments.	0.93
L5	Net production of fuel wood in state forests	Based on the report of the National Bureau of Statistics for this assortments.	1.007
L6	Wood residue in state forests 0,2 *milion m³*	Based on the report of the National Bureau of Statistics for this assortments.	0.2
	G1+G2 = ∑(S1, S2,..S6); 0.696+2.137 = 0.062 + 0.564 + 0.07 + 0.93 + 1.007 + 0.2: **2.833 = 2.833**		
E1	Export of fuel wood	Exports of firewood is registered in the amount of 25.000 *m³.*	0.025
E2	Export of round technical wood	Export of technical round wood 2.322 m³ (mainly oak logs).	0.0023

|			
I1	Import of round technical wood	Mainly import of logs of spruce from Montenegro and Bosnia and Herzegovina.	0.0154
I2	Import of fuel wood		0.0064
I3	Import of wood residue	Imports of sawdust and wood waste to 25,000 tons.	0.003
C1	Consumption of technical wood	Consumption of roundwood in the sawmill processing of wood and other forms of primary production. Based on the reports of the company and reports for shipment of logs from private forests, obtained data from 1.007 million m³. According to the research (Glavonjić B. at all, 2010) consumption is determined in the amount of 1.0667 million m³.	1.007
C2	Consumption in the production of wood-based panels	Consumption of fuel wood and similar rawmaterials in the production of wood-based panels (OSB and fibreboard). Based on a survey of manufacturers input quantities.	0.6
C3	Production of pellets and briquettes.	Production of pellets and briquettes. data based on the reports of the manufacturer of the raw material consumed.	0.16
C4	Production of charcoal	According to Glavonjić B. 2012.	0.24
C5	Consumption of fuelwood	Consumption of fuel wood for energy purposes, originating from forests, according to (Glavonjić, 2012)	6.36
	Total Consumption $\sum$ (C1, C2,...C5) = 8.367		
	$\sum$(L1-L6) = $\sum$ (C1, C2,...C5) - (I1 + I2) + (E1 + E2) 2.833 $\neq$ 8.367 - (0.015 + 0.006) + (0.025 + 0.002) **2.83 $\neq$ 8.37, razlika 5.54** *million m³.*		

Data on export and import, according to the database of the Serbian Chamber of Commerce, which were taken from the customs authorities

Indexes in Table 26 and Figure 14:

G - Gross (*m³*), L - Logging (net *m³*), E - Exports (net *m³*),

I - Imports (net *m³*), C - Consumption (net *m³*)

Data from Table 26 are graphically presented in Figure 14.
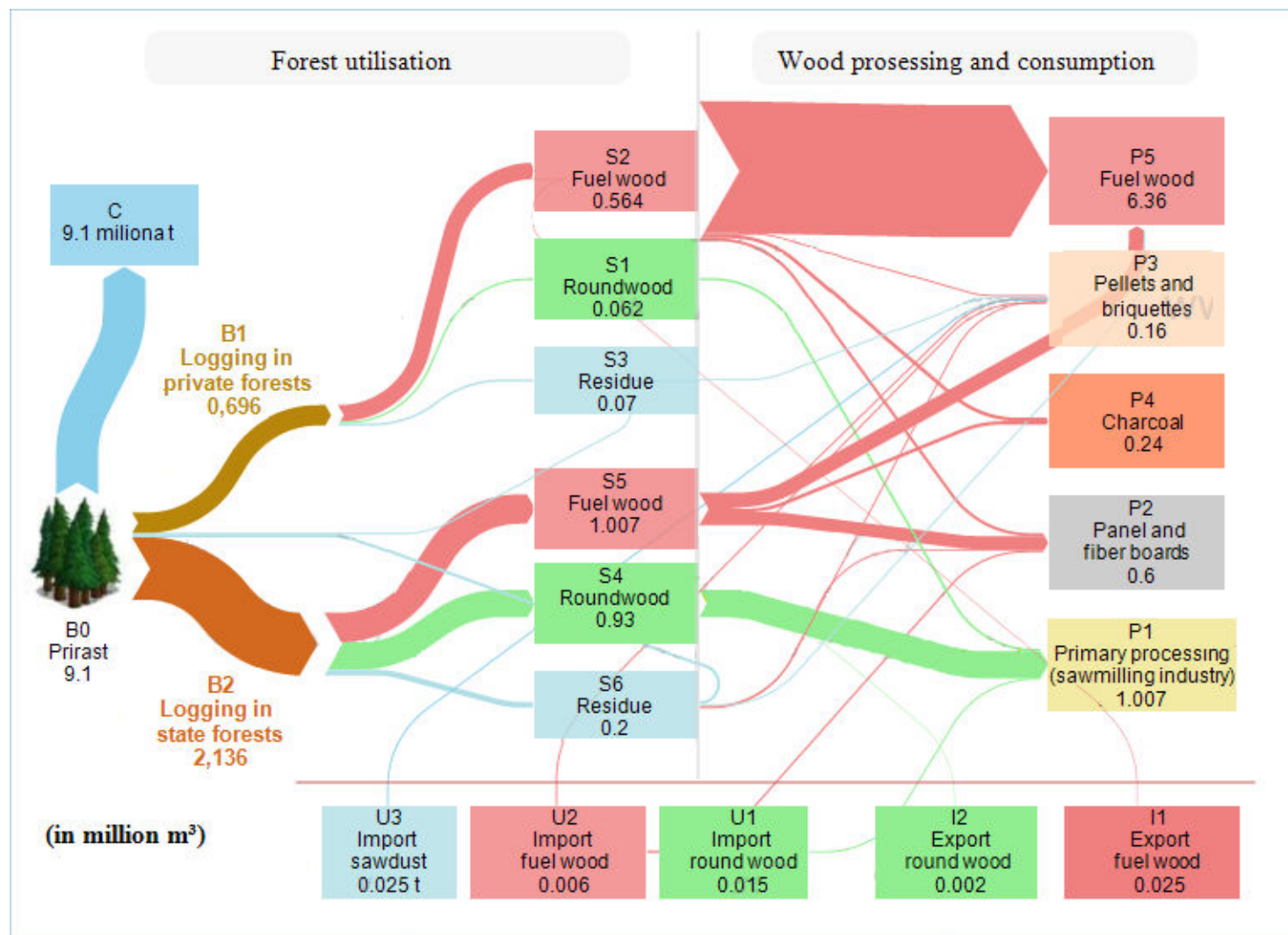
Picture 14. The relation between of the production and consumption of wood in Serbia. *(Source Table 26)*

On the basis of previously presented calculation, it can be seen that there is a significant discordance between the data of wood production and those of its consumption, in the amount of 5.28 *million m³*. It is obvious that the greatest disparity exists in the area of production and consumption of fuelwood. The important information that is missing in this analysis refers to the volume of produced fire (and other) wood **outside the forest (non-forest land)**. This information was recorded in the official statistics within the report "SU20 – Logging in the Republic of Serbia", and, in 2011, it was stated that logging outside forests was realized in the scope of only 27,217 *m³* (SORS, 2012). Noother specific researches that could determine this production have been made. According to the FAO project (FAO, 2011), the total amount of wood consumed outside the forest is expressed in the amount of 1,441,426 *m³*.

It is interesting that the data on logging of wood outside the forest can hardly be found in other countries. Although, according to the methodology MCPFE for determining the value of the indicator relating to the amount of logging, it has been planned to express it separately from the overall logging and forest logging, according to the National reports for 2010, very few countries showed this value. Slovenia, for example, stated that the total amount of logging was larger by 8% than the amount of loggings realized in the forest.

In a study that analyzed the potentials for the biomass production in the EU countries "Real potential for changes in growth and use of EU forests" (EUwood, 2010), there are data for many EU countries on the quantity of fuelwood obtained from outside forest areas, including gardens, orchards, parks, alleys and others. The total amount of this quantity reached the value of 8.4 *million m³*, as it has been shown for France[73]. If these data are placed in proportion to the total area of non-forest land, it can be found that the production of fuelwood per 1 hectare of non-forest land is 0.16 *m³* for the analyzed 11 countries. Calculated on the surface of the non-wood land in Serbia (5.62 *million* ha), the value of 0,88 *million m³* of wood which is produced outside forests is obtained. This value, which is 0,5 *million m³*,approximates the amount of orchards and vineyards, as Nikolic and Ninic claim (Ninic, and others, 1994). If we add

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[73] Austria 0.763; Bulgaria 0.834; Czech Republic 0.868; France 8,401; Germany 3,270; Greece 1,028; Italy 2,248; Poland 3,279; Romania 1,868; Slovakia 0.492; Slovenia 0,115, on the basis of (EUwood, 2010) in million m3.

the amounts of parks, alleys, and others, to this value, we will get approximately the same value.

On the basis of the presented estimates, the data on the total volume of logging should certainly be increased by the amount of about 1 *million m³* gross of logged wood that comes from non-forest area. The given difference in the balance is to decrease by this amount.

3.83 ≠ 8.37, difference 4.54 *million m³*.

The difference in the balance is determined by the amount of 4.5 *million m³* and points to the necessity of establishing the system of statistical evidence and monitoring of flows, starting with the production and finishing with the final consumption, on the basis of which the reasons for this inconsistency of the data would be determined.

The most important data which is necessary to analyze additionally is the volume of logging done in private forests. Even the very source of the data (Statistical Office of the Republic of Serbia) emphasizes that the data on private forests are either based on the data obtained on the basis of the permits for logging, or mostly on estimates. Comparing statistical data on the volume of logging in private forests with the data of public companies for forest management, it is obvious that the data has been obtained only on the basis of issued permits for logging and that the estimates for additional quantities haven't been done. The other data source on logging in private forests does not exist, so it is not possible to correct these values.

In some works and studies relating to the potential for biomass production, the volume of wood that is not included in the statistics was being estimated. So Nikolic (Nikolic, 1992) estimated that statistically unregistered logging in Serbia accounted for 3.5 *million m³*, and that the orchard and vineyard wood covered 0.5 *million m³* of total wood production. In another paper (Ninić and others, 1994) a slightly lower amount was estimated, where statistically unregistered logging accounted for 2.8 *million m³* and, there were additional 0.5 *million m³* of orchards and vineyards.

The problem of unregistered logging of fuelwood for personal needs of the forest owners exists in other countries. According to (MCPFE, 2012) report on the state of forests for 2011 it is said "only a few countries have assessed the real extent of fuelwood logging. The occurrence that considerable quantities of wood used for personal needs have not been registered is wide spread. The data mostly underestimate the total extent of fuelwood logging."

As to the data on the volume of resource utilization, many answers can be found in the National Forest Inventory. In fact, in order to obtain data on trends in forest utilization, it is necessary to repeat the national inventory at planned intervals. Comparing states of forests between the two inventories, the effects of forest utilization and the influence of the wood market to the state of forests can be evaluated. However, in addition to the data relating to the state of forests and their production potentials[74], it is necessary that the next inventory include wood resources located on non-wood land and that can be the subject of utilization and processing. Also, by registering stumps of logged trees arisen as a result of legal or illegal logging, important data on wood consumption could be obtained.

The introduction of regular, annual analyses of wood flows is a necessity in current situation. This implies two sided monitoring of flows- on one side there are forest utilization and management, and on the other processing and consumption of wood. For almost every phase in processing and consumption of wood it is possible to provide the appropriate quantitative and qualitative data on consumption of industrial wood. Comparing data on processing and consumption makes the real assessment of the amount of wood consumption possible. The data entering the system of monitoring wood flows have to be checked many times. When it comes to the fuelwood consumption in households, it must be adequately grounded by regular annual statistical researches, with prior thorough methodological analysis of the methods of data collecting and processing.

According to registered consumption, intensive changes on the wood market that have taken place in recent years, have undoubtedly influenced the increase in wood consumption, and they represent an additional reason to introduce regular analyses of wood flows. In fact, with the investments in production facilities for wood based panels, wood pellets, briquettes and charcoal, the demand for wood has significantly increased. Only with these products, according to the available data, is the amount of consumed wood over 0,9 *million m³* annually. Another reason for introducing the system of monitoring wood flows refers to the planned investments in district heating system. In fact, the potential for the reconstruction of the existing district heating systems and their transition to biomass in over 15 cities is currently being discussed in Serbia, which was explained in more details in a separate section of this paper. With the implementation of

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[74] The previous inventory included only forests and forest areas.

these investments the demand for energy wood will be increased to the extent of at least 0.5 *million m³*. Also, favorable market conditions, the low price of raw materials and energy, encourage further development of pellet production and related products. In relation to the consumption of fuelwood in households, the increase can also be expected due to the increase in prices of other energy sources and the present economic crisis.

Solutions relating to the rise in demand for wood should not be looked for in restricting the production of wood or the volume of logging, because the rise in demand is economically and socially very important. Every new investment based on wood makes not only job vacancy, but increases the sources of income for rural population as well. Keeping balance between the conditions in forest resources and demand for wood can be (and must be) provided, among other things, by reforestation, making biomass plantations, energy plants, etc. It is well known that the increase in the demand for wood can partly be overcome by afforestation and planting, which is the best way to ease the pressure put on natural forests. This practice is not unknown in Serbia, because, as a result of a rising demand for pulp wood during the fifties of the last century, a significant work on raising plantations of poplar began[75], which now, according to (NIŠ, 2008), cover an area of 48,000*ha* and have a great economic importance. Under current conditions, large areas of abandoned farmland in the hilly and mountainous areas represent a major potential for the establishment of new forest plantations. These plantations could, among other things, meet the growing demand for wood.

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[75] According to (Ivanisevic, and others, 2008) " People's Committee of the district, or Woodland Sremska Mitrovica, having in mind the plan to build the pulp and newsprint factory, started as far as 1950, building new plantations, devoting full attention to care and protection."Referring to the achieved results, the above mentioned authors conclude: "It was the best response to an increase in wood consumption, caused by population growth, rising standards and increased utility value of wood."

The maximum recorded impact of Matroza, then the largest processor of pulp wood, according to the Institute of Economics was 123.000t of pulp in the late 80s.

3.2 Wood market and the economic component of the sustainable development of the wood sector in Serbia

Economic contribution of the wood sector is expressed on the basis of financial or other measurable indicators. Employment, value of goods produced and services rendered, contribution to the overall national economy, profitability, number of companies, participation in international trade and others are commonly used and recognizable indicators that indicate the economic importance of the sector. The impact of the market on these indicators is outstanding. Changes in supply and demand of wood and wood products affect the values of economic indicators of the wood sector.

In relation to economic indicators of sustainable development of the wood sector in Serbia, the data referring to the number, structure and business activities of companies and entrepreneurs in the wood sector in Serbia have been analyzed, as well as their territorial distribution and profit. Also, the value of roundwood production, imports and exports, the share of the sector in the gross domestic product of Serbia, the amount of budget allocations, as well as the sector's contribution to public revenues and others, have been analyzed.

3.2.1 The number, structure and business activities of companies and entrepreneurs in the wood sector in Serbia

The state in the wood sector, in relation to the size, ownership structure, number of companies and organization in general, is the result of the incomplete process of transition. As a result of the changes, the wood sector in Serbia today consists of:

- Forest management companies that are owned by state;
- Forest management companies in other forms of property (eg. Religious communities);
- Entrepreneurs and companies in the field of forest utilization and forest transportation;
- Entrepreneurs and companies in the field of wood processing, fuel production based on biomass and Manufacture of other products of wood.

During the changes that started in 1990 two parallel processes were going on within the wood sector, one in the direction of state centralization of management in forest resources and the other in the direction of defragmentation and privatization[76] of activities within the sector of forest utilization and wood processing. The first process, which is reflected in the centralization of enterprises for forest management, was carried out centrally, by state administration. The second process is characterized by closing of large social enterprises for wood processing and establishing of a large number of small private factories. Newly established factories dealt with only certain phases in wood processing (usually in the area of primary wood processing), under the strong influence of the market of wood and wood products, driven by entrepreneurial interests of private investors.

Practically, the beginning of the establishment of the present organizational form of the wood sector started in 1989, when, according to the Law on Forests, all state forests were organized in 16 public companies for forest management. Soon after that, in 1991,by the Law on Forests (Fig. Gazette of the Republic of Serbia, No. 46/91), all community forests were declared state and assigned to the newly established forest management company, "Srbijašume" Belgrade. Not only was the forestry united by this law, but, forestry and wood industry were separated in organizational and economic sense as well. Before that, during the 1980s,the wood sector was jointly organized within the framework of the so called forest-industrial complexes[77]. Practically by the Law on Forests from 1991, the former 53 companies, which managed forests in different forms (community forests), transformed into one Public company for forest management (Vucicevic, 2008).

Similar changes were taking place in almost all countries in transition at that time. Changes directed transition processes towards market economy. Many countries,

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[76] The first wave of privatization was initiated by the federal government of Ante Markovic in 1989, with the correction in 1990. The method of privatization was recapitalization. Privatization was optional, but it got its stimulus in the provision that the increase in salaries could only be paid in shares. During 1990, 1.200 companies were transformed into joint companies in Serbia.

[77] Forest-industrial complexes: : „Crvena zastava" Kruševac, „Južni Kučaj" Zaječar; „Jasen" Kraljevo, „Kopaonik" Kuršumlija, ŠPIK Ivanjica, ŠIRO „27. november" Raška, "Jablanica" Leskovac and others.

during the period of joining the EU, went through the process of reconstruction of the wood sector, which previously had belonged to the state. The scope of organizational models became diversified. In some countries the management of state forests was integrated with the wood trade, inspection and the state budget, while in the others, by introducing the concession model, forestry became commercialized to a high degree.

Key factors that contributed to the organization of forestry in a country referred to whether the country was rich or poor in forests, how deep the market reforms had been implemented, how close it was to the EU, the development and the impact of wood industry, the extent of forest denationalization and restitution, and others (PROFOR, 2005).

However, what was common for all the sectors of forestry is that they had significant support of international institutions aiming to strengthen their capacities and build institutions for the sake of ensuring sustainable management of forest resources (UNFF, UNECE, MCPFE and other processes). On the other side of the wood sector, the wood industry was completely left alone to the market, and, as a rule, without a significant support of local or international institutions.

Social ownership in wood industry in Serbia entirely disappeared, the new sector was established, which, due to the lack of favorable investments, lack of knowledge, insufficient organization and many other weaknesses, could not (with some exceptions) find its place on the international market of wood and wood products. Business activity of this sector today is mainly based on primary procession, with a low degree of finalization of wood raw material. This can be confirmed by the data on wood export (Table10), on the basis of which the participation of products with low degree of finalization is 49.7%.

3.2.1.1 Number and structure of the company by its size, ownership and foundation form

Companies for forest management belong to the group of large and medium sized companies and are mainly state owned (public companies). This means that public companies for forest management ("Srbijašume" "and "Vojvodinasume"), as well as 4 national parks, manage over 95% of forests which do not belong to private owners. The activity of these companies is usually (but not completely) related to the wood sector, so

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that, the classification according to the size, in relation to the conditions shown in Table 27, could be minimally corrected for the employees who are not directly related to the relevant activity (eg. Faculties, utilities, etc).

Table 27. Number of companies for forest management in 2012.[78]

Preduzeće	Area which is managed by ha	Total	Micro	Small	Medium	large
"Srbijašume"	917,318	1				1
Vojvodinašume	129,878	1				1
NP Đerdap	63,608	1			1	
NP Tara	19,715	1			1	
NP Fruška gora	25,393	1			1	
NP Kopaonik	11,809	1		1		
Utilities and other companies	8,700	2		2		
Property of the faculty	7,500	1		1		
Religious communities	30,000	3		3		
Total	1,213,521	13		7	3	2

Source: Business data of the companies

Forest utilization section is functionally linked to the activities of enterprises for forest management. In the current conditions forest utilization section is mainly organized within the framework of private sector. The social significance of these operations is reflected in the employment of the rural population. From the standpoint of the wood market, the ability of the companies for forest utilisation is of great importance for the regular supply of the market.

In further analysis, the structure and organization of activities in forest utilization will be observed, on the basis of the evidence on forest utilization in "Srbijašume"[79]. This analysis covers production, or logging in the amount of 0.768 *million m³* and dragging and wood disposal in the amount of 0.779 *million m³*. The

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[78] According to the Law on Accounting and Auditing ("Off. Gazette of RS", no. 46/2006, 111/2009, 99/2011, 62/2013), legal entities can be classified into micro, small, medium and large, depending on the average number of employees, operating income and average value of operating property. The micro-entities include entities that have not more than 10 employees and whose business income does not exceed € 0.7 million. The small companies include entities that do not have more than 50 employees and the revenue does not exceed € 8.8 million. In medium entities the limit is 250 employees and € 35 million. Legal entities that exceed two criteria from the previous category are classified as large entities.

[79] The analysis based on the database of service companies which was engaged in 2012. Data for 2011 were not processed and available.

scope of work that has been analyzed is sufficient for a realistic assessment of the state and problems in forest utilization section in this company and Serbia in general.

In fact, the work on logging and dragging of wood in PE "Srbijašume", was mainly realized by engaging service companies and entrepreneurs. In that period, it was registered that as many as 396 contractors were engaged. 185 of them did all the work on forest utilization, while 211 of them were specialized in logging or dragging and disposal. Additional 111 companies were engaged for wood transportation, mainly car carriers, which did the transport on behalf of PE "Srbijašume" (in cases of wood sales FCO buyer). Out of these, 36 companies simultaneously did the logging, dragging and transportation. If we put all the companies that took part in forest utilization (logging, disposal, dragging, etc) and transportation together, the total number of the engaged companies was 421.

The engaged contractors, as a rule, had little technical and human capacity. Thus, only 17 contractors had the amount of logging above 10,000 m^3, and only 16 of dragging. The average realized logging per contractor was 2,877 m^3. and dragging 2.520 m^3.

The remaining production in the amount of 28% or 0.33 *million m^3* was carried out in this public company by selling wood on the stump. The data on the organization of assortment production does not exist, but it is certain that the engagement of small contractors and individuals was the most common.

Comparing the data on the number of companies and entrepreneurs who are registered for forest utilization with the number of companies that are actually engaged in this business, there are significant differences. According to the records of the BRA in 2011 only 4 companies for conducting the activities from section "0220 - Logging" were registered. For business related activities from section "0240 - Service activities related to forestry", 21 companies and 9 of entrepreneurs were registered.

Registration of the predominant activity of the company or entrepreneur does not oblige the company to be exclusively engaged in this activity. Also, by registering the company, only the initial conditions for performing the activity have been created. In practice, a significant number of companies and entrepreneurs do not start the registered business or eventually they opt for some other activity.

When analyzing the structure of a company or entrepreneur who did the job of forest utilization, it can be concluded that there is a great number of them whose predominant activity does not refer to forest utilization. There are many trade firms,

wood processing companies, transportation firms, craft shops, and others. Practically, the only reliable data that is related to the real number of engaged companies can be obtained from the evidence of public companies for forest management and National parks. The evidence of companies engaged in forest utilization of private forests and in the sale of wood on the stump in state forests does not exist.

The problem with classification of forest utilization companies also refers to the number of employees. In fact, these companies are usually registered as micro companies or entrepreneurs that provide the necessary labor force hiring seasonal workers. Employees who are engaged in temporary work, or engaged in any other way, as a rule, are not included in the official records of employees. Therefore, in order to understand the size and the actual capacity of these companies, they are grouped depending on the scope of work, as presented in Table 28.

Table 28. The number of companies engaged in forest utilization in PE "Srbijašume" in 2012

Ammount of wood	Number of engaged companies			
m^3	Logging	Extracting and forwarding	Logging + Extracting and forwarding	Transport
> 10.000	8	7	9	1
1.000-10.000	37	78	114	28
< 1.000	39	42	62	82
	84	127	185	111

Source: Databases of Enterprises

If we calculate the number of required permanently employed workers on the basis of average standards, only companies from the group of capacity over >10,000 m^3 a year will belong to the group of small and medium sized companies, while the rest belong to the group of micro companies and entrepreneurs.

24 companies belongs to the first group (> 10,000 m^3) in relation to their capacities[80]. According to the extent of the work done these companies sholuld be the representative group of companies for forest utilization with development prospects. That is the reason why an additional analyisis has been done.

The analysis of the business data of selected 24 companies, which are classified in the first group, leads to the conclusionsthat in more details describe the situation. From 24 selected business subjects only 7 of them fall into the catyegory of a company,

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[80] Companies for forest utilization without transport companies

2 of them are medium and 5 of them are small sized companies (6 limited liability companies and 1 limited company). The rest 17 are registered as entrepreneurs. None of 7 companies has registered forest utilization as their predominant activity, but the activities of wood processing, trade and construction work. The income from forest utilization in the total amount accounts for about 11% in these companies. This suggests that forest utilization is a subsidiary, and perhaps a temporary activity to these companies. This is additionally confirmed by the fact that these companies are at the same time buyers of technical roundwood and fuelwood in lesser extent. The total value of goods that these companies have taken is by 90% higher than their claims for work on forest utilization. It is possible that, in this way, companies in this group have provided more favorable conditions relating to the raw material, which is apparently still used in processing.

The remaining 17 contractors that belong to the category of entrepreneurs registered for activities in the field of forest utilization (210 and 240), except one that is registered for freight. However, two of the 17 selected entrepreneurs were deleted from the registry, because, in the period December 2012-January 2013, they unregistered their operations without explanation. The amount of goods that entrepreneurs took as compensation for services is minimal and is only 8%. Detailed financial analysis of business activities of entrepreneurs is not possible because they have no obligation to submit the final balance sheet or have an obligation to keep simple bookkeeping, so that there are no necessary business records.

On the basis of invoiced services for logging and wood dragging in 2012, the data was obtained showing that the analyzed companies and entrepreneurs (24 of them) made the total income of €0.96 *million*, or an average of €40,097 pre company. Bearing in mind outlined problems in business activities of the companies from the first group, it can be assume, that the situation in other companies is significantly less favorable. It is hard to provide necessary funding to improve and sustain business with less than 10,000 *m³* of annual production.

Business capacity of the contractors in the activities of forest utilization is often crucial for the regular supply of wood market. Under current conditions, despite the organizational problems that have been shown, these companies are able to carry out the planned scope of work on the use of forests. However, the customers frequently complain that the dynamics of supply of wood for further processing is not always in line with their needs, especially in winter months. These weaknesses point to the

necessity of strengthening and enlarging companies within this sector, which should affect the long-term stability and quality of the supply of wood market.

The wood processing sub-sector, according to the data of the BRA, is made of 1,855 legal entities. 1,517 companies and 338 entrepreneurs were registered. The total number of registered business associations for performing business activities in Serbia, in 2011, was 106,537. The same year, 92,974 business associations submitted their financial reports containing data on their successful business activities, which practically represented the number of active companies. In relation to this number, wood processing companies accounted for only 1.63%. The largest number (697) of entities was registered for logging and wood processing, followed by 505 companies and entrepreneurs registered for the activity of "production of joinery and carpentry".

Table 29. Number of companies and entrepreneurs within section 16-Processing of wood and products made of wood, straw, cork and plaiting materials, excluding furniture, in Serbia, in 2011[81]

Activity	Type	Division according to the number of employees			
		Total	Small 0-49	Medium 50-249	Large >250
1610 - Sawmilling and planing of wood	Company	577	565	12	0
1610 - Sawmilling and planing of wood	Entrepreneur	120	120		
1621-Manufacture of veneer sheets and wood-based panels	Company	39	34	2	3
1621-Manufacture of veneer sheets and wood-based panels	Entrepreneur	3	3		
1622- Production of parquet	Company	3	3	0	0
1622- Production of parquet	Entrepreneur	0	0		
1623-Production of other builder's carpentry and joinery	Company	396	390	6	0
1623-Production of other builder's carpentry and joinery	Entrepreneur	109	109		
1624- Manufacture of wooden containers	Company	175	173	2	0
1624- Manufacture of wooden containers	Entrepreneur	33	33		

[81] Companies and entrepreneurs are presented according to the field of activity, based on the data of the BRA. The predominant activity they perform, in some cases, differ from the officially registered. In the case of parquet production, the entrepreneurs are mainly registered for the activity "logging and wood processing", or some other from group 16. Therefore, they are not present in the evidence as parquet manufacturers. The manufacturer dealing with wood processing, and who is not registered for activities from group 16, couldn't be presented in the given overview.

1629- Manufacture of other products of wood, cork, straw and plaiting materials	Company	327	324	3	0
1629-Manufacture of other products of wood	Entrepreneur	73	73	0	0
Total number of companies	Company	1517	1489	25	3
Total number of entrepreneurs	Entrepreneur	338	338		
Total		1855	1827	25	3

Source: Agency for Business Registers, register the financial statements and information on the creditworthiness of legal entities and entrepreneurs

The insight into business data of the two largest public companies for forest management[82], which are the most important suppliers of raw material for wood processing in Serbia, has allowed us to obtain another data referring to the number of companies and their capacity in relation to the technical wood, indirectly through supplied quantities, as presented in Table 30.

Table 30. The number of registered buyers of technical wood in Public companies for forest management in 2012

Quantity	Number of buyers
Less than 100 m^3	351
From 101 to 500 m^3	203
From 501 to 1 000 m^3	62
From1001 to 5 000 m	118
From 5 001 to 10 000 m^3	18
Over 10 000 m^3	8
Total:	760

Source: Business databases

The number of registered buyers of technical wood (raw material) in two largest public companies for forest management, shown in the Chart, differ from the total number of registered companies and entrepreneurs from section 16 (760 in relation to 1,855). This implies that the trade of wood, to a large extent, takes place between companies within the activities in section 16, or it implies that a part of companies does not use round technical wood for production, but partly processed wood belonging to section "1610 - Sawmilling and planing of wood". At the same time, small

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[82] The data of the PE "Srbijašume" Belgrade and PE "Vojvodinasume" Petrovaradin have been used for the analysis. The data of other companies showing on the wood market was not possible to present due to the different structure of their business databases.

manufacturers mostly buy raw material in private forests and they cannot be seen on the list of wood buyers of public companies.

A very large number of companies in the field of wood processing confirm the conclusion which is set at the beginning of this chapter that the current situation in the wood sector in terms of size, ownership structure, number of firms and the organization in general, is the result of an incomplete transition process. In fact, in the last two decades, these companies have mainly been founded as a result of the initiative of entrepreneurs, without sufficiently clear strategy, knowledge or the capital for development. In the last ten years only, with the arrival of foreign companies, the companies with clear objective, substantial capital and familiar market have been founded. The impact of global economic crisis and globalization that is present, which in recent years has significantly affected the wood sector in general, may lead to the reduction in the number of companies. This process was is in the EU particularly intensive in sawmill industry, where today dominated companies with extremely high capacities (some with a capacity of over then 1 *million m³* per annum).

Despite the large number of registered companies, the number of medium and large sized companies is small (25 + 3). Having in mind that the supply of wood raw material is, to a large extent, centralized, it is logical to expect the companies to direct the sales of raw material to larger and financially more reliable buyers. The current situation, where two largest companies ("Srbijašume" and "Vojvodinasume") had more than 400 buyers of technical wood (only those that took over more than 100 $m³$), cannot be justified in the long term, from the standpoint of productivity of resource use. The ability of customers of technical wood, for procesing wood on efficient and productive way, to add value on this natural resource, should be one of the criteria for the selection of customers.

If we accept the statement that the transition process in the wood sector is still in progress and the level of development and mutual alignment of individual activities and sub-sectors are not aligned, it can be concluded that it is necessary to define common policies and objectives for the participants in the wood sector in Serbia. This is particularly important from the standpoint of trade of wood and maximum valuation of limited quantities of raw materials for processing. A significant percentage of hired temporary labor force, a large number of small enterproces, low level of finalization due to lack of competence to perform activities, reduce the effects of the use of wood raw

material, which is a national resource whose valuation cannot be viewed only by financial indicators.

3.2.1.2 The structure and territorial distribution of companies by the activity they perform

Economic and social significance of the wood sector in some areas of Serbia surpasses natural and production potentials of forests and it is based on wood coming from other areas. In other areas, despite valuable forest resources, wood utilization is reduced to meeting the energy need of the population. The reasons for this territorial distribution of companies for wood processing are quite often beyond the domain of the wood sector and they are the result of the initiative of entrepreneurs, business environment, local support, favorable investment conditions, available labor force, etc.

Phenomenon that economic power and development of the wood sector is not always based on production potentials of forest, but on "foreign" wood, is present on national levels as well. A well known example is the example of Italy, which has developed a very powerful and globally respectable wood sector, although it has modest forest resources, and imports about 90% of the raw material for the wood industry (UNECE, 2012).

However, the concept of sustainable development means "satisfying" social needs of local communities, having in mind their life needs, which, among other things, refer to employment, earning income by using local natural resources. Higher degree of finalization of wood in areas where it exists ensures greater employment and income for local development. The importance of forests and activities related to forests and forestry to the development of local communities and rural areas has been recognized and accepted by signatory countries of Lisbon resolution, and they have taken responsibilities in implementation of socio-economic aspect of sustainable forest management (MCPFE-L1, 1998).
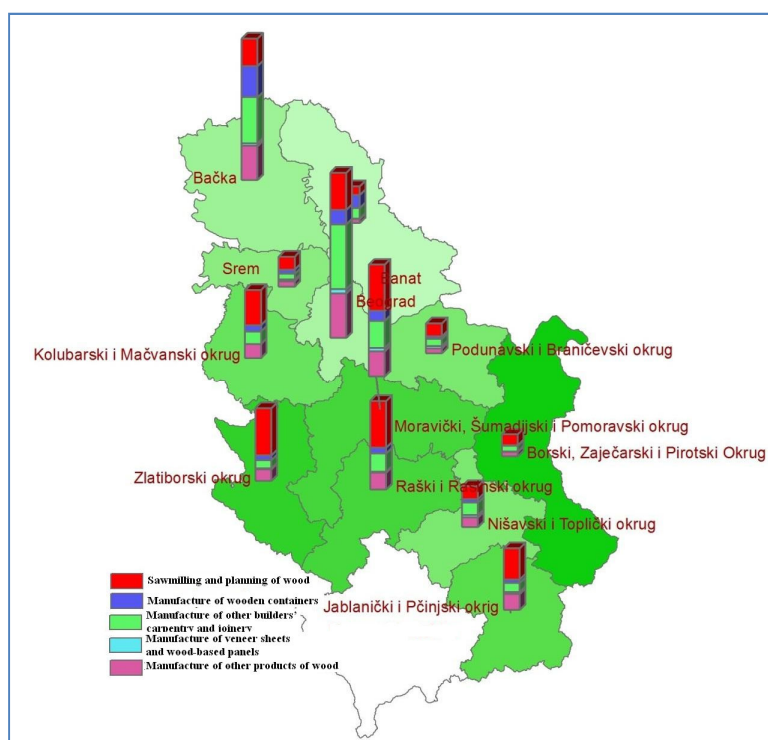
Regional distribution of companies for wood processing can be analyzed by monitoring wood flows, which was shown in chapter "Wood flows in Serbia". The overview of registered companies for wood processing by type of production is given in table 31, based on the BRA data for 2008 and 2011.

Table 31. Number of registered companies for wood processing by type of production in 2008 and 2011, according to nomenclature of statistical territorial units

Districts	Activity	Number of companies	
		2008.	2011.
Backa	Sawmilling and planning of wood	61	48
	Manufacture of wooden containers	38	54
	Manufacture of other builders' carpentry and joinery	72	80
	Manufacture of veneer sheets and wood-based panels	6	5
	Manufacture of other products of wood	40	58
	Total	217	246
Banat	Sawmilling and planning of wood	19	15
	Manufacture of wooden containers	16	23
	Manufacture of other builders' carpentry and joinery	16	18
	Manufacture of veneer sheets and wood-based panels	1	1
	Manufacture of other products of wood	5	7
	Total	57	64
Srem	Sawmilling and planning of wood	29	23
	Manufacture of wooden containers	5	7
	Manufacture of other builders' carpentry and joinery	9	10
	Manufacture of veneer sheets and wood-based panels	3	3
	Manufacture of other products of wood	6	9
	Total	52	51
City of Belgrade	Sawmilling and planning of wood	72	65
	Manufacture of wooden containers	26	25
	Manufacture of other builders' carpentry and joinery	114	112
	Manufacture of veneer sheets and wood-based panels	11	8
	Manufacture of other products of wood	63	77
	Total	286	287
Kolubara and Macva districts	Sawmilling and planning of wood	70	61
	Manufacture of wooden containers	15	11
	Manufacture of other builders' carpentry and joinery	22	22
	Manufacture of veneer sheets and wood-based panels	0	0
	Manufacture of other products of wood	12	24
	Total	119	119
Zlatibor	Sawmilling and planning of wood	94	82
	Manufacture of wooden containers	12	9
	Manufacture of other builders' carpentry and joinery	14	14
	Manufacture of veneer sheets and wood-based panels	2	2
	Manufacture of other products of wood	10	20
	Total	132	128
Moravic, Sumadija and Pomoravlje	Sawmilling and planning of wood	92	80
	Manufacture of wooden containers	24	18
	Manufacture of other builders' carpentry and joinery	47	47
	Manufacture of veneer sheets and wood-based panels	5	6
	Manufacture of other products of wood	22	44
	Total	190	196
Raska I Rasina	Sawmilling and planning of wood	94	82
	Manufacture of wooden containers	13	10
	Manufacture of other builders' carpentry and joinery	32	32
	Manufacture of veneer sheets and wood-based panels	1	1
	Manufacture of other products of wood	15	30
	Ukupno	155	156
Podunavlje and Branicevo	Sawmilling and planning of wood	22	23
	Manufacture of wooden containers	4	4
	Manufacture of other builders' carpentry and joinery	11	13

	Manufacture of veneer sheets and wood-based panels	4	4
	Manufacture of other products of wood	5	8
	Total	46	53
Bor, Zajecar and Pirot	Sawmilling and planning of wood	19	19
	Manufacture of wooden containers	1	1
	Manufacture of other builders' carpentry and joinery	8	10
	Manufacture of veneer sheets and wood-based panels	1	1
	Manufacture of other products of wood	4	7
	Total	33	38
Nis and Toplica	Sawmilling and planning of wood	22	23
	Manufacture of wooden containers	6	6
	Manufacture of other builders' carpentry and joinery	18	22
	Manufacture of veneer sheets and wood-based panels	4	4
	Manufacture of other products of wood	10	17
	Total	60	72
Jablanica and Pčinj	Sawmilling and planning of wood	54	55
	Manufacture of wooden containers	6	6
	Manufacture of other builders' carpentry and joinery	13	16
	Manufacture of veneer sheets and wood-based panels	3	3
	Manufacture of other products of wood	17	28
	Total	93	109
Total	Sawmilling and planning of wood	648	577
	Manufacture of wooden containers	166	175
	Manufacture of other builders' carpentry and joinery	376	396
	Manufacture of veneer sheets and wood-based panels	41	39
	Manufacture of other products of wood	209	330
	Total	1440	1517

Source: BRA, Belgrade, 2008/2011. g.

*Picture 15. Territorial distribution of wood processing companies
(Based on the data in table 31)*

Analyzing data on the number of companies in relation to their activity and spatial distribution, it can be concluded that the total number of companies is extremely high (1,517) and that there is a significant mismatch between the distribution of companies and production potential of forests. Comparing the total annual growth to the number of companies for lumber production, it can be concluded that in some regions, notably Backa and Belgrade, facilities, for which a high percentage of raw materials is necessary to obtain bytransporting from other areas, have been installed. In other regions, such as Bor, Zajecar and Pirot districts, the number of companies dealing with processing of technical round wood is particularly small. The national forest inventory has noted down annual growth of 16% out of the total growth in Serbia in these three districts. On the other hand, the number of registerd companies for wood processing in these districts is only 2.5% in relation to the total number of such companies in Serbia. Similar data have been obtained by analyzing the flow of wood trade where one can identify directions of movement of raw material within Serbia.

The evan distribution of companies is also very important to the employment of local population. Analyzing the data on the number of employees in companies belonging to wood sector, it is found that in the area of Belgrade City, where the participation of forests is only 2.3% in relation to the total forest area of Serbia, 37.1% people are employed in wood sector. Contrary to this, **in the Region of Southern and Eastern Serbia there are 13.6% employees in the territory that covers 46% of the total forest area in Serbia.**

Low level of usage of local materials and a small number of wood processing companies in certain areas directly lead to a reduction in the number of employees, which furher leads to depopulation. According to the census of 2011, in the area of Southern and Eastern Serbia, there was a reduction in the total population by 338,000 (Faculty of Philosophy, 2012).

Table 32. Review of registered companies and indicators, given according to the nomenclature of statistical territorial units NTUS 2

Group	Forest area ha	%	Wood volume $V * 10^6$	%	Number of companies	%	Number of employees	%
Region of Belgrade								
Forestry				2.0	12	0.4	3,271	22.9
Manufacture of wood				2.0	287	8.8	2,022	14.2
Total	50,800	2,3	0.00732	2.0	299	9.2	5,293	37.1

Region of Southern and Eastern Serbia								
Forestry				42.4	38	1.2	138	1.0
Manufacture of wood				42.4	271	8.3	1,797	12.6
Total	1,045,600	46,4	0.154	42.4	309	9.5	1,935	13.6
Region of Šumadija and Western Srbija								
Forestry				47.6	35	1.1	305	2.1
Manufacture of wood				47.6	598	18.4	3,318	23.2
Total	1,002,000	44,5	0.172	47.6	633	19.5	3,623	25.4
Region of Vojvodina								
Forestry				8.0	23	0.7	1,679	11.8
Manufacture of wood				8.0	361	11.1	1,741	12.2
Total	154,000	6,8	0.0291	8.0	384	11.8	3,420	24.0
Serbia								
Forestry					108	6.6	5,393	37.8
Manufacture of wood					1,517	93.4	8,878	62.2
Total	2,252,400	100	0.362	100	1,625	100	14,271	100

Source: the BRA 2011. god., (NIŠ, 2008)

Quite uneven territorial distribution has been noted at the level of the overall economy of the Republic of Serbia. In 2011, about three quarters of business associations worked in the region of Central Serbia, and, at the same time, there were a little more than three quarters of employees out of the total number of employees in the republic of Serbia. Of these, the largest part (58%, or 56% for the employed) is related to Belgrade area, where 39,123 business associations with 426,958 employees worked. There were 23,842 business associsations with 240,046 employees in the area of Vojvodina (The Business Registry Agency, 2012).

If we compare the situation in companies in the wood sector in 2008 to the situation in 2011, we can see that in the total amount the number of companies was reduced from 1517 to 1440, or by 5.8%. The largest reduction was recorded in companies for lumber production 10.96%. A small increase in the number of companies was realized in Manufacture of wooden containers and builder's carpentry, which was in accordance with the increase in export in these activities.

Trend in the decrease in the number of business associationsand employees was recorded in other fields as well. Speaking of the field of activity, the smallest decrease of all business associations was recorded in the region of Branicevo (8.2%), followed by Bor, Zajecar and Jablanica regions (7.9%), while the largest decrease of the number of employees was in Zajecar and Nis regions (13.9% and 12.7%) (Faculty of Philosophy, 2012).

3.2.1.3 Number of entrepreneurs and the structure by fields of activities in the wood sector in Serbia

According to (the BRA, 2012), financial reports for 2011 were submitted by 20,589 entrepreneurs who had their business books kept by the double entry booking system. 368 or 1.78% of them belonged to the wood sector. According to the same source, the entrepreneurs employed 45,099 workers, of whom 1,205 or 2.67% worked in the wood sector.

The review of entrepreneurs by fields of activity within the wood sector is given in Table 33.

Table 33. The review of registered entrepreneurial stores in the wood sector in 2011.

Activity	Number of entrepreneurs	Number of employees
0210- Silviculture and other forestry activities	21	40
0240 - Support services to forestry	9	11
1610 - Sawmilling and planning of wood	120	320
1621 - Manufacture of veneer sheets and wood-based panels	3	3
1623 - Manufacture of other builders' carpentry and joinery	109	434
1624 - Manufacture of wooden containers	33	106
1629 - Production of othe products of wood, cork, straw and plaiting materials	73	291
Total	368	1205

Source: the BRA, Belgrade, 2008/2011. god.

As we can see in the table, entrepreneurs within the wood sector are mainlydealing with the activities relating to the wood processing sub-sector, while only 30 are registered for forestry. However, although there is ni doubt about the number of entrepreneures registered for these activities, previously displayed analyses, relating to the forest utilization, lead us to the conclusion that the number of entrepreneurs that really do these tasks, primarilly in forestry, is larger than the registered ones.

This situation requires detailed analysis of the situation and prospects of development of entrepreneurial activity in the wood sector. Entrepreneurs in the forestry and wood processing can be a significant segment of the wood sector. Also, should have in mind that in forest utilization significant number of entrepreneurs, which are engaged in forest transportation and wood trade, has been registered for activities that belong to other areas of business operations.

3.2.1.4 Profit made in business operations of companies and entrepreneurs in the wood sector in Serbia in 2011

Total business revenues in the wood sector in 2011 amounted to *€* 469.9 *million*, of which 93.3% was achieved by companies (Table 34). According to the Agency for Business Registers, total operating revenues of all companies in Serbia amounted to *€* 73,912 *million*, of which the wood sector accounted for 0.64%. The highest total revenue was generated in silvicultural activities, or in forest management companies and in cutting and processing of wood, in the approximate amounts of *€* 102 *million* and *€* 107 *million*.

Total business expenses of the wood sector in 2011 amounted to *€* 467 *million*, which was 0.66% of total business expenses of all companies in Serbia.

In the same period, the wood sector companies showed profit of *€* 2.4 *million*, while the entrepreneurs realized loss of *€* 0.1 *million*. The biggest benefit was realized in the activities of production of joinery and in cutting and processing of wood, which were also the largest exporters in the sector (chapter "Export and import of wood and wood products in Serbia").

According to the nomenclature of statistical territorial units, the largest realized revenue was made in the region of "Sumadija and Western Serbia", followed by Belgrade. Loss in business activities, as well as the smallest revenue, was realized in the region of "Southern and Eastern Serbia". However, **the analysis of business operations of companies by regions is not reliable enough**, considering that the dat a are related to the place where the company has been registered, not to the region where the revenue has been made. Several very significant companies are registered in Belgrade area, but they make their revenues in other regions, primarilly PE "Srbijašume" (Table 35).

Table 34. Actual business results of companies and entrepreneurs in the wood sector in 2011

	Field of activity	Number of companies	Number of workers	Business revenues in €1.000			Profit in 1,000€
				Total	Per company	Per worker	
companies	Silviculture and other forest activities	77	5,235	102,394	1,329.8	19.6	319.1
	Logging	4	11	107	26.6	9.7	-26.2
	Gathering of wild growing non-wood products	6	86	7,636	1,272.7	88.8	438.6
	Support services to forestry	21	61	4,565	217.4	74.8	40.9
	Sawmilling and planning of wood	577	3,521	107,128	185.7	30.4	1,504.7
	Manufacture of veneer sheets and wood-based panels	39	1,314	59423	1,523.7	45.2	-3894.8
	Manufacture of assembled parquet floors	3	1	277	92.4	277.3	-8.1
	Production of other builder's carpentry and joinery	396	1,712	67,672	170.9	39.5	2,889.1
	Manufacture of wooden containers	175	999	47,656	272.3	47.7	1,867.8
	Production of other products of wood, cork, straw and plaiting material	327	1,331	41,706	127.5	31.3	-587.3
	Total companies	**1,625**	**14,271**	**438,564**	**269.9**	**30.7**	**2,543.9**
Total entrepreneurs	Silviculture and other forest activities	21	40	1,119	53.3	28.0	34.3
	Support services to forestry	9	11	689	76.5	62.6	-31.7
	Sawmilling and planning of wood	120	320	11,694	97.4	36.5	103.0
	Manufacture of veneer sheets and wood-based panels	3	3	99	32.9	32.9	3.5
	Production of other builder's carpentry and joinery	109	434	10,316	94.6	23.8	-264.1
	Manufacture of wooden containers	33	106	2,322	70.4	21.9	-9.7
	Production of other products of wood, cork, straw and plaiting material	73	291	5,125	70.2	17.6	30.3
	Total entrepreneurs	**368**	**1,205**	**31,363**	**85.2**	**26.0**	**-134.5**
Total:	**Total wood sector**	**1993**	**15,476**	**469,927**	**235.8**	**30.4**	**2,409.3**

Source: the BRA, register of financial reports and information on the solvency of legal entities and entrepreneurs

Table 35. Actual business results of companies in the wood sector in 2011, **shown by** the NTUS regions

Region	Number of workers	Total revenue in €1,000	%	Profit in €1.000
Region of Šumadija and Western Serbia	4,087	172,017	36.6	471.0
Region of Belgrade	5,395	138,858	29.5	342.7
Region of Vojvodina	3,631	110,944	23.6	1907.1
Region of Southern and Eastern Serbia	2,363	48,108	10.2	-311.4
Total	15,476	469,928	100.0	2409.4

Source: the BRA, register of financial reports and information on the solvency of legal entities and entrepreneurs

If we observe the most important activities, classified by regions (NTUS-2), the first ten that made the largest profit in 2011 are shown in table 36.

Table 36. Activities with the largest profit by regions NTUS-2

	Activity	Region	Profit in 1,000€
1	Production of other builder's carpentry and joinery	Region of Belgrade	1833.3
2	Production of other builder's carpentry and joinery	Region of Šumadija and Western Serbia	1333.9
3	Sawmilling and planning of wood	Region of Šumadija and Western Serbia	1191.9
4	Manufacture of wooden containers	Region of Vojvodina	1173.4
5	Production of other products of wood, cork, straw and plaiting material	Region of Vojvodina	603.2
6	Manufacture of wooden containers	Region of Belgrade	596.5
7	Gathering of wild growing non-wood products	Region of Šumadija and Western Serbia	426.0
8	Sawmilling and planning of wood	Region of Vojvodina	381.3
9	Silviculture and other forest activities	Region of Belgrade	336.3
10	Production of other builder's carpentry and joinery	Region of Southern and Eastern Serbia	289.2

Source: the BRA, register of financial reports and information on the solvency of legal entities and entrepreneurs

On the basis of the given data it can be noticed that, due to the spatial distribution of wood processing companies, the business profit is realized in regions with a small percentage of forest area, exept the region of Western Serbia. This certainly

influences the social importance of the wood sector in these regions and provides profit that can be directed to the further development of the wood sector.

3.2.2 The value of roundwood production with the analysis of individual assortments in public companies and national parks

0.85 *million m³* of technical wood, which acconted for 42.7% of the total amount of wood production(Table 37), from state owned forests or those belonging to religious communities was deleivered to the market in 2012. The differences that appeared in companies in relation to the percentage of participation of individual assortments had been caused by the type of wood, or stand category and habitat conditions. In the area of the PE "Vojvodinašume" there are mainly poplar plantations and stands of oak with extensive participation of technical wood, especially in better quality classes. The participation of technical wood in this company accounts for 60%. In national parks, due to the large presence of conifers (particularly in NP Tara and NP Kopaonik), preserved forests and favourable habitat conditions, the share of technical wood is significant and it acounts for 50.4% (total for all national parks). In the case of PE "Srbijašume", which is characterizes by the large presence of beech forests with a significant presence of coppice and degraded forests, the percentage of technical wood is only 33.6%. The share of technical wood in total realization in 2012 for all companies was 42.7%, of which the share of roundwood for veneer and peeling acounted for 9.98%.

Table 37. Sale of wood by assortment groups in 2012 (*m³*)

Company	Total	Logs for veneer and peelingl		Logs for sawmill		Other technical wood		Fuelwood and pulp wood	
	$m³$	$m³$	%	$m³$	%	$m³$	%	$m³$	%
"Srbijašume"	1,236,103	37,189	3.0	350,928	28.4	26,619	2.2	821,367	66.4
„Vojvodina šume"	551,147	159,712	29.0	157,160	28.5	13,811	2.5	220,464	40.0
National parks	151,389	555	0.4	58,920	38.9	16,839	11.1	75,075	49.6
Others	53,177	1,408	2.6	26,907	50.6	0	0.0	24,862	46.8
Total	1,991,816	198,864	10.0	593,914	29.8	57,269	2.9	1,141,768	57.3

Source: Business reports of companies
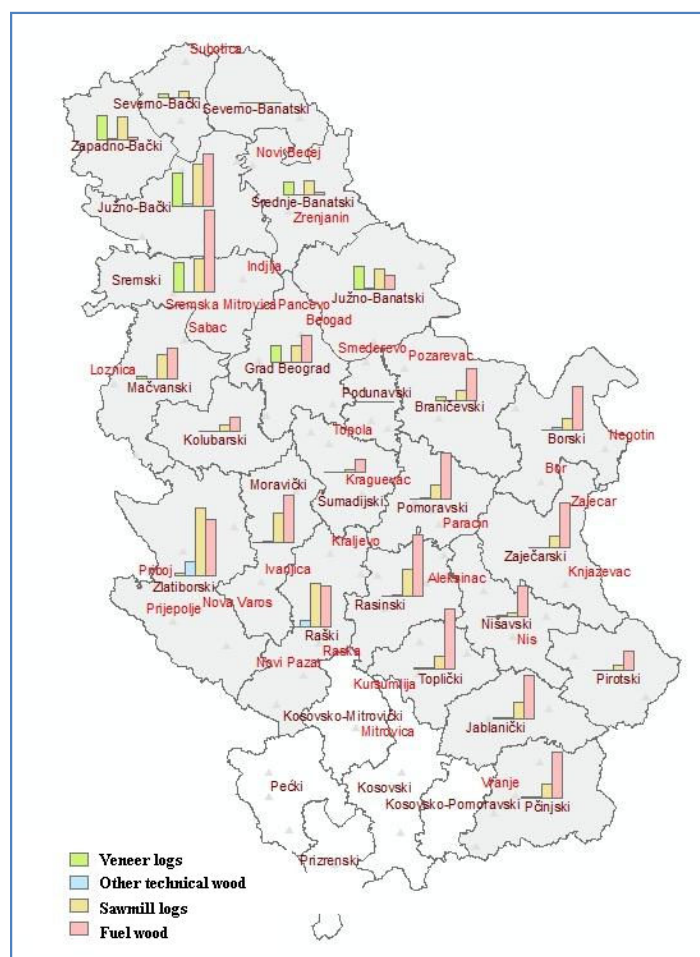
Picture 16. Spatial distribution of the share of assortment groups in sale

If the participation of individual assortments in sales is viewed spatially, by districts (Figure 16), certain rules can be noticed. In fact, from north to south and west to east the presence of technical wood is decreasing while the share of fuelwood is increasing. Such spatial distribution is the result of different stand categories. In spatial graphs which are given in chapter "Conditions and productive potential of forests in Serbia", that from the standpoint of wood production, the south, east and central parts of Serbia are featured by forests of beech, Turkey oak, sessile oak and Hungarian oak. The presence of stands of coppice origin, degraded and diluted forests in these stand categories have an impact on the increase in participation of fuelwood. In the western part of Serbia, the presence of conifers, spruce and fir have a positive effect on the increased participation of technical wood. In the north of Serbia there are mostly forests of high origin, English oak, plantations of poplar, where the participation of technical wood is significant.

A larger share of technical roundwood compared to less valuable assortments may significantly affect the economic and social effects of the business and the sector as

a whole. They are expressed directly as increased income from the sale of wood or in the processing of wood, which further employes workforce and creates new value. On the other hand, by the production of fuelwood and its use in itsbasic form, these effects are absent.

Different types of sales of wood assortments are present on the wood market in Serbia (on the stump, by the stump, on the road, etc), which are expressed as "revenues from sales of goods" in a company's balances. Such an expressed ravenue contains the ravenue of other types of goods in a small percentage. For these reasons, in orfer to determine the value of other wood assortments sold on the roadside (the amount of 1.99 *million m³*), the calculation of the value of the sold wood in euros was done, based on the official price list of the PE "Srbijašume" and "Vojvodinasume" for 2012[83]. The data was obtained showing that the total value of realized wood assortments, at prices on forest roadsides was €75.15 *million* (table 38). In the total value of wood assortments the fuelwood and pulp wood participated with 43.7%, logs with 34.4% logs for veneer and peeling participated with 16.9%. The share of fuelwood and pulpwood was less by 13,6% than the participation of these assortments in volume. Quite contrary, the value of logs for veneer and peeling was higher by 6,7%. By companies, the largest share had PE "Srbijašume", with 62.1% and PE "Vojvodinasume", with 27.7%.

Table 38. The value of the wood sold on the roadside, by assortment groups, in 2012, expressed in Euros

Company	Total		Logs for veneer and peeling		Logs for sawmill		Other techn.wood		Fuelwood and pulpwood	
	€*10³	%	€*10³	%	€*10³	%	€*10³	%	€*10³	%
PE „Srbija-sume"	43,921	62.1	2,360	18.8	5,398	59.5	2,045	52.2	24,119	73.5
PE „Vojvodina sume"	23,388	27.7	9,990	79.7	6,661	25.7	844	21.5	5,894	18.0
National parks	5,972	7.6	59	0.5	2,849	11.0	1,030	26.3	2,034	6.2
Others	1,871	2.7	131	1.0	965	3.7	0	0,0	776	2.4
Total	75.152	100,0	12.540	100.0	25.871	100.0	3 919	100.0	32.822	100.0

Source: Business reports of companies

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[83] The calculation of value was made on the basis of the established database of delivered wood assortments in 2012, according to tree species and their classes. For the creation of this database the detailed data from bookkeeping of public companies were used.The value was calculated in euros on the basis of the price list, for each assortment class and a group of tree species.

The average value of $1m^3$ of the wood sold on the roadside was 37.8€/m^3. The realized average price was mostly lower in comparison to the EU countries. According to the reports[84] submitted by the member countries of MCPFE conference, in 2010, the average value of wood which was realized on markets of some EU countries was 62€/m^3 in Austria, 78.34€/m^3 in Croatia, 62.97€/m^3 in Germany, 39.7€/m^3 in Slovakia, 49.5€/m^3 in Slovenia and 36.8€/m^3 in Sweden.

Low average price for m^3 of wood sold in Serbia is firstly the result of a low qualitative structure, characterized by a large share of fuelwood and other less valuable assortments, whose cause should be looked for in unsatisfactory conditions of forests[85]. The price surely depends on ratio between supply and demand, ways of sales and other factors, but it is undesputable that the low qualitative structure of the produced wood significantly reduces the value of the sold goods and directly influences reduction of competitivness of Serbian forestry in relation to others. This lessens the possibility for development and investment in wood sector.

Besides relatively small prsence of technical roundwood in the total sales of wood in Serbia, what concerns even more is the fact that the share of these assortments has decreased during the last 20 years.What we can see in figure 8 is the changes in presence of some assortment groups in PE "Srbijašume" for the period 1992-2012. The analysis encompasses only the realization of wood in the central part of Serbia, without provincess.

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[84] Database of the Ministerial Conference on protection of forests in Europe (now Forest Europe) contains data on values "Pan-European Indicators for SFM' of each of the member for 2010. The average value of m^3 of wood assortment was calculated on the basis of expressed quantities and the total value of realized wood.

[85] The indicators of condition of forests and wood production by assortment structure were given in previous chapters.

$1000\ m^3$

3. Fuel wood

$y = 0.2331x^2 + 3.5454x + 567.93$
$R^2 = 0.5663$

2. Logs for sawmills

$y = -0.208x^2 + 5.702x + 315.0$
$R^2 = 0.091$

1. Veneer logs

$y = -0.3925x^2 + 9.389x + 3.5898$
$R^2 = 0.530$

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1	12.2	22.2	21.9	28.2	32.2	40.7	47.9	72.6	102.2	65.3	53.1	50.3	47.7	42.6	49.0	51.7	45.2	39.5	42.7	41.0	36.4
2	391.4	286.1	284.1	305.9	320.4	360.2	354.0	361.2	406.0	332.7	353.6	340.1	392.1	319.3	344.3	356.2	373.1	320.9	322.4	362.6	356.6
3	574.6	552.3	542.0	589.0	557.5	651.6	601.2	683.7	690.5	578.3	667.1	655.8	665.1	645.9	628.2	557.3	718.5	675.9	749.7	723.8	809.3

Figure 16: Share of various assortments in sales in PE " Srbijašume " (without provinces) in the period 1992-2012 (in 1000 m³). *(Source: Company reports)*

In the period from 1992 to 2012 some variations in selling of fuelwood were noted in PE "Srbijašume" (without provinces). The quantities sold ranged from 0.54 to 0.81 *million m³*. The reasons are mainly consequences of adjustment of wood production to market demands. The increase in sales existing in the last couple of years is a result of increased demand for biomass raw material and production of wood based panels. The changes in assortment structure, among other things, have been caused by changes in demand for technical wood on European market. Due to the limited cut, the increase in ralization of one assortment leads to the reduction in others. This can be seen in figure 17.

Table 39. Analysis of the absolute values of sold assortments inPE "Srbijašume" (without provines) in the period 1992-2012.

	Assortment *m³*			
	Logs F i L	Logs for sawmill	Fuelwood and pulpwood	Total
Mean	44978.05	344917.86	643679	1063679.52
Median	42684.00	353575.00	651552	1066638.00
Mode	12188[a]	284085[a]	542002[a]	871153[a]
Std. Deviation	19160.256	32685.110	72256	103123.713
Variance	3.671E8	1.068E9	5,221E9	1,063E10
Range	89997	121961	267344	367548
Minimum	12188	284085	542002	871153
Maximum	102185	406046	809346	1238701
Sum	944539	7243275	13517258	22337270

(Source:Company reports)

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In the given example, by the analysis of statistical parameters on the sales of assortments, in the period 1992-2012 it has been found that the sale of fuelwood recorded continuou increase. Increase in sales of fuelwood in 2012, compared to the initialsales in 1992 amounted to 40.9%, or 235,000 m^3. The average rate of change of sales of this assortment annually amounted to + 1.73. However, the selling of Logs for sawmill recorded a negative rate of change of - 0.46 in the same period.Decreased selling of logs for sawmill was partly compensated by the increase in selling of logs for veneer and peeling, with the average change rate of + 5.6. However the increaes in selling logs for veneer and peeling didn't hava a large impact, being of small absolute values (average 44,978 m^3 a year or 4.2%). If we look at the total sales of wood, it is characterized by a slight increase in the rate of change of + 1.04, which is shown in Figure 3.

Trend analysis showed that changes in the selling of fuelwood and logs for veneer and peeling had a considerable statistical significance with a correlation coefficient of 0.75 and 0.73. However, in the case of logs for sawmill, given the low value of the correlation coefficient (0.33), the resulting trend can not be accepted as a significant one.

On the basis of analysis of the trend in sales of wood in PE"Srbijašume", in the coming years, we can expect a further rise in the sale of fuelwood, at an average of about 1.7% per year, and a slight decrease in the share of logs for sawmill.

The resulting statistical parameters of the trend in the prevalence of certain groups of wood assortments in the sales in PE"Srbijašume", based on quadratic polynomials, are as follows:

	Fuelwood	Logs for sawmill	Veneer logs
$y = a1 + a2 * X + a3 * X^2$	a1 =567934.5466 a2 =3545.3219 a3 =233.0604	a1=315.02026 a2=5.702586 a3=-0.208252	a1=3.58984 a2=9.38919 a3=-0.39254
Number of pairs of series	N=21		
Level of function	R=2	R=2	R=2
Degrees of freedom of	N-R-1=18	N-R-1=18	N-R-1=18
The amount (sum) of deviation(Yi – Yr)	S=4,528464E+10	S=19399.32	S=3447.568
Standardna greška proc.	Sd=50157.88	Sd=32.829	Sd=13.839
The average rate of change of	Sp=1.727	Sp=-0.464	Sp=5.618
The coefficient of determination	R^2=0.566	R^2=0.091	R^2=0.53
The correlation coefficient	R=0.753 (visoka)	R=0.302(mala)	R=0.728(visoka)
The coefficient of determination (corrected)	R^2=0.518	R^2=-0.01	R^2=0.478
Fisher's F-test	F=11.75(+)	F=0.90 (-)	F=10.16(+)

The rising trend in the share of fuelwood in total sales may have long-term negative impact on the financial results of a company, which can be reflected to the socio-economic component of the development of the wood sector. Percentage share of technical wood in sales has great economic importance and its reduction reduces the overall potential of the wood sector. Also, the low average value of the produced wood reduces the opportunities for investment in the improvement of the condition of forests and improvement of the qualitative structure of the forests

The presence of technical round wood in wood supply to a large extent depends on state of forests, their conservation, origin, branching and other characteristics, that can be influenced on by applying long term maesures of forest management. The percentage of roundwood share may be reduced because of inadequate technology applied in forest utilization, poor differantiation of wood assortment classes, long standing, poor storage and others. Because of that, the continuous decrease of technical roundwood share in the last twenty years, indicates the existance of problems, such as deterioration of forests, the drop of control and responsibility in the process of technical classification, inadequate application of technologies in forest utilization and others. Also, the influences of the market should not be neglected, because the steady increase in demands for fuelwood for energy needs and the production of panels, while procession in lumber mills faces problems of placement and difficult payment of receivables.

Increasing the participation of technical wood and more valuable wood assortments, as a rule, is a long-term goal of forest management in relation to which silvicultural measures are prescribed and implement. This leads to the conclusion that, in order to offer qualitative improvement of wood supply, it is necessary to intensify measures to repair the situation of forests and improvethe assortment structure, for which, among other things, the systematic support of the state is required. In the long run, the contribution of these measures can be multiple and it is reflected to all aspects of sustainable development - economic, environmental and social.

3.2.3 Participation of the wood sector in export and import of Serbia

The Statistical Office of the Republic of Serbia collects and processes data relating to the export and import of companies according to the predominant field of activity carried out by individual companies. Summary data relating to the export and import of companies registered within thew wood sector in the period 2000-2012, are shown in Table 40. Statistical unit for these data is a company, so the data refers to the overall foreign trade of all companies in the wood sector, while the analysis in the previous section shows the exchange of product of the wood sector. The obtained data for the wood sector export, meaning the export realized by all companies, to a large extent, match the data on the exchange of wood products, although there are slight differences. The differences in values of export are present because companies that export wood products are not always registered for some of the activities of wood sector. As to the import, differences come from the structure of import, which, with these companies, is related to the equipment and raw material for production. In the previous case we talk about the import of wood products mainly intended for other industries (eg construction building).

On the basis of data on export in wood sector, viewed as the export of companies, it can be concluded that in the field of growth and forest utilization (02) in the reporting period, the realized export was very low and it was related to very rare cases of the export of wood assortments for which the demand on local market was low. The share of products made by forest utilization in the total export of the wood sector, depending on a year, was from 2.6% to 12.9%, except in 2000 when the share accounted for 18.6%, as a result of a significant drop of production and export of companies belonging to the wood processing sector. The average share of growth and forest utilization in the period 2000-2012 was 6.5%. The small value of the export of products from section 02 leads to the conclusion that the prices and level of demand on local market were satisfactory and that there was no need to import them.Consequently, the largest part of round technical wood and other industrial wood remained in the country for further processing.

However, the situation in the field of wood processing (16) was significantly different, in 2012 export reached the value of 159.7 *million €*. The same year the largest export of the wood sector of 164 *million €* was recorded. Compared to the initial 2000, export increased by 7.7 times.

Table 40. The export of the wood sector in the period 2000-2012 by sections

Year	Export *milion €*					Import *milion €*					
	02	16	02+16	Total export of Serbia	%	02	16	02+16	Total import of Serbia	%	Balance
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
2000.	1.1	20.2	21.3	1,655.6	1.3	3.7	15.9	19.6	3,538.5	0.6	1.7
2001.	5.2	60.5	65.7	1,995.5	3.3	8.6	63.8	72.4	4,940.6	1.5	-6.7
2002.	7.9	58.0	65.9	2,088.0	3.2	12.9	87.0	99.9	5,649.2	1.8	-34.0
2003.	8.9	57.5	66.5	2,390.4	2.8	13.2	105.5	118.6	6,483.9	1.8	-52.2
2004.	8.8	72.9	81.7	2,897.1	2.8	12.5	141.6	154.1	8,842.6	1.7	-72.4
2005.	9.3	62.2	71.5	3,711.7	1.9	9.9	131.0	140.9	8,663.1	1.6	-69.4
2006.	11.5	92.7	104.2	5,051.1	2.1	19.9	168.9	188.9	10,363.3	1.8	-84.6
2007.	12.4	144.0	156.3	6,535.1	2.4	31.6	215.6	247.2	14,161.0	1.7	-90.9
2008.	6.0	142.8	148.8	7,697.4	1.9	6.4	244.2	250.6	17,090.8	1.5	-101.8
2009.	2.8	104.2	107.1	5,996.4	1.8	4.6	164.6	169.2	11,577.8	1.5	-62.1
2010.	4.6	117.4	122.0	7,320.1	1.7	5.5	161.3	166.9	12,484.3	1.3	-44.8
2011.	5.2	152.7	157.9	8,564.9	1.8	4.9	160.5	165.4	14,460.7	1.1	-7.5
2012.	4.3	159.7	164.0	8,676.4	1.9	4.1	153.6	157.8	14,484.1	1.1	6.3

Source: The Statistical Office of the Republic of Serbia, Bulletins,,Statistical Yearbook of the Republic of Serbia"
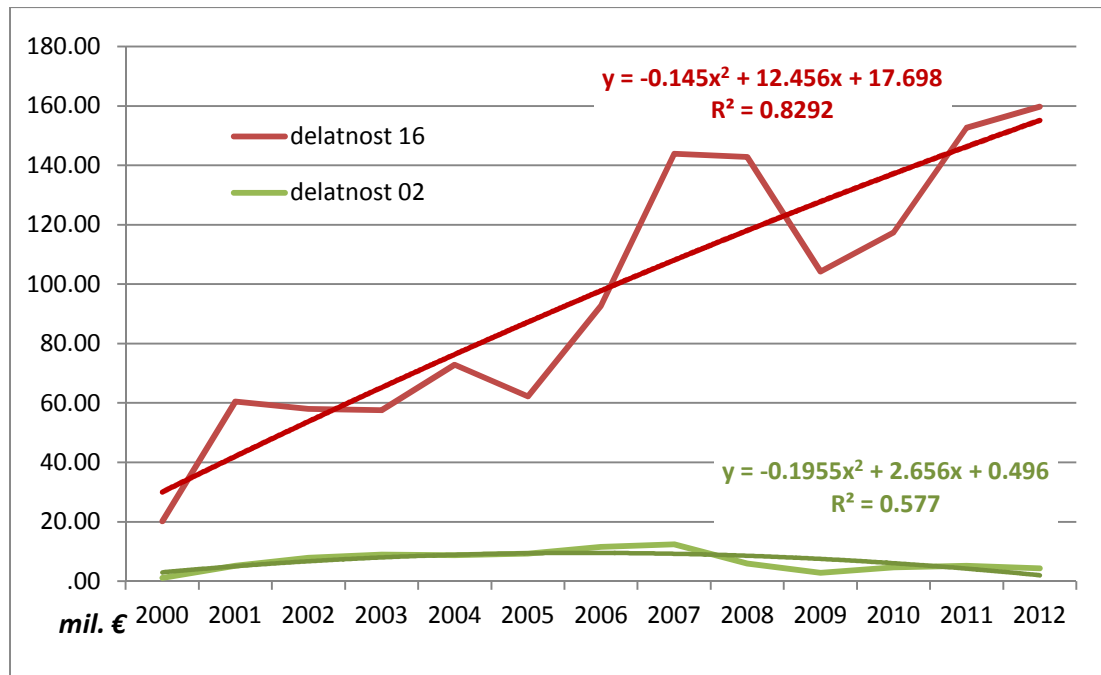
Figure 17. Exports of wood sector in the period 2000-2011. *(Source: SORS)*

Trend analysis of export in sections 02 and 16 showed that in the period 2000-2012, for both observed models, which were shown in Figure 18, there was a certain statistical regularity. In both cases, the maximum values of the correlation coefficient were obtained using the second degree polynomial. The value of the correlation coefficient was high in export in section 16 ($R = 0.91$), in which the value of F-test was significant. However, the resulting value of F-test for the section 02 was below the tabular values. This result suggested that export in section 02 was the consequence of individual cases and should not be viewed as a rule. By applying the model to predict changes in export in the coming years, it can be assumed that, under the same conditions of the market, export in section 16 will increase by about 5.5% in 2013, while the export trends in section 02 will still be at a low level, and their values are not possible to predict.

The resulting parameters of shown polynomials ($Y = a_1 + a_2 * X + a_3 * X^2$) which represent the export of the wood sector in the period 2000-2011 are as follows:

		Export 02	Export 16
	Parameters	a1 =0.49581 a2 =2.65574 a3 =-0.1955	a1 =17.70922 a2 =12.4533 a3 =-0.1449
1.	Number of pairs of series	N=13	N=13
2.	Mean	Ya=6.77	Ya=95.75
3.	Minimum	Ymin=1.1	Ymin=20.2
4.	Maximum	Ymax=12.4	Ymax=159.7
5.	Standard deviation(Ya)	S(Ya)=3.35	S(Ya)=44.638
6.	Variance(Ya)	S^2=11.22	S^2=1992.53
7.	Level of function	R=2	R=2
8.	Degrees of freedom of	N-R-1=10	N-R-1=10
9.	The amount (sum) of deviation(Yi – Yr)	S=56.92371	S=4089.444
10.	The standard error of estimate	Sd=2.386	Sd=20.222
11.	The coefficient of determination	R^2=0.577	R^2=0.829
12.	The correlation coefficient	R=0.76 (visoka)	R=0.91 (visoka)
13.	The coefficient of determination (corrected)	R^2=0.493	R^2=0.795
14.	Fisher's F-test	F=6.83 (-)	F=24.23 (+)

The achieved results and prediction of export of companies belonging to the wood sector may be encouraging because they show the ability of the companies of the wood sector to adapt to the needs of foreign markets and achieve specific business results in international competition. However, the average annual export value of € 97.3 *million* (for the period 2000-2012 for activities in section 16), which does not include furniture production, points to structural defects, and the fact that the production of finished wood products in Serbia is still underdeveloped, and that the export is significantly based on the semi-products. The optimal situation would surely imply an increase in domestic consumption and export of finished wood products.

On the basis of the data of the SORS "*External trade of the Republic of Serbia by Enterprize Characteristics*", the share of small, medium and large sized companies in the export of wood sector is shown in Table 41. According to the number of employees, the companies are classified into four groups: Micro (0-9), small (10-49), medum (50-249) and large (250 and more).The structure of companies appearing in the export relative to their size isvery heterogeneous. From the total of 601 exporters in 2012, only 3 were classified as large (>250 employees), 25 asmedium (50-249 employees), and 275 as small companies. In wood processing companies the average export value per company is in accordance with their size and in the cathegory of large companies amounts to €4.77 *million* (1 company). In medium sized companies this average is €1.45 *million* per company (calculation done for 24 companies).

Table 41. Participation of small, medium and large companies in the export and import of wood sector in Serbia in the period 2008-2012.

Year	Sector	Number of companies in export						Number of companies in import					
		Total	Structure by the number of employees					Total	Structure by the number of employees				
			0-9	10-49	50-249	>250	ostalo		0-9	10-49	50-249	>250	ostalo
2008.	02	27	18	1	1	2	5	407	192	113	51	9	42
2008.	16	560	266	166	26	1	101	612	298	160	29	1	124
2008.	**Svega**	**587**	**284**	**167**	**27**	**3**	**106**	**1019**	**490**	**273**	**80**	**10**	**166**
2009.	02	23	14	3	1	2	3	23	13	1	0	2	7
2009.	16	525	219	145	24	1	136	496	237	132	21	1	105
2009.	**Svega**	**548**	**233**	**148**	**25**	**3**	**139**	**519**	**250**	**133**	**21**	**3**	**112**
2010.	02	19	10	2	1	2	4	21	12	0	1	2	6
2010.	16	539	240	131	26	1	141	461	234	111	26	2	88
2010.	**Svega**	**558**	**250**	**133**	**27**	**3**	**145**	**482**	**246**	**111**	**27**	**4**	**94**
2011.	02	20	7	2	1	2	8	30	12	1	1	2	14
2011.	16	549	227	127	25	1	169	430	205	102	21	2	100
2011.	**Svega**	**569**	**234**	**129**	**26**	**3**	**177**	**460**	**217**	**103**	**22**	**4**	**114**
2012.	02	27	16	1	1	2	7	25	14	1	1	2	7
2012.	16	574	259	136	24	1	154	473	209	122	20	1	121
2012.	**Svega**	**601**	**275**	**137**	**25**	**3**	**161**	**498**	**223**	**123**	**21**	**3**	**128**

Source: the SORS, bulletins „External trade of the Republic of Serbia by Enterprize Characteristics", number 516/2010, 525/2010, 259/2010, 554/2012, 569/2013.

The import of wood sector by companies is shown in Table 40 and Figure 19. In the related period (2000-2012) until 2008 the value of import was increasing, followed by the increase in export. After that, starting with 2009, the import from section 16 was significantly dropping. A considerable drop in import in section 02 had been recorded a year before, in 2008, and the values of export were significantly lower.

The chart shows two series: delatnost 16 and delatnost 02, with trend equations:

$$y = -2.690x^2 + 49.06x - 34.43$$
$$R^2 = 0.859$$

$$y = -0.369x^2 + 4.828x + 0.061$$
$$R^2 = 0.392$$

miliona €
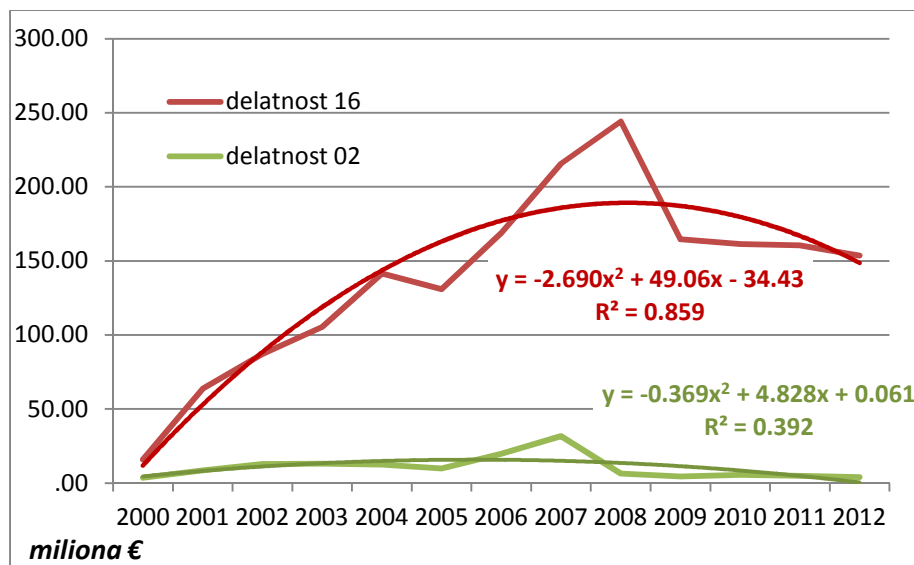
Figure 18. Import of the wood sector in the period 2000-2001.
(Source: The SORS)

Statistical analysis of the import trend shows that there is no satistfactory significance in the section 02, considering that the value of F test is lower than the tabular, although the correlation coefficient implies that there is some connection. Such a result leads to conclusion that the import in section 02 is the consequence of individual cases and cannot be considered to be the rule.

However, the import in section16, despite periodic deviations, shows a significant statistical reliability which is confirmed by high values of correlation coefficient and the F-test. Based on this, it can be predicted that in unchanged (primarily market) circumstances the value of import contunue with slow dropping in the following year. Increase in imports, particularly in the period 2005 -2008, was the result of a favorable economic situation that motivated the companies to investment and development. Decline of imports, and after that his stagnation, coincides with the beginning of the global economic crisis, which has had a significant impact on the business and development of the wood sector.

Polinom: $y = a_1 + a_2 * X + a_3 * X^2$		Import 02	Import 16
	Parametri polinoma	a1 =6.1559E-02 a2 =4.8286 a3 =-0.3692	a1 =-34.42983 a2 =49.05985 a3 =-2.690304
1.	Number of pairs of series	N=13	N=13
2.	Mean	Ya=10.6	Ya=139.5
3.	Minimum	Ymin=3.7	Ymin=15.9
4.	Maximum	Ymax=31.6	Ymax=244.2
5.	Standard deviation(Ya)	S(Ya)=7.9	S(Ya)=60.8
6.	Variance(Ya)	S^2=62.47	S^2=3696.59
7.	Level of function	R=2	R=2
8.	Degrees of freedom of	N-R-1=10	N-R-1=10
9.	The amount (sum) of deviation(Yi – Yr)	S=455.584	S=6234.589
10.	The standard error of estimate	Sd=6.75	Sd=24.969
11.	The coefficient of determination	R^2=0.392	R^2=0.859
12.	The correlation coefficient	R=0.626 značajna povezanost	R=0.927 visoka povezanost
13.	The coefficient of determination (corrected)	R^2=0.271	R^2=0.831
14.	Fisher's F-test	F=3.23 (-)	F=30.57 (+)

For the purpose of comparative analysis, the figure 20 shows the value of import and export of the wood sector (02 + 16) for the period 2000-2012. Both trend lines obtained (import and export) have a high correlation coefficient (0.84 and 0.92) and show statistical significance (F-test).
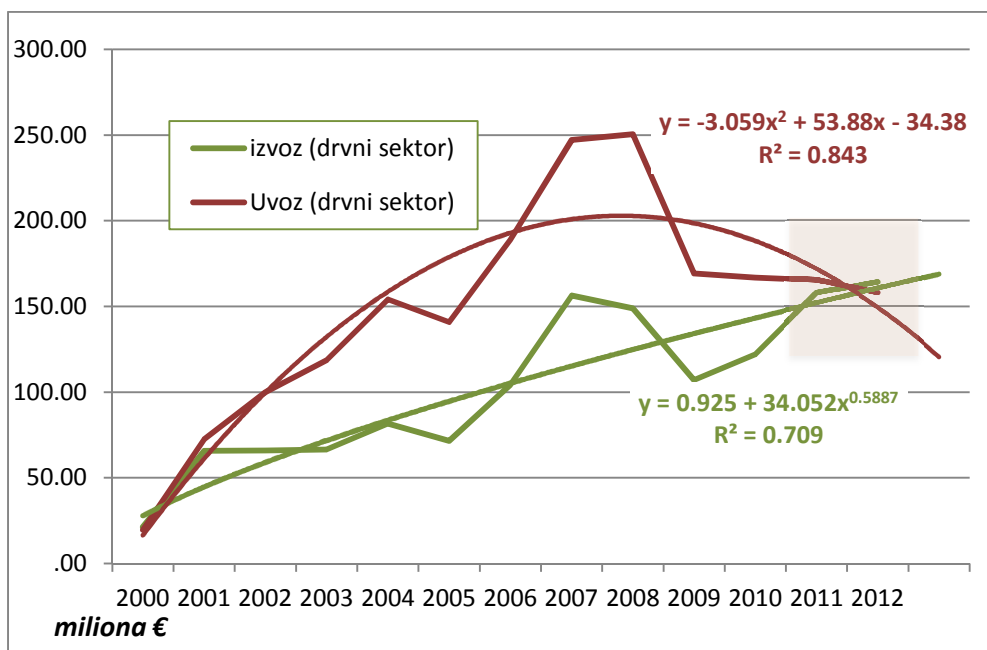
Figure 19. Comperative review of import and export of the wood sector in the period 2000-2012 *(Source: the SORS)*

Statistical parameters for the shown models of imports and exports in the period 2001-2012. years are as follows:

		Export (02 + 16)	Import (02 + 16)
	Parametri	$Y = a + b * X^R$ $a = 0.92521$ $b = 34.05199$ $r = 0.5887$	$y = a1 + a2*X + a3*X^2$ $a1 = -34.37656$ $a2 = 53.88503$ $a3 = -3.058781$
1.	Number of pairs of series	N=13	N=13
2.	Mean	Ya=102.53	Ya=150.12
3.	Minimum	Ymin=21.3	Ymin=19.6
4.	Maximum	Ymax=164	Ymax=250.6
5.	Standard deviation(Ya)	S(Ya)=44.97	S(Ya)=63.68
6.	Variance(Ya)	S^2=2022.559	S^2=4054.583
7.	Level of function	R=2	R=2
8.	Degrees of freedom of	N-R-1=10	N-R-1=10
9.	The amount (sum) of deviation(Yi – Yr)	S=4630.469	S=7652.578
10.	The standard error of estimate	Sd=21.519	Sd=27.663
11.	The coefficient of determination	R^2=0.709	R^2=0.843
12.	The correlation coefficient	R=0.842visoka	R=0.918 visoka
13.	Koeficijent deter. (corrected)	R^2=0.771	R^2=0.811
14.	Fisher's F-test	F=18.57	F=26.79

On the basis of the data it can be concluded that the continuous increase in the export of wood since 2000 (which was generated by foreign market demands) had an influence on the increase of import of the wood sector. The import served the development of the sector, enabling export to continue rising after significant decrease in import in 2008 and reduced investments. The total balance of foreign trade of the wood sector became positive only in 2012, when the value of export was €6.3 *million* higher than import. Significant decrease in import values, and partly in export, was recorded in 2008, which matched the beginning of the global economic crisis on the wood market. In fact, the effects of the global economic crisis began to influence business activities in the wood sector in the second half of 2008. The decline in prices of wood assortments on the global wood market began by the end of 2008. According to (UNECE, 2009), small demand caused the prices of lumber to fall, where the price of softwood lumber dropped by 26%. As a consequence of the decrease in demands on foreign markets, the export in section 16 in the period 2008-2010 was decreased by 17.8%. In the same period was a reduction in imports by 33.9%. After 2010, there was an increase in exports, while the value of imports continued to fall slightly.

For the purpose of the detailed analysis of ralations between import and export in the wood trade the correlation analysis of the interdependence of export (x) and import (y) has been done and shown in figure 21. On the basis of the correlation analysis, as well as the resulting value of the correlation coefficient (R=0.88), it may be concluded that there is a high correlation of import and export. The value of the determination coefficient implies that 77.4% of variationsof import can be explained by changes in export. The F-test also shows statistical significance, which all together suggests that there is a strong connection between export and import of the wood sector.

The resulting parameters of correlation analysis of relation between export and import of the wood sector, applying the quadratic model are as follows:
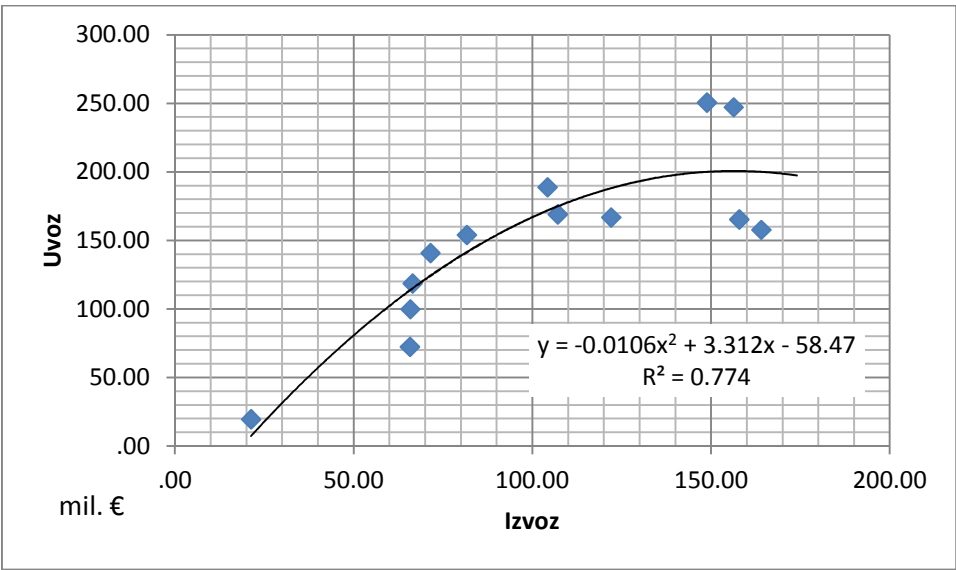
Figure 20. The relation between exports and imports of wood sector.

(Source: SORS)

$y = a1 + a2 * X + a3 * X^2$	a1 =-58.4686 a2 =3.312681 a3 =-1.05874E-02
1. Number of pairs of series	N=13
2. Mean	Ya=152.59
3. Minimum	Ymin=19.6
4. Maximum	Ymax=250.6
5. Standard deviation(Ya)	(Ya)=63.676
6. Variance (Ya)	S^2= 4054.58
7. Level of function	R=2
8. Degrees of freedom of	N-R-1=10
9. The standard error of estimate	Sd=33.176

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10. The coefficient of determination	$R^2= 0.774$ (+)
11. The correlation coefficient	$R=0.88$ (visoka povez,)
12. The coefficient of determination (corrected)	$R^2=0.729$
13. Fisher's F-test	$F=17.10$(+)

In 2012 the export of companies belonging to the wood sector was higher by 3.9% than the import. If we applied the presented model to assessment of the value of import in terms of changed export results, we would get that with the increase of export by €10 *million* the import may decrease by €2.7 *million*. With a greater increase in export, for example €20 *million*, the decrease of import could be €7.5 *million*. But, if there was the decrease in export again, to the amount of €20 *million*, the import could still cover the export. After that companies of the wood sector would have started to record negative foreign trade balance.

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Table 42. Participation of wood sector (seen as an export and import of companies) in total exports and imports of the Republic of Serbia for the period 2000-2012. (in million €)

	2000.	2001.	2002.	2003.	2004.	2005.	2006.	2007.	2008.	2009.	2010.	2011.	2012.
Export Wood sector	21.3	65.7	65.9	66.5	81.7	71.5	104.2	156.3	148.8	107.1	122.0	157.9	164.0
Export Serbia	1,656	1,995	2,088	2,390	2,897	3,712	5,051	6,535	7,697	5,996	7,320	8,565	8,676
Participation %	1.29	3.29	3.15	2.78	2.82	1.93	2.06	2.39	1.93	1.79	1.67	1.84	1.89
Import Wood sector	19.6	72.4	99.9	118.6	154.1	140.9	188.9	247.2	250.6	169.2	166.9	165.4	157.8
Import Serbia	3,539	4,941	5,649	6,484	8,843	8,663	10,363	14,161	17,091	11,578	12,484	14,461	14,484
Participation %	0.55	1.47	1.77	1.83	1.74	1.63	1.82	1.75	1.47	1.46	1.34	1.14	1.09
Balance Wood sector	1.7	-6.7	-34.0	-52.2	-72.4	-69.4	-84.6	-90.9	-101.8	-62.1	-44.8	-7.5	6.3
Balance Serbia	-1,883	-2.945	-3,561	-4,094	-5,946	-4,951	-5,312	-7,626	-9,393	-5,581	-5,164	-5,896	-5,808

Source: the SORS

Observing the total amount of export of the Republic of Serbia for the period 2008-2012, the share of companies predominantly belonging to the wood sector, ranged from 1.29% to 3.29%. The largest share, and the greatest absolute amount, was recorded in 2001 and 2002. The data relating to the presence of the wood sector in the export and import of Serbia are shown in table 42.

In order to determine mutual relation between the overall export of Serbia and the export of the wood sector in the period 2000-2012, as well as possible existence of correlation dependence, the correlation analysis has been done, and the results are shown in Figure 22.
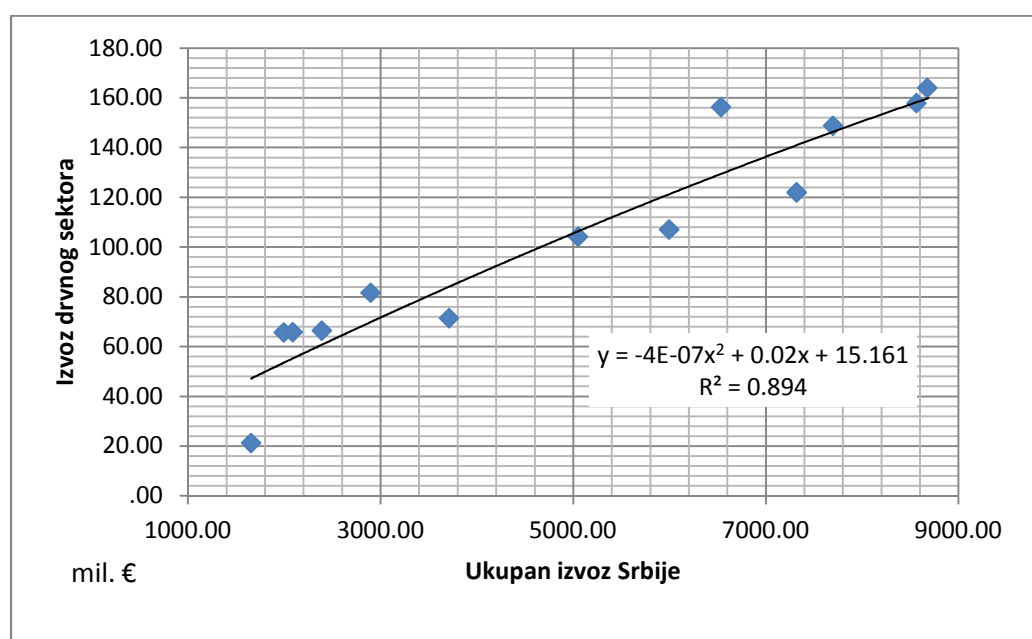
Figure 21. Relation of the total export of Serbia and the export of the wood sector
(Source: SORS)

The parameters obtained by this correlation analysis, using the quadratic model, indicate that there is a significant correlation between the total export and the export of wood sector (Figure 22). Correlation coefficient is 0.95, with considerable significance (F-test). The results indicate that 90% of the variations in exports of wood sector can be connected to changes in Serbia's total export. This leads to the conclusion that the same factors largely influence the total export of Serbia and export of the the wood sector.

The parameters of this model are:

$$Y = a1 + a2 * X + a3 * X^2$$

a1 =10.8123
a2 =2.26122E-02
a3 =-6.51546E-07

1.	Number of pairs of series	N=13
2.	Mean	Ya=104.1
3.	Minimum	Ymin=21.3
4.	Maximum	Ymax=164
5.	Standard deviation(Ya)	S(Ya)=45.498
6.	Variance(Ya)	S^2=2070.107
7.	Level of function	R=2
8.	Degrees of freedom of	N-R-1=10
9.	The amount (sum) of deviation(Yi – Yr)	S=2475.669
10.	The standard error of estimate	Sd=15.734
11.	The coefficient of determination	R^2=0.9
12.	The correlation coefficient	R=0.95 (visoka povez,)
13.	The coefficient of determination (corrected)	R^2=0.88
14.	Fisher's F-test	F=45.17 (+)

Based on the model, which shows the ratio of total exports of Serbia and export wood sector, it can be concluded that the increase in total exports of Serbia was not accompanied by a corresponding increase in exports of wood sector. According to the model, with an increase in the total exports of Serbia for 5%, wood sector will growth in exports for 3.5%. In case of increase of total Serbian exports by 15%, the wood sector can expect an increase of 10.3%.

The increase in export, as a rule, besides economic, have a positive social impact which is most often expressed in the increase of employment. However, in the case of the export of wood sector in Serbia in the period 2000-2012 the opposite phenomenon has been noticed, which can be seen in Figure 23. The increase in exports was accompanied by the reduction in the number of permanent employees in the wood sector. Mutual correlation connection indicates a high degree of correlation (R = 0.91), as well as its significance on the basis of the F-test. This phenomenon could certainly be assessed as unnatural in conditions of developed markets and a stable economic environment. However, as it has been said, in that period there were intensive processes of econonic transition, changes in the ownership structure and the construction of new factories, which had a dominant impact on employment and social contribution of the wood sector. Ensuring competitiveness in foreign markets obviously required the increase of productivity, reducing the number of labor force and their specialization. Practically, the change in exports and employment were caused by various factors.

However, based on correlation analysis shown, it can be assumed that there is a cessation of downsizing and that with further increase in exports the increased number of employees can be expected. Although not reliable enough, the assessment suggests the negative effects of the transition process in the wood sector of Serbia begin to lose intensity.
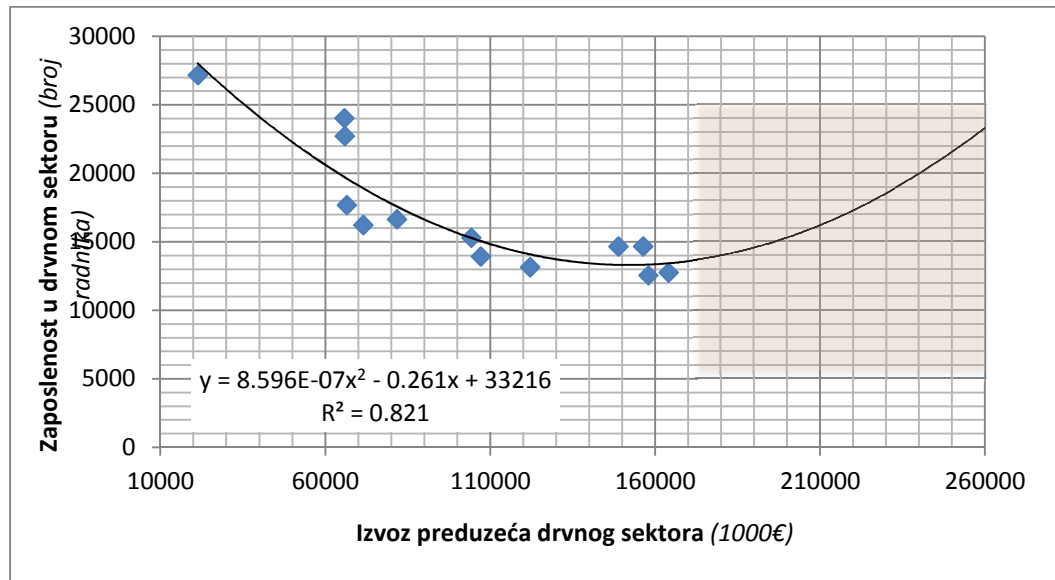
Figure 22. Relation between export and employment in the wood sector in the period 2000-2012.

The parameters obtained by correlation analyses of relation between the export of the wood sector and employment in the wood sector are the following:

kvadratni model $Y = a1 + a2 * X + a3 * X^2$	a1 =33216.1658 a2 =-0.261624 a3 =8.59641716E-07
1. Number of pairs of series	N=13
2. Mean	Ya=17034.46
3. Minimum	Ymin=12547.5
4. Maximum	Ymax=27170
5. Standard deviation(Ya)	S(Ya)=4679.09
6. Variance(Ya)	S^2=2.189387E+07
7. Level of function	R=2
8. Degrees of freedom of	N-R-1=10
9. The amount (sum) of deviation(Yi – Yr)	S=4.692463E+07
10. The standard error of estimate	Sd=2166.21
11. The coefficient of determination	R^2=0.821
12. The correlation coefficient	R=0.906 (visoka povezanost)
13. The coefficient of determination (adjusted)	R^2=0.786
14. Fisher's F-test	F=22.99 (+)

Based on the presented analyses of wood sector export (Figure 18) there is no doubt that the demand for wood products in foreign markets had an impact on the development of the wood sector in Serbia and the values of economic indicators, as was assumed in the hypothesis H1. Based on the resulting trend, it can be predicted that in the coming period, the export willcontinue mild growth, unless there is a significant negative impact of factors outside the wood sector. It can be expected that in 2015 the export will have reached the value of €180 *million*. The results of the analysis of relation between the export and employment in the wood sector (Figure 23) imply that the further increase in export should generate employment in the wood sector. However, the realization of this prediction depends on the overall trends in the global market and future impact of the global economic crisis. As noted in the previous section, the global trends in foreign trade of the wood sector, as it was stated by (UNECE, 2012), provide optimism that the recovery of the global wood market has begun.

3.2.4   The share of the wood sector in gross domestic product of Serbia

Gross domestic product (GDP) is the basic macroeconomic indicator and it represents the most comprehensive measure of the total production of goods and services in a country (Pejanović, 2008). Gross domestic product (GDP) is the market value of all final goods and services that are created within a country in a given time period (a year or a quarter). GDP is a measure of production, or the creation of goods and services in the economy of a country. The market value of the goods determines its contribution to GDP (Tawni Hunt Ferrarini, James Gwartney). By definition of (EuroStat & OECD, 2012) It is the sum of the value added generated by producers residing in the economic territory of a country during the accounting period which is usually a calendar year or a quarter.

The definition of the GDP can be transferred to the individual sectors that have less or greater importance in the economy of a society. The participation of a sector in the gross domestic product of the country can be expressed in this way. This participation certainly does not reflect the real social importance of the sector, but often has a significant impact on economic policy, incentives, investments, education and other economic measures.

According to the methodology of macroeconomic accounts (Republički zavod za statistiku, 2013), exists three approaches to calculating GDP, as follows:

1. Production calculation of GDP

2. Expenses calculation of GDP

3. Ravenue calculation of GDP

The Statististical Office of the Republic of Serbia, whose reports and data processing methodology have been used in this analysis, shows GDP (at current prices) using production calculation. According to this source, GDP calculated by production method, is made of summation of gross values added of all resident institutional units, increased by taxes on products and decreased by the sum of subsidies of the products (SORS,2012). Conversion of the GDP in € was done at an average annual exchange rate of dinar against euro, and the calculation of the GDP per capita based on the estimated total population the middle of the year.

In international comparisons, the sectors of the activity classification are generally grouped in three major segments: agriculture, industry and services. According to this classification, agriculture includes activities related to forestry (agriculture, forestry and fisheries), while wood processing is integral part of the industrial segment. The share of agriculture in GDP is relatively small and shows variations during the year, due to its seasonal nature. In the total gross value added in 2010, agriculture participated with 9.9% (SORS,2012), while in 2011 the share increased to 10.5% (SORS,2013)[86].

The second, industrial segment covers mining, processing industry, electricity, gas and steam supply, water supply and management of wastewater and construction.Within the sector the data relating to the processing of wood and wood products are given.

The real growth of the GDP in 2011, in relation to the previous one, was 1.6%. Regarding activities, the largest increase in the **gross value added (GVA)** was recorded in the sector "Other services" in the amount of 12.4%, then "Information and communication" 10.7%, in the sector "Construction" 10.4% and in the sector "Electricity, gas and steam supply" the increase was 9.7%. The largest decline of the GVA was recorded in the sector "Wholesale and retail trade and repair of motor

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[86] According to the Statistical Office, GDP in agriculture in 2010 amounted to RSD 245,127.5 million, and in 2011 292,918.7

vehicles" by 6.5%, "Education" by 2.8%, and "Health and social care" by 0.9% (SORS, 2012).

Regarding them separatly, according to (SORS, 2013) forestry and logging achieved growth of 10.8% (in dinar value). In the same period the groth in processing of wood and wood products amounted to 16.5%, and in total for the wood sector 14.1%. However, in 2011 there was a slight increase of the value of the dinar, the overall growth GDP for the wood sector, calculated in euros, was 15.6%.

Contribution of the wood sector to the National economy is one of the indicators of its sustainable development and the information which is related to this contribution is important for the evaluation of the conditions in the sector. According toSORS data, the contribution of the wood sector in 2011 was €142.8*million*, or only 0.45% of the total GDP of Serbia, as presented in Table 43.

Table 43. Overview of the share of the wood sector in the GDP of Serbia in the period 2008-2011 (the official data and the data obtained by calculation)

		2007.	2008.	2009.	2010.	2011.
1	The average number of population (mid-year) in thousands	7,381,579	7,350,222	7,320,807	7,291,436	7,258,753
2	GDP, u tekućim cenama (*million €*)	28,467.9	32,668.2	28,956.6	28,006.1	31,472.4
3	GDP, in current pricess – per capita (2/1) (€)	3,856.6	4,444.5	3,955.4	3,841.0	4.,335.8
4	GDP, Forestry and Logging (*million €*)	58.2	64.0	55.5	54.0	55.0
5	GDP, Manufacture of wood and wood products, except furniture (*million €*)	75.0	95.7	79.2	67.4	77.4
6	GDP, Total for wood sector (4+5) (*million €*)	133.2	159.7	134.8	121.4	132.4
7	GDP, Total for wood sector per capita (6/1) (€)[87]	18.0	21.7	18.4	16.7	18.2
8	The share of forestry(02) in total GDP (4/2 %)	0.205	0.196	0.192	0.193	0.177
9	The share of manufacture of wood (16) in total GDP (5/2 %)	0.263	0.293	0.274	0.241	0.248
10	**The share of wood sector in total GDP (6/2%)**	**0.468**	**0.489**	**0.465**	**0.434**	**0.45**

Source: SORS – Statistical Yearbook of the republic of Serbia 2012 (National accounts). Lines 10, 11, 12 – calculationsof the author

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[87] The calculation of GDP per capita is performed based on the estimated total population in mid-year (National Bureau of Statistics, 2012).

Analyzing the participation of the wood sector in relation to the total gross domestic product, it can be concluded that the value below is the expected value. For this reason, an additional, more comprehensive calculation was done, in order to fully observe all contributions of the wood sector to the GDP in Serbia.

The calculation was performed by the production method, according to which the BPD represented the sum of value added of institutional units, ie. economic operators belonging to a particular sector, plus taxes on products (VAT, excise tax and other direct taxes) minus subsidies on products (subsidies directly linked to the production of goods and services). Gross value added (GVA) is the total value of production (output) of goods and services minus intermediate consumption, ie. of products and services consumed as inputs in the process of creating output (RSO, 2013). According to this definition, the calculation of GDP is reduced to the calculation of the difference between the total value of all goods and services produced and the cost of materials used for manufacturing and services, which is then increased by taxes on products (ToP) and reduced by subsidies (SUB).

The production method is suitable for application within the wood sector, considering that there are manufacturing sectors, whose GDP is expressed through the value of the finished product. According to (Eurostat & OECD, 2005) the comparison of the GDP for industrial activities should be carried out using this method.

When it comes to the wood sector as a whole, it is important to emphasize that within the sector, between the activities 02 (Forestry and Logging) and 16 (Procession of wood and wood products), an intermediate consumption (industrial raw material) appears which influences the total value of the GDP of the wood sector.

The calculation of the GDP value was done according to the equations[88]:

GDP=GVA + ToP − SUB ....(1)

GDP= gross value added = Gross value added is obtained by the production method, as the difference between the total output (value of production) and intermediate consumption. The intermediate consumption includes products and

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[88] The equation is taken from the methodological guidelines of the National Bureau of Statistics for the calculation of gross domestic product by production approach: Gross domestic product (GDP) = gross value added (GVA) + taxes - subsidies on products (Source: System of National Accounts of the Republic of Serbia 1997-2006.godina, RZS, Beograd, 2014.)

services that are being used in the production process (but does not include consumption of fixed capital-depreciation) during the observed period[89].

ToP = taxes on products **(**VAT, excise tax and other direct taxes**).**

SUB = subventions on products (subventions directly linked to the production of goods and services).

The complexity of the application of these methods is reflected in determining the value of the intermediate consumption, which in total GDP of the country, is represented as inputs and results of business activities of other sectors. According to the methodology applied in the EU (Eurostat, 2000) the intermediate consumption in forestry (02) consists of the following sets of costs:

- Forest seeds, seedlings and cuttings;
- Fuels and oils (fuel, electricity, heating costs, oil);
- Fertilizers, plant protection and the use of pesticides;
- Cost of maintenance of equipment and facilities;
- Services in forestry;
- Other goods and services (other materials, leasing costs, insurance costs, consultancy, research, payment transaction costs, other goods and services).

The approach in calculating the intermediate consumption within the section 16 is identical, and it differs in the absence of positions that are specific for forestry, while, on the other hand, the postions for the costs of materials for further production are increased.

According to the data of the BRA, in 2011, 1652 companies and 368 entrepreneurs within the wood sector were obliged to submit financial statements [90]. They realized the total sales income in the amount of 44,328.8 million RSD, which is €435.36 million. For the same period the cost of materials amounted to 18,006.9 million RSD or €176.85 million. However, given the different business models between the section 02 (Forestry and logging) and 16 (Procession of wood and wood products) the calculation of the gross value added and gross domestic product is shown separately for

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[89] Annual national accounts RSO 2013(Republički zavod za statistiku, 2013).

[90] Calculation included 368 entrepreneurs. These 368 belonged to a group of entrepreneurs with annual revenue exceeding $ 5 million dinars and, on that basis, they had the obligation to submit financial statements. This group of entrepreneurs achieved total sales revenue in the amount of € 30.8 million dinars. The second group of entrepreneurs, whose income was less than 5 million, consisted of lump sum tax entrepreneurs who didn't have the obligation to prepare and submit beneficial financial statements.

these activities. Business results of companies in the wood sector of Serbia in 2011, which are of importance for the calculation of the share of this sector in the gross domestic product of Serbia, are shown in Table 44.

Table 44. Business results of companies in the wood sector of Serbia in 2011, which are of importance for the calculation of the share of this sector in the gross domestic product of Serbia in dinars.

	Name of the balance sheet items	02-Forestry	16-wood processing	In total for wood sector
		Million euro		
1	**Operating income**	**11,735**	**35,598**	**47,333**
2a	Costs of materials for production, overhead materials, fuel and energy	2,008	15,999	18,007
2b	Other operating expenses (costs of production services, rents, etc.).	2,313	5,690	8,003
2c	Purchase cost of goods sold	834	8,751	9,585
2	**Intermedial consumption (2a+2b+2c)**	**5,154**	**30,440**	**35,594**
3	**VAT and other taxes**	**1,695**	**4,428**	**6,123**
4	**Subsidies**	**387**	**0**	**387**
GDP	**1 – 2 + 3 - 4**	**7,889**	**9,586**	**17,475**

Source: The Business Registre Agency of the Republic of Serbia (BRA)-Internal report, Belgrade, 2013

Conversion of data from Chart 44 in euros (€) was performed on the basis of the average values of the average rate of euro against dinar in 2011, the National Bank of Serbia[91] as shown in Chart 45.

Table 45. Business results of companies in the wood sector of Serbia in 2011, which are of importance for the calculation of the share of this sector in the gross domestic product of Serbia in euros.

	Name of the balance sheet items	02-Forestry	16-wood processing	In total for wood sector
		Million euro		
1	**Operating income**	**115.3**	**349.6**	**464.9**
2a	Costs of materials for production, overhead materials, fuel and energy	19.7	157.1	176.9
2b	Other operating expenses (costs of production services, rents, etc.).	22.7	55.9	78.6
2c	Purchase cost of goods sold	8.2	85.9	94.1
2	**Intermedial consumption (2a+2b+2c)**	**50.6**	**299.0**	**349.6**
3	**VAT and other taxes**	**16.6**	**43.5**	**60.1**

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[91] The annual value for the year 2011 amounted to 101.82 din./ €, according to the average exchange rate of NBS (http://www.nbs.rs/internet/cirilica/scripts/ondate.html).

| 4 | Subsidies | 3.8 | 0.0 | 3.8 |
| GDP | 1 – 2 + 3 - 4 | 77.5 | 94.2 | 171.6 |

Sources: 1. The Business Registre Agency of the Republic of Serbia (BRA)-Internal report, Belgrade, 2013; 2. Original

In the section 02 the achieved total operating revenues amounted to € 115.3 million, respectively (11.735 million RSD) (Table 44), of which 88.8% belonged to the activity "0210 - Silviculture and other forestry activities." The result of business activities of these companies were the wood assortments that were, at the same time, the most important inputs (production material) within the section 16. Applying formula 1 and the data from tables 44 and 45 the calculation of the GDP in forestry was performed in the following way: the total business revenue was reduced by the value of the spent material (€19.72 million) and services (other expenses [83]) (€22.71 million) and that amount was increased by liabilities for VAT and other taxes (€16.6 million) and all this decreased by subsidies (€3.8 million) (chart 45)[92]. In accordance with the above mentioned the obtained value of the gross domestic product in forestry amounted to €77.5 million. For companies and entrepreneurs from the section 16 ("Procession of wood and products of wood, cork, straw and plaiting materials excluding furniture"), the BRA registered the total income of €349.6 million or 35,598 million RSD (table 44), while, at the same time, the expenses for the material amounted to €157.1 million. The value of the VAT and other taxes amonted to €43.5 million. State subsidies for production were not registered. On the basis of these data (Table 45), the value of the GDP in the amount of €94.2 million was determined for the section 16. Based on calculations, the total amount of the GDP of 17,475 million dinars or €171.6 million was obtained. The officially published value of the GDP of the wood sector (02+13) (RSO, 2013) was 14,539 million RSD (€142.8 million). The calculation shows that the percentage of share of the GDP of the wood sector in relation to the total GDP of the country (published by the RSO) is 0.55%.

However, the detailed analysis of the data sources showed that there were certain business activities that additionaly contributed to the GDP of the wood sector. In the section 02-forestry and logging, entrepreneurs dealing with forest utilization were not fully covered by statistical calculations. This was not possible considering the fact

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[92] Within this area (02) the position of other expenses (218) is primarily related to the services on forests utilisation.

that they were only partly registered in the BRA data base. The official calculation covered 30 entrpreneurs, out of which only 4 were registered for activities in the section "0220-Logging". This phenomenon was explained in the chapter "Employment (direct and indirect employment) in the wood sector in Serbia. During 2011, the production of wood in forest management companies was mainly realized engaging service companies for forest utilization. According to the business statements of PE "Srbijasume" and PE "Vojvodina sume" service expenses for production of wood assortments ("530- Costs for the development effects) amounted to €12.16 million. At the same time, according to business balance sheets, based on the BRA database, the income of enterprises engaged in the use of forests amounted to only € 5.27 million (only 4 companies were registered). The difference of € 6.89 million represented unregistered income that was earned by the so called small entrepreneurs who were not in the VAT system and had no obligation to submit financial statements at the end of the year or they had incomes that were registered in other activities (improper registration of activities). If this value was subtracted by the cost of production materials[93], the amount of € 5.79 million was obtained and the calculated value of the GDP should be increased by this amount. Thus, the amount of the GDP for section 02 was increased by €83.3 million or €177.4 million for the wood sector in total. In this way, an indirect method also covered a certain number of so-called small entrepreneurs who performed work in forestry, but who did not have the obligation to submit financial statements to the Business Registers Agency. By applying this method satisfactory coverage was achieved.

On the other hand, as an additional contribution of business activities in the field of forestry (02), National parks that gain their income using forests and selling wood assortments, were identified. These public companies are registered for conducting activities of "botanical and zoological gardens and protection of natural resources" (9104) and "protection and maintenance of immovable cultural heritage, cultural and historic sites, buildings and similar tourist monuments" (9103). By analysing business reports of these companies, using the identical formula (formula 1), it was calculated that these companies made contribution to GDP in the amount of € 7.31 million. By increasing the previously given amount of the GDP in the field of 02, the total amount of the GDP is increased to 90.6 million €, ie to € 184.7 million for the wood sector as a whole.

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[93] Based on calculations of PE "Srbijasume" cost of material in harwesting and producing of wood assortments, participated with 16% of their value.

Further analyses of companies dealing with procession of wood and wood products determined that the calculation of the GDP did not include companies registered for other activities but which, among others, performed activities of wood processing[94]. According to statements submitted, these companies registered income in the amount of €44.1 million from selling wood products, material expenses in the amount of € 24.1 million, and other expenses in the amount of € 2.6 million. By applying identical methodology, the value of the GDP in the amount of € 18.4 million was determined. If the previously calculated value of the GDP was added by business operations of these companies, the total value of the GDP for the wood sector in the amount of €203.1 million was obtained.

On the basis of the given calculations, the total value of GDP for the wood sector was determined in the amount of:

GDP = GDP(02) + GDP(16) =90.6 + 112.5 = 203.1 (€ *million*)

Or in % in relation to the total GDP of Serbia

GDP=GDP(02) +GDP(16)=0.29+0.35=0.64(%)

If the GDP, calculated using the BRA data (for 2011), is put in relation to the total GDP of the Republic of Serbia (3,208,620 million RSD), the data is obtained showing that the share of the wood sector in the GDP is 0.64 or 0.2% higher than the statistically published value of the RSO. This calculation shows that the share of forestry (02) in the GDP is increased from 0.19% to 0.29% and the share of wood procession (16) from 0.26% to 0.35%.

If we take into consideration the fact that important activities are taking part in the area of private forests in Serbia, first of all in production and transportation of fuelwood, which are not included in business reports, national accounts and statistical data, the value of the participation of the wood sector in the GDP should additionally increase the market value of that production. Identical position is set forth in the document "Methodological Manual on Purchasing Power Parities" " (EuroStat & OECD, 2012), according to which the GDP should include other household products for

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[94]Companies which, among other things engaged in the production of floors and other wood-based products are partly registered to conduct other activities. The most significant production of wood-based products has been identified within the activity 2223-Production of plastic for construction". Based on the report of the enterprises in this sector, which is engaged in processing of wood, the generated revenue from sale, which is related to the wood products, is amounted to € 44,059 million.

their own use. According to the previous methodology and practice, production of households (which does not engage the workforce) is not included in the calculation of GDP.

The high share of fuelwood that originates from private forests and whose turnover is usually performed between the forest owner and the household, other than the officially registered economic trends, has great significance for the income of forest owners and meeting the energy needs of the population. The difference between the recorded and the actually spent amounts of fire wood is important. According to the report of the SORS[95], in 2011, 1.51 *million m³* of fuelwood was produced in the forests of Serbia, out of which 0.52 *million m³* by private owners and 0.99 *million m³* by state companies. According to another source-the FAO study on wood consumption (Glavonjic, 2011), during the heating season of 2010/2011, the quantity of 6.36 *million m³* of fuelwood was spent in 934,237 households. This high difference indicates the possibility that actually 4.85 *million m³* of fuelwood was not evidenced in the GDP calculation. This information opens up an additional dilemma related to the presence of the wood sector in national accounts. If we include the fuelwood which hasn't been statisticaly evidenced and which undoubtedly represent a significant energy resource (Ministry of Energy, Development and Environment, 2013) in the calculation of the participation of the wood sector in the GDP, we get the increase of *€109.06 million*, where the share of the wood sector in the GDP amounts to **0.99%.** The calculation was done for 4.85 million m³, according to the pricelist of PE "Srbijašume" Beograd in 2011, for the fuelwood of second class, whose price was 2,731 din/m³ (26.77€/m³). According to the calculations of this company, costs of material in fuelwood production were 16% and by that amount the price of the fuelwood was reduced in the calculation. Multiplying the total quantity of wood in the amount of 4.85 million m³ by the price of the second class fuelwood, subtracted by the costs of material, the data was obtained showing that the share of this wood in the GDP would be €109.6 million. The value of taxes and subsidies (TS) was not calculated in, because the production of wood in private forests was not the subject to the payment of VAT, instead the tax for logging was paid and it was returned as a subsidy for professional and technical jobs in private forests (see the chapter "The contribution of wood flow to public revenues in Serbia). With the increase of the total GDP of Serbia (3,208,620 million RSD, or €31,472

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[95] Forestry in the Republic of Serbia in 2011.

million) for the value of GDP of unrecorded fuelwood (€ 109.06 million), the value of GDP of Serbia is increased to € 31,581 million, while the total value of GDP of the wood sector is increased to € 312.1 million. In this way we get the information that the real share of the wood sector in total GDP is 0.99%.

The data derived from calculation shows that the real value of the GDP is 2.2 times larger (increase from 0.45% to 0.99%) compared to the officially published value of the Republic Statistical Office.

This imposes the need to improve the overall system of monitoring production activities of the wood sector and correction of official data, not only in relation to the value of the GDP, but in relation to the total production of wood and wood products in Serbia.

As previously emphasised, the share of the wood sector in the GDP implies the significance of the sector for the economy of the country. However, this indicator is not applicable to comparison of economic power of the sector with other countries, because its value largely depends on the overall economic power of the country. Thus, the overview of participation of forestry and wood processing in the GDP in countries of the MCPFE, which is given in table 46, only indicates the significance of the sector to national ecnomies. What we can see in the review is that the significance of the wood sector is particularly high in Scandinavian countries, while Serbia is at the bottom of the list of observed countries. The height of the participation of the wood sector to the overall GDP or the overall market value of all final goods produced in the wood sector, has been influenced by, besides forest resources, investment and development measures which have influenced the increase of the value of produced goods.

Table 46. The overview of the wood sector share in the GDP in 2010 by country (%)

	Country	Forestry	Manufacture of wood	Total
1	Latvia	1.28	1.85	3.13
2	Finland	2.20	0.77	2.98
3	Estonija	0.88	1.65	2.52
4	Sweden	0.93	1.02	1.95
5	Czech Republic	0.60	0.85	1.45
6	Austrija	0.46	0.92	1.38
7	Slovenija	0.55	0.75	1.30
8	Romania	0.23	0.97	1.20
9	Canada	0.35	0.78	1.13
10	Croatia	0.40	0.45	0.85
11	Slovakia	0.39	0.42	0.81

12	Switzerland	0.08	0.71	0.79
13	Norway	0.21	0.42	0.63
14	Macedonia	0.35	0.27	0.62
15	Bugarska	0.28	0.30	0.58
16	Ruska federacija	0.23	0.30	0.53
17	Hungary	0.16	0.32	0.48
18	Germany	0.12	0.35	0.47
19	Montenegro	0.01	0.23	0.24
20	Serbia according to data from the National Statistics	0.19	0.24	0.43
21	Serbia - The calculations of authors **without** unrecorded amount of firewood (in 2011) [96]	0.29	0.35	0.64
22	Serbia - The calculations of authors **witht** unrecorded amount of firewood (in 2011)	0.64	0.35	0.9.9

Source: Database of MCPFE, Forest Europe „Quantitative Indicators Country reports"[97], 21 – calculation of the author.
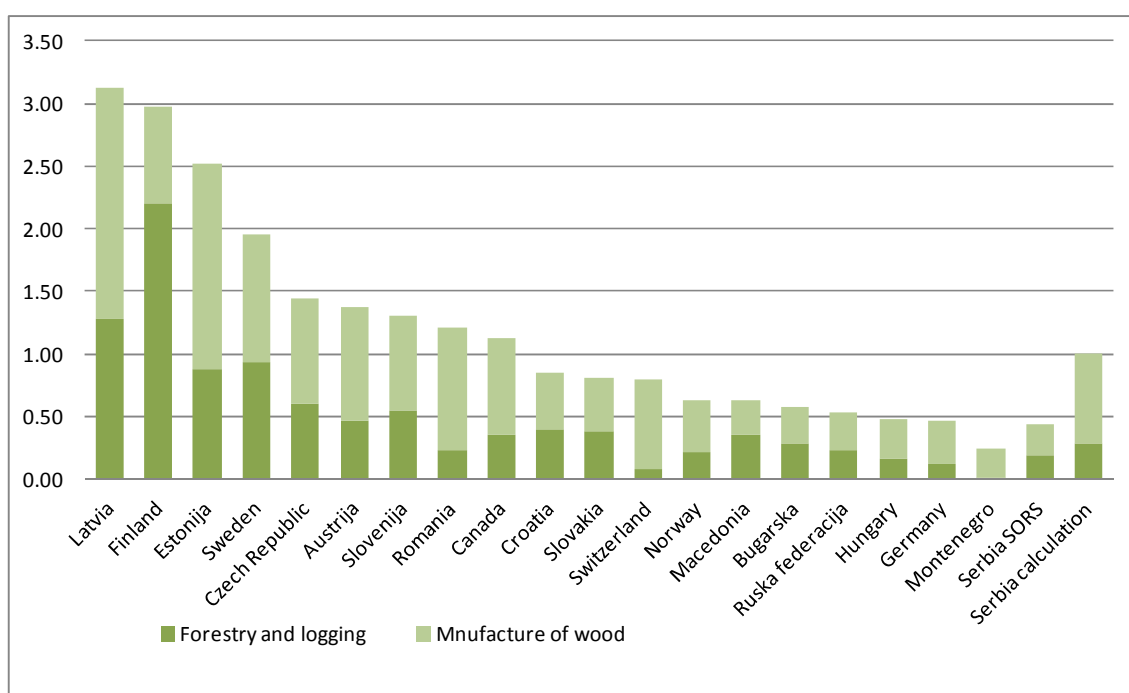
Figure 23: The overview of the wood sector share in the GDP in 2010 by country (%)

As we know, the wood sector is based on forest as conditionally renewable natural resource and its ravenues are limited by production potentials, or forest yield. It

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[96] Data in the table are related to 2010. However, because of the availability of the data, the calculation of the GDP was done for 2011. According to the SORS the official share of the wood sector in 2011 was the same as in 2010 and amounted to 0.43% (0.425%).

[97] http://www.foresteurope.org/SoEF/quantitative-indicators.

is certainly important for each national economy that the level of resource utilization and values added on used forest yields be as large as possible. In order to assess economic effects of resource utilization (forests and lands) the values of the GDP could be put into relation to some of indicators of forest conditions, such as forest area, productive area, total average wood volume, volume yield, etc.

According to the national forest inventory (NFI, 2008), the total coverage of forest areas is 2,5 *million* hectars. In relation to the official value of the GDP of the wood sector for 2011, the realized value per hectar is €58.8. If we apply the values of the GDP which were calculated in the previous analysis, we get the value of 163.5€/ha., which was the annual amount of share of one hectar of forests before the introduction of value added in wood processing.

Comparative values of the GDP of the wood sector for 19 countries and their relations to forest area are presented in table 45.

Small value of the GDP share of the wood sector in Serbia per hectar of forests, particularly if compared with the values in countries with highly developed forestry (table 45), is mainly the result of unsatisfactory conditions in forests, small values of wood volume per area unit and insufficient presence of assortments of high economic values. Such state of forests directly leads to the reduction of values in annual cut. However, in relation to this indicator, the contribution of wood processing is very important, whose production activities should contribute to the increase of efficiency of forest utilization as a natural resource. In table 45, column 9, these values for most European countries are presented. It is noticeable that the highest values of this indicator have been recorded in Switzerland, Germany and Austria, which is not necessary to explain additionalybecause of the high development of the wood sector in these countries. The smallest value of this indicator has been recorded in Russia, which has been recognized as a county with considerable quantities of wood stock which is still not available for utilization, and where some quantities of wood are in circulation as statistically unregistered. Serbia is at the bottom of this list for the reasons already highlighted in this chapter.

Table 47. The review of GDP distribution according to the forest area in 2010 by country

	Country	Forest area	Forest utilisation	Wood processing	Total	Forest utilisation	Wood	Total
		(1.000 ha)	*(mil. €)*	*(mil. €)*	*(mil. €)*	*(€/ha)*	*(€/ha)*	*(€/ha)*
1	2	3	4	5	6	7	8	9
1	Germany	11,076	2,650.0	7,560.0	**10,210.0**	239.3	682.6	921.8
2	Canada	260,783	3,921.0	7,437.8	**11,358.8**	15.0	28.5	43.6
3	Sweden	28,605	2,707.1	2,955.9	**5,663.0**	94.6	103.3	198.0
4	Russian Federation	809,090	1,766.7	2,342.7	**4,109.4**	2.2	2.9	5.1
5	Austria	3,857	1,136.9	2,279.5	**3,416.3**	294.8	591.0	885.7
6	Switzerland	1,240	258.6	2,206.0	**2,464.6**	208.5	1,779.0	1,987.6
7	Finland	22,084	3,562.0	1,248.0	**4,810.0**	161.3	56.5	217.8
8	Czech Republic	2,657	803.6	1,126.0	**1,929.6**	302.4	423.8	726.2
9	Romania	6,573	442.1	1,075.6	**1,517.7**	67.3	163.6	230.9
1	Norway	10,250	501.2	1,003.5	**1,504.7**	48.9	97.9	146.8
1	Latvia	3,354	266.2	384.3	**650.5**	79.4	114.6	193.9
1	Hungary	2,039	142.9	285.5	**428.4**	70.1	140.0	210.1
1	Slovakia	1,938	221.5	242.1	**463.6**	114.3	124.9	239.2
1	Estonia	2,203	103.6	195.0	**298.6**	47.0	88.5	135.6
1	Slovenia	1.,253	179.1	179.1	**358.2**	142.9	142.9	285.9
1	Croatia	1,920	156.6	176.4	**333.0**	81.6	91.9	173.4
1	Macedonia	998	17.0	13.0	**30.0**	17.0	13.0	30.1
1	Bulgaria	3.927	96.6		**96.6**	24.6		24.6
1 9	Serbia –calc.of the author(2011)	2.252	90.6	112.5	**203.1**	40.2	50.0	90.2
2	Serbia – SORS	2.252	54.0	67.0	**121.0**	24.0	29.8	53.7

Source: Calculation of the author based on the data of MCPFE, Forest Europe „Quantitative Indicators Country reports"

3.2.5 Budget allocations (amount and structure) for the wood sector in Serbia, with an analysis of the relationship: *the contribution of public sector revenues / budget allocations for the wood sector*

State subsidies, investment and investment incentives are of great importance to the development of a sector and implementation of development policy. The state subsidies in the forestry are mostly direct, in cash, while in the field of wood processing they mostly appear as favourable development loans.

Subsidy funds within the wood sector in Serbia allocated from the budget of the Republic of Serbia are intended for perfoming activities of general importance in forestry, which are as such declared according to the Law on Forestry. According to the Article 29 and 60 of the Law on Forests (Fig. gazette 46/91) it was determined that the compensation funds and other budget funds be used for financing activities of general importance. By the Law on Forests from 2010 (Fig.gazette 30/2010) in Article 80, priorities for financing activities on forest improvement were set. In details, the activities to be financed are allocated according to Regulation on Implementation of the program of protection and improvement of forests, passed by the Government of the Republic of Serbia and they are distributed on the basis of the open competition for the allocation of funds for protection and improvement of forests.Financing is arranged with final users whose Programs meet the requirements provided by the Regulation. The related activities mostly involve works on extended reproduction of forests, such as: afforestation of barren land, planting, melioration of degraded forests and brushwoods, production of forest seeds and plantation stock, care, protection and maintenance of forest plantations, construction of roads for the purpose of afforestation, scientific researches important to forestry, etc. The amount of funds for works on protection and improvement of forests ranged from *€*2.9 to *€*4.6 *million* in the period 2004-2011, as presented in table 48.

Table 48. Amounts of allocated funds for protection and improvement of forests in the Republic of Serbia in the period 2004-2011.

Godina	Sadnja šuma (državne +privatne)		Nega šuma	Izgradnja šumskih puteva		Proizvodnja semena i sadnica	Naučno-istraživački rad	Zaštita šuma	Ostalo	Ukupno u 1.000	
	ha	din. 000	din. 000	km	din. 000	din. 000	din. 000	din. 000	din. 000	din.	€
1	2	3	4	5	6	7	8	9	10	11	12
2011.	1,240	78,974	56,900	171	143,508	26,665	20,000	16,036	17,000	359,083	3,577
2010.	2,076	88,281	49,839	157	100,782	27,554	18,410	19,808	19,230	323,904	3,108
2009.	2,103	85,011	13,489	140	110,913	25,029	20,175	24,208	3,280	282,105	2,928
2008.	1,234	49,244	41,528	161	124,315	28,681	20,186	55,779	36,050	355,784	4,537
2007.	3,012	152,205	39,618	127	92,111	27,517	19,986	8,904	24,426	364,766	4,630
2006.	2,053	55,477	22,639	59	27,164	17,925	16,000	81,670	19,000	239,874	2,830
2005.	1,997	44,013	19,594	76	19,996	14,023	8,000	134,597	14,000	254,324	3,087
2004.	2,681	42,097	22,206	57	13,886	14,772	8,999	44,877	16,241	163,077	2,264
Ukupno	16,397	595,302	265,814	948	632,675	182,166	131,755	385,879	149,227	2,342,917	26,962

Source: Data of the Ministry of Agriculture, Forestry and Waters, Belgrade, 2012.

The second group of activities in forestry financed by the budget of the Republic of Serbiais related to the works that are dedicated to public companies and other institutions by Law on Forests. This is primarily related to the works on private forest management which include payment fees for logging, tree marking, and documentation for transportation, as well as other professional activities. According to the Law on Forests, professional and technical works in private forests are performed by public companies for management, according to the decision of the Minister. Thus, the funds for performing theses tasks are provided by the budget of the republic of Serbia (Article 48 of the Law on Forests). The works of informative, diagnostic and prognostic services of forest protection are also financed from the budget as delegated tasks. The amount of allocated funds for delegated tasks ranged from €1.0 to €2.27 *million* in the period 2005-2011 (table 49).

Table 49. The amounts of allocated funds for delegated tasks in forestry for the period 2005-2011 in the Republic of Serbia

Year	Private forests	Reporting, diagnostic and prognostic taskss	Total		5 + 12 from tab 46
	din. (000)	din. (000)	din. (000)	€(000)	€ (000)
1	2	3	4	5	6
2011.	113,512	8,400	121,912	1,214	4,791
2010.	99,602	8,400	108,002	1,036	4,145
2009.	99,946	8,400	108,346	1,124	4,052
2008.	170,000	8,000	178,000	2,270	6,808
2007.	145,000	7,000	152,000	1,929	6,560
2006.	115,009	6,900	121,909	1,438	4,269
2005.	105,000	5,000	110,000	1,335	4,422
Total	**848,096**	**52,100**	**900,169**	**10,348**	**35,047**

N	Min	Max	Sum	Mean	Std, Dev	Variance
7	4,052	6,808	35,047	5,007	1,172	1374000

Source:Data of the MoAFW
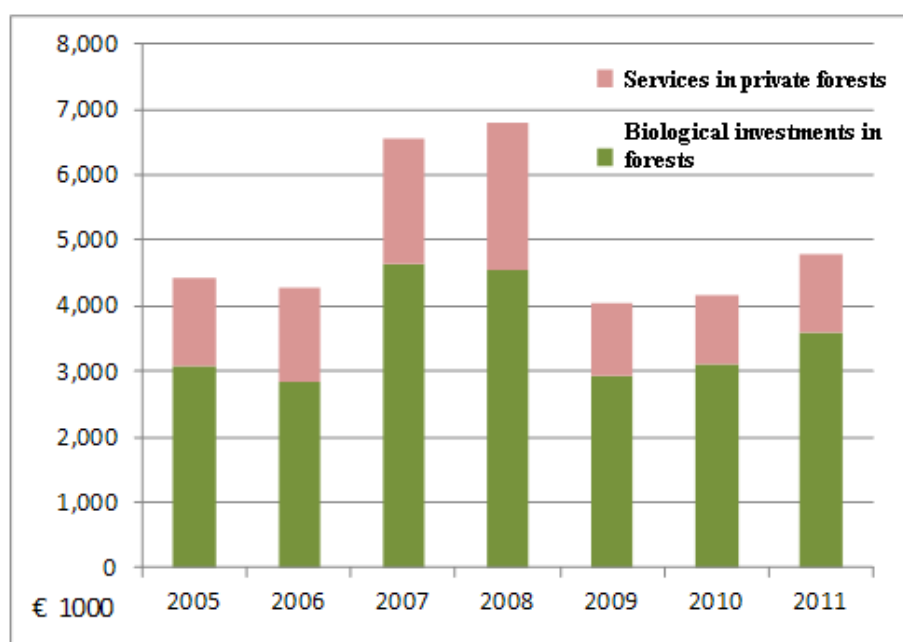
Figure 24: Allocated funds (2005-2011). *(Source:MoAFW)*

All previously mentioned funds for protection and improvement of forests and the performance of delegated tasks practically represent direct participation of the budget of the Republic of Serbia in financing tasks carried out in forestry in order to improve the condition of forests. The effects of these investments are long term and go beyond the field of forestry and their importance is primarily environmental and social.

The work of state institutions conducting activities related to the wood sector also represents budget expenditures directly focused on the activities of the sector. The State Administration of Forestry, which is organized under the MoAFW, or the

Directorate for Forests as a body within the Ministry, is the holder of the regulation and supervision within the forestry sector. Budget expenditures for the operation of some state directorate may be symbolic in relation to the positive effects that can be achieved by well-defined and implemented measures of public administration.In case of the Directorate for Forests, the costs of its work within the planned budget and regular reports of the Ministry are not presented separately, but they are combined at the level of the Ministry of Agriculture, Forestry and Waters. For these reasons the costs of the Directorate for 2011 were estimated based on the proportion of the number of employees in the Directorate to the total number of employees in the Ministry. Thus, the data has been obtained that the costs of work of the Directorat of forestry in 2011 amounted to 95 *million* dinars. If we add costs of individual workers, who performed activities related to the wood sector in other institutions, to this amount, the total amount of about 100 *million* dinars for 2011 can be determined, which is equivalent to €1 *million*.

By financing education in forestry (high schools and faculties) and projects for research activities that are being implemented in scientific institutions for forestry, the contribution of the budget to the wood sector is additionaly increasing. This financing covers 8 educational and scientific institutions (table 48), for which the amount of €5 *million* was spent from the budget in 2011.

Table 50. Educational and scientific institutions in the wood sector included in the analysis

1	Faculty of Forestry, Belgrade
2	Institute of Forestry, Belgrade
3	Institute of Lowland Forestry and Environment, Novi Sad
4	Forest and Chemical School, Sremska Mitrovica
5	Agro-forestry school Josif Pancic, Surdulica
6	Forestry school with boarding school, Kraljevo
7	Building and woodworking school, Apatin
8	Technical school for woodworking, interior design and landscape architecture, Belgrade

On the basis of presented data the total amount of funds from the budget of the Republic of Serbia for the direct financing of the wood sector was determined, and in 2011 it amounted to €14,17 *million* (table 49).

Table 51. Budget expenditures for activities in the wood sector in 2011[98].

1	Name of the expenditure	Amount in 1,000€	%
2	Protection and improvement of forests	3,577	25.3
3	Delegated tasks	1,242	8.8
4	State administration	1,000	7.1
5	Forestry Institutes (2)	1,842	13.0
6	Faculty (1)	2,891	20.4
7	High schools (5)	3,812	26.9
8	Reduction for science which was presented under 1 + 4 and 5	-199	-1.4
	Total	14,165	100.0

Source: Data of Ministries, institutes, faculties, high schools.

On the other hand, legal entities that operate within the wood sector are oblidged to pay certain taxes, contributions, duties and other fees that belong to the budgets of the Republic and local governments or by special accounts of the budget as dedicated funds for certain activities. These payments can be reliably observed and they are practically a direct (cash) social contribution of the sector to the society.

Forestry sub-sector, in addition to the basic payments, according to the Law on Forests has established additional duties paid by users of state forests and private forest owners. Payments are made on a dedicated Account of the Directorate for forests as a compensation for logged wood. This fee is calculated and paid after the completed logging, while the calculation is made on the basis of the value of logged wood. For the period 2008-2011 the average annual amount of paid fee was € 2.28 *million*[99]. In 2011, the amount of fees for the use of forest was 1.91 *million €*, while the fees for the use of private forests were realized in the amount of € 0.85 *million*.

Other fees which are paid within the wood sector are related to the tax payments, contributions, various fees and other allocations. It is necessary to emphasize that that fees which are particularly noticeable are those paid for water utilization and drainage (income of the Directorate for water of the Republic of Serbia), as well as taxes for firms (revenue of the local governments), whose amounts are disproportionately high in relation to business activities.[100]

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[98] The calculation of the euro was based on the buying rate of the National Bank of Serbia on the day 31.06.2011 (http://www.nbs.rs/internet/cirilica/scripts/ondate.html).

[99] 2008: 2,98 *million €* ; 2009:2,41 *million €* ; 2010: 2,45 *million €* ;, 2011: 1,31 *million €*.

[100] Fee for firms is given only for the forestry sector, since for the companies within the wood sector there are no separate data on expenditure for this purpose.

Table 52. The amounts of contributions of the wood sector to the public revenues of Serbia (2011 in €mil)

Name of fee	Iznos u *mil. €*
The fee for the logging of state forests	1.91
The fee for the logging of private forests (charged fee)	0.85
VAT for sold wood assortments (8% i 20%)	11.5
VAT for the other goods and services in wood sector	44.2
VAT for indirect involvement(services) (transportation, etc.).	4.12
Taxes on property	0.1
Taxes on earnings	7.45
Social and health contributions on earnings	22.2
Tax on contracts for temporary work	0.4
The fee for use of water (Directorate for Water)	0.36
The fee for a firm	0.46
Custrom taxes (1% on imports from the group 4410 to 4411)	0.7
Payments for money transaction	0.85
Compensation for building land	0.15
Other	0.19
TOTAL	**95.51**

Sources: Directorate for forests, the BRA, Public companies, Ministry of education, science and technological development, Tax Directorate.

The total amount of taxes and contributions of the wood sector to budgets and budgetary funds at local and national level, which are possible to present and view directly amounted to €95.51 *million* in 2011.On the other hand, direct allocations of the budget for the wood sector were €14.17 *million*. This proves hypothesis H3, "The total contribution of the wood sector to the public revenues of the Republic of Serbia is significantly higher than the allocation of public funds for the wood sector in Serbia", ie, the ratio of allocations to the sector and sector contribution was 1:6.7. In other words, the allocations of the wood sector to the budget of the Republic of Serbia are by 6.7 times higher than the budget allocations to the wood sector.

Practically, the direct contribution of the wood sector was €81.34 *million*, which, related to the total business income of €469.93 *million*, made 17.3%. In relation to the registered volume of logging in state forest (1.992 *million m³*), the contribution to public revenues was 40.8€/*m³* of cut wood, through direct sales and by creating value added. We should bear in mind that this contribution relates only to the wood sector, which does not include the production of furniture.

3.3 SWOT analysis of the socio-economic components of the wood sector Serbia

The assessment of socio-economic possibilities of the wood sector as a component of its sustainable development was done on the basis of research results and obtained values of relevant indicators in this doctoral thesis. The analysis intended to highlight the advantages and threats that might affect the future development of the wood sector in Serbia. After identification of the relevant elements of the SWOT analysis, their evaluation[101] was performed, in order to obtain the average intensity of the strengths, weaknesses, opportunities and threats.

On the basis of the SWOT analysis certain conclusions can be made. The intensity of the weakness of the wood sector is greater than the intensity of strengths, in ratio 7.8:6.1. The main weaknesses come from unsatisfactory state of forests, which is characterized by insufficient representation of assortments of higher technical value. On the other hand, the opportunities of the sector in the long term may increase just by activating resources that are available to increase the forest coverage and improve the current state of forests. Also, the existing organizational strength of the wood sector, which is characterized by a large number of companies and entrepreneurs that have come to existance in the last two decades, represents the strength of the sector, but asks for the support in order to stabilize business activities and raise the level of technical and other business facilities. With regard to relations between strengths and weaknesses, it can be concluded that the existing waeknesses can be reduced or elliminated in the long run by improving the state of forests and applying a new approach in economic policy making in the area which refers to the wood sector.

Besides strngths and weaknesses, it is necessary to assess potential negative influence of the perceived threats. Threats are largely caused by the global economic crisis and the level of their occurrence will depend on intensity of the economic crisis and relations between supply and demand on the market of wood and wood products.

The increase in demand on the international market of wood and wood products can be crucial to the further development of the wood sector in Serbia, the growth of

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[101] All individual elements have been assessed using marks ranging from 1 to 10, as presented in the chart, and on the basis of which the average marks have been determined. Mark 1 has the lowest, while mark 10 has the highest score value.

exports and employment. One of the factors that may contribute to its more dynamic development is specific support measures within the framework of official economic policy in Serbia.

Table 53. SWOT analysis of the socio-economic components of the wood sector of Serbia

STRENGTHS	6,1	WEAKNESSES	7,8
The forest coverage that meets domestic demand for raw material.	5	Unsatisfactory state of forests, which in relation to the timber market, characterized by insufficient participation of valuable roundwood.	9
Favorable ownership structure, satisfactory proportion of forest ownership.	6	Lack of data of the condition and extent of forest felling in private forests.	4
Continuity of supply in the timber market, with a slight increase.	9	A small percentage of technical roundwood in total sales of wood assortments.	10
In the long term, there are opportunities to increase the production of wood raw material for processing industry.	5	Utilisation of forests is relies on a large number of small contractors, without the technical capacities and the permanent employees.	7
Completed the privatization process in the wood processing sector.	5	Fragmentation of production, a large number of small producers and entrepreneurs.	9
A large number of companies and entrepreneurs.	4	Too many customers of technical roundwood, whose technical capacities do not provide an adequate level of utilisation of raw material.	8
Skilled workforce (tradition, experience, knowledge). Developed network of educational institutions.	5	Unregistered employment in some branches of wood sector.	7
The increase of export of wood products.	8	Inadequate spatial distribution of capacities of wood industry, where the largest number of enterprises are located in districts that are not rich in forest resources.	9
Potential for employment in rural and underdeveloped areas.	8	Low level of export of products with higher quality	10
A significant number of self-employed and indirectly employed persons.	6	The capacity of primary processing are oversized, which increases the overall demand for technical wood.	7
Wood sector is important for the production of energy from renewable sources.	6	The low value of the average wage.	7
Introduced system of forest certification in the state forests and chain of custody (COC) in a significant number of wood processing companies.	6	The associations of private forest owners are not present on the legal wood market.	8
		Insufficient control of wood flow by state authorities.	7
		Officialy reported GDP is less P than real.	6
		Insufficient budget allocation for the strategic development of the wood sector.	8
		Insufficient number of specialized employed staff in the sector.	8

SWOT			
THREATS	**7,7**	**OPPORTUNITIES**	**7, 9**
The danger of over-use of forests due to increase in demand of industrial and fuelwood.	9	Increase forest cover and economic potential of forests.	7
The decreasing trend of production of technical roundwood and rise of fuelwood.	9	Sector development in the field of biomass and bioenergy.	8
Decreases in the total income from the use of forests.	9	Space for the development of business and export growth in certain areas.	9
Influence of economic crisis on business.	10	Increasing the degree of finalization and development of areas that have export potential.	9
The increase in unregistered employment.	4	Increasing the number of employees through diversification of activities (contracting).	8
Due to no proper monitoring of the official participation of the wood sector in GDP, economic policies are not adapted to its dynamic development.	4	Greater influence on the development of rural areas and diversification of the income of the local population.	9
Inability of wood processing in some wooded regions due to the lack of local processing facilities.	9	Organization of private forest owners in a joint access on the market of wood.	8
Increased competition from neighboring countries on mutual export markets.	9	Certification of private forests.	4
Insufficient effects of support from the state for activities to improve the condition of forests, due to budget reduction.	5	Larger budget allocations (and / or direction of its own funds) to improve the condition of forests.	6
Because of the fragmented production in the wood processing, their position in the regional and EU market is very weak. Due to this, they supply a large distribution systems.	9	Uspostavljanje i razvoj novih partnerskih odnosa unutar sektora. Establishing and developing of new partnerships within the sector.	9
		Strengthening competitiveness in the international market.	9
		Changing of the existing spatial distribution of wood production, in the direction of establishing the optimal production of certain product categories, in accordance with the characteristics of the forest resources of the region.	9
		Changes and adaptation of the system of education, in accordance with companies needs and conditions of their business.	8

The indentified opportunities of the sector have the highest quotient, which implies that there are potentials for further development of the wood sector and increase of its economic and social significance.

On the basis of an average intensity of each component of the SWOT analysis the "ground strategy" of the SWOT analysis of the wood sector was made as a framework to define possible development strategies of the sector.
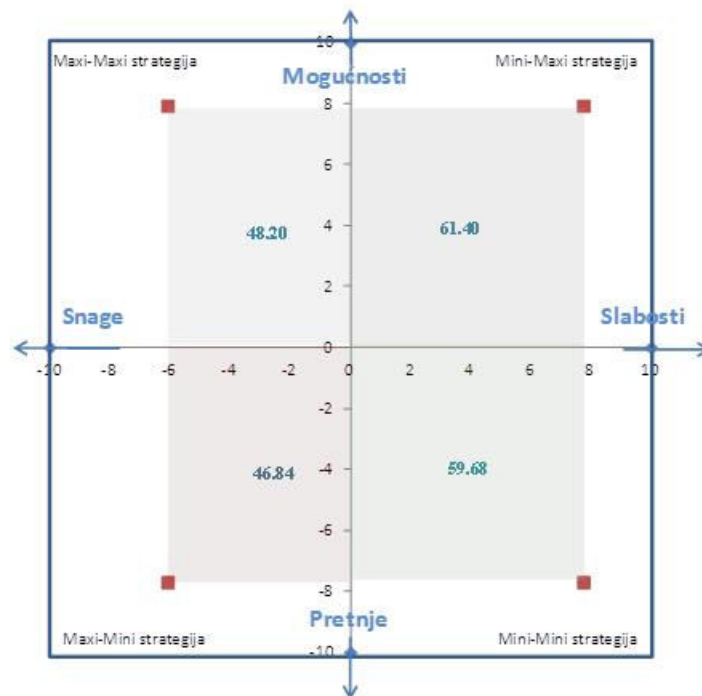
Figure 25. Ground strategies of SWOT analysis

By analyzing the "ground strategies" it can be concluded that higher intensity is on the right side, which suggests that there is the need to minimize and eliminate inner weaknesses that reduce opportunities and intensify threats from the outside. On the basis of the methodology of SWOT analysis and ground strategies the strategies "Mini-Maxi"should be used, aiming to alleviate spotted weaknesses in the sector in order to use favourable conditions in the best possible way. Also, by implementing "Mini-Maxi" strategies the weaknesses of the sector should be alleviated in order to minimize threats from the outside.

The obtained results of the SWOT analysis imply that there is the necessity to establish system measures that will ease identified weaknesses within the wood sector. Extenal impacts and threats that cannot be influenced, such as theimpact of the global economic crisis on the global wood market, or others that ask for implementation of the

long term measures (improvement of the state of forests), can be considerably reduced by neutralizing their own weaknesses.

4 Discussion

The wood market in Serbia relies on domestic forest resources. The import of unprocessed wood is sporadic and mainly refers to the assortments that are not offered on the domestic market or that are more available in cross-border municipalities of the neighboring countries (Montenegro and Bosnia and Herzegovina). Consequently, the forest coverage, quality and production potential of forests have a great impact on the status of forest sector and market of wood in Serbia.

The values of indicators of state of forests that are important from the aspect of wood supply, are bellow optimal. High participation of coppice, degraded and thinned forests significantly reduces production possibilities and the quality of cut and supply. This is one of the main reasons why only 42.7% of round technical wood is present in the total sales of wood from state forests in Serbia (Table 3). For comparison's sake, according to the report submitted within Timber Committee (Timber Committee, 2011), percentage of the presence of a round technical wood in the total sales in Slovakia was 58.2%, in 2010. The difference of 15.5% implies that the wood sector of Slovakia has advantages related to the development opportunities, engaging of wood industry and employment. As a result of this state and unfavourable assortment structure, in 2011, the average value of $1m^3$ of wood from state forests amounted to €37.7[102]. Participation of assortments of high value significantly influenced this value, first of all English oak, which is predominant in the north of Serbia, while the other parts are covered with less valuable assortment. In the example of Slovakia, the realized average price of $1m^3$ of sold wood was €46.9[103]. By comparative analysis of business activities of „Lesy

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[102] For the realized 1.99 million. m3 (Section 3.2.2).

[103] As to the Slovak Republic, the data were available only for 2010, based on the statement of MCPFE „Table for Improved Pan-European Indicators for SFM – quantitative indicators". On the basis of the submitted report of the company "Lesy" that managed state owned forests, the data was obtained showing that the average price of the wood sold was 41.36€/m³ in 2010 and 48.92€/m³ in 2011, which was an increase of 18,2%. According to the coefficient of the price increase and the data from the

Slovenskej Republiky"[104] and "Srbijašume" for 2011, the Slovak company realized higher average price of assortment sold by 40.1% (48.9€/m³ in the company„Lesy Slovenskej Republiky"and 34.7€/m³ in "Srbijašume")[105].

In addition to a relatively low level of participation of a round technical wood in Serbia, the problem is the decrease in the presence of these assortments in the last 20 years, which has been recorded in sales of wood from state forests in the central part of Serbia[106]. Although this decrease is not large, it deserves special attention. Over time, the accumulated reduction of the supply of technical wood for processing, which engages labor force and creates value added, may adversely affect not only financial results, but the overall conditions of the wood sector. If the reduced supply of technical wood is observed as a potential to engage workers, on the basis of the data obtained in the nalysis of value chain (chapter 3.1.11), it can be concluded that by the reduction of participation of technical wood (in relation to the state in 1992) the possibility of employment of 697 workers[107] is also reduced, (hypothetically, on condition that the final products of higher degree of processing are produced).

Although there are no reasons for optimism, the national forest inventory of Serbiahas pointed to some positive trends and a slight improvement in the condition of forests, increase in the volume and areas of forests, which in the long run should affect the increase in the supply of wood. Measures of forest management, long-term investments to improve the condition of forests, afforestation, planting of biomass plantations, better qualitative usage of cut and other measures may have a positive impact on improving the supply of wood.

Condition and needs of the wood market must be kept in mind by all market participants. For example, processing of wood in Europe, faced with a lack of large

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MCPFE report for 2010, for the level of total production of Slovakia, the correction of an average price from 39.7€/m³in 2010 to 46.9€/m³ in 2011 was made.

[104]Public forest enterprises owned by the state of Serbia and the Slovak Republic.

[105] Based on the annual business reports for listed companies "Lesy Annual Report 2011" and the "Annual Report - Srbijašume for the year 2011".

[106] PE "" Srbijasume", Belgrade, without "Vojvodinašume"and without parts from the Autonomous Province of Kosovo and Metohija

[107] Regarding jobs which included primary and final processing, the factory "Tina" Knjaževac engaged 106 workers on jobs of processing 5,290 m³ of roundwood. The volume of logs sold in the PE "Srbijasume" (without provinces) in 2012 was less by 34.814 m³ compared to 1992. Consequently, the prospect of hiring 720 workers was reduced.

diameter logs, has adjusted its production and successfully uses technical roundwood of thinner dimensions. Technologies of cross and longitudinal coupling, as well as the drying of wood have been developed, and often thinner technical roundwood represents an advantage. In addition, we have noticed an increase in demand for lower quality wood for energy purposes and the production of wood-based panels. On the other hand, highly valuable roundwood doesn't lose its significance when it comes to broadleaf species and, usually, exclusive assortments always have their place in the market. Responds to market demands should be included in the long-term and short-term objectives of forest management.

Analyzing data on barren and other forest land, depopulation of rural areas and the expansion of forests on abandoned agricultural land, the need for renewable energy sources and consumption of wood in general, it can be concluded that from the standpoint of the demand for wood it is necessary to intensify work to increase forest areas and forest plantations. These activities represent a stake in the development of the wood sector and meeting the increased demand for wood. Funds necessary for financing the activities could not be identified on the basis of the analyzed business performance of companies in the wood sector, primarily forestry. For that reason it is understandable that the wood sector expects the allocations from the budget of the Republic of Serbia for forest improvement to be higher in order to stimulate these activities. The justification for this can be found in the relation between budget allocations for the forestry sector and wood processing and the contribution of the sector to public revenue. In this paper, it has been shown that this contribution is disproportionate and the wood sector annually allocates € 95.5 *million*, while budget expenditures for the sector accounts for only €14.2 *million*. This supports the hypothesis H3, according to which "the total contribution of the wood sector to public revenue of the Republic of Serbia is significantly higher than the allocation of public funds for the needs of the wood sector in Serbia", ie the allocations of the wood sector to the budget of the Republic of Serbia are 6.7 times higher than the budget allocations to the wood sector. Social effects of forestry may be important to engage economically vulnerable population in rural areas. Taking into account the importance of rural development, the activities on forest development in Slovakia are mainly financed within EAFRD[108] funds. In recent years the incentives for forestry have referred to the increase of economic significance of

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[108] European Agricultural Fund for Rural Development (EAFRD).

forests, forest management, projects within Natura 2000, professional education, consultancy and others. According to the report of the company "Lesy", the EU funds and related ministry invested €2.78 *million*[109] in development projects in 2012. That the economic importance of the wood sector in Slovakia has been recognized by the EU can be confirmed by the decision passed by the European Investment Bank[110], to support projects for financing afforestation, improvement of protection and management of forests, as well as improvement of agricultural infrastructure in rural areas in the amount of 120 *million* euros.

However, nowadays, the socio-economic importance of the wood sector is less dependant on forest resources, but the product, knowledge, technology and adaptability of companies to market demands have the crucial impact on meeting the needs of society. The number of companies included in wood processing, particularly small ones, in 2011 was exceptionally high. 1,855 active small companies and entrepreneurs were evidenced, 1,827 of them belong to the category of companies with les than 50 employees. This situatuon is reflected by the presence of a large number of buyers of technical wood in public companies. Comparing the situation with the state in the Slovak wood sector, a considerable difference refers to the presence of large processing facilities which include 8 lumber mills with the capacity of more than 50,000 *m³* a year (the largest lumber mill „Rettenmeier Tatra timber" has the capacity of 0,8 *million m³*) and 15 lumber mills with the capacity ranging from 20,000 and 50,000 *m³* (Timber Committee, 2011). Such facilities do not exist in Serbia, where only a few mills have the capacity of about 20.000 *m³* a year. Also, there are large producers of pulp (Mondi SCP 0.5 *million tons* of pulp, Bukoza Holding, 0.13 *million tons*), chipboards, fibreboards, and others in Slovakia.

There are 18,293 directly employed workers in companies in the wood sector of Serbia. The total number of the directly and self-employed is over 31,000 workers. Without a doubt it can be estimated that the even wood supply, primarily industrial offered by forest management companies, has been an important catalyst for the establishment of companies and employment of workers. Private forests have additionally generated indirect employment. Comparing the number of workers

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[109] Výročná správa štátneho podniku LESY Slovenskej republiky za rok 2012.
http://www.lesy.sk/files/sprava2012/vs-lesy-2012-web-sj.pdf

[110] European Investment Bank (EIB). http://www.eib.org/projects/press/2014/2014-044-eib-supports-the-forestry-sector-in-slovakia-with-eur-120-million.htm

employed directly in the wood sector in Slovakia, there are 3.2 times fewer registered workers[111] than in Serbia. This significant difference is the result of a difference in the volume of wood production (and the state of forests). The number of employees per 1,000 *m³* of produced raw material in Serbia is 7,6 workers, while in Slovakia it is 6.4 which is by 14.9% less than in Serbia. The difference is not of great importance unless it takes into account the type and structure of production, the size of the wood processing facilities and their efficiency, organization of the sector and others. However, the difference in the number of employees confirms the assumption that is set out in section 3.1.7 that the task of the wood sector in the coming years will be more expressed through the preservation of existing jobs rather than the creation of new ones.

Significant changes in the number of employees in the wood sector in Serbia in the past decade were primarily taking place towards "movement" of the labor force to larger cities, especially toward Belgrade and Vojvodina. By the analysis of flows of wood the phenomenon of relocating wood processing plants to economically developed parts of the country was noticed, which led to territorial discrepancy of woo processing facilities and forest resources. It was found that, on average, only 50% of round technical wood remained in the district where it was produced. Such spatial distribution can affect the social discontent of certain regions and local communities. Bor district can be pointed at as a negative example, from which the wood is distributed to 20 other districts, or Pirot district where 97% of technical wood from state forests is being processed in other districts. Insufficient wood processing facilities in some forest areas directly lead to a reduction in the number of employees, and further, to depopulation. Thus, for example, only 21.0% of workers are employed in the field of production of wood and wood products in the region of "Southern and Eastern Serbia", which includes 46% of the total forest area in Serbia. On the other hand, in the territory of Vojvodina and Belgrade, 43.7% of the workers are employed. This has led to the situation that the number of employees in the field of "processing of wood and wood products" in the region of Southern and Eastern Serbia is smaller by 2.2 times, and the number of companies by 2 times in relation to the region of Vojvodina and Belgrade, which

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[111] Based on "Table for Improved Pan-European Indicators for SFM - quantitative indicators" MCPFE database, in 2010, the total amount of 9,03 million *m³* of wood was produced, and 24.000 workers were employed in forestry (ISIC/NACE 02) and 34.100 in wood processing (ISIC/NACE 20) in Slovakia.

directly affected business results which were lower by 3,5 times[112]. The results obtained by the analysis of wood flows prove the hypothesis (H2) about the strong synergetic impact of the wood market and socio-economic factors on the overall development of the wood sector of Serbia. High percentage of forest area and a good supply of industrial wood are not enough to satisfy socio-economic needs of a country or a region and have to be accompanied by suitable processing which generates demands for industrial wood, employment, and provides more productive usage of resources. Higher emplouyment causes making connections between population and the area they live in, which is particularly important to wooded areas that usually characterize the outflow of the population, and which should be responsible for the development of the wood sector in Serbia.

The positive effects of internal trade of wood can be found in the transport of wood. It has been shown that the wood trade generates a significant number of carriers for internal transport of raw materials, semi-finished and finished products within Serbia, and transport in foreign trade as well. The total value of transport that is generated by the wood sector is estimated in the amount of 32 to 39 *million €* per annum. In the analysis of the value chain for the observed company it has been found that the transport of goods in the final value of the finished product sold on the EU market participates with 12%. This high value approaches the cost of participation in management and forest utilization[113], which indicates the great importance of the wood sector to the transport sector.

Relations between forest management and wood processing companies are established as direct relations, without intermediaries. In practice, public companies sell roundwood according to the criteriua set within the company and there are no agents who are engaged in buying and selling of raw material in bulk. Such a state can be assessed as favourable for forest management companies, which, having professional and financial recourses, can respond to market demands and overcome problems that appear as a result of the short term decrease of demands or other minor disturbances on the market. However, in such circumstances, the private forest owners are marginalized

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[112] Based on the database of the BRA for 2011, which was formed on the basis of final accounts of all entities. Data refers to companies and entrepreneurs from the section processing of wood and wood products.

[113] Forest management and forest utilization participates with 13,4% in realization in value chain of the company "Tina"-Knjazevac.

because of fragmented land and small quantities and, as a rule, without possibility to sell their products to large customers. Associations of private forest owners, although can be identified in some regions, are still not capable of taking on the role of intermediaries in sale between wood processing and private forest owners. In addition, the lack of certification for sustainable management of private forests and the required evidence of the origin of wood are the problem for export-oriented wood processing companies and that is why they would rather purchase the raw material from state-owned companies.

Private foresta are additionally marginalized in other aspects. Many official reports related to the conditions of forests and the volume of production, private forests either do not recognize or the data are incomplete or unreliable. In the analysis of wood flows it was clearly shown that, when it came to fuelwood, whose most important source was forest, there was a significant discrepancy between the registered production and calculated consumption of fuelwood . This suggests that there are two parallel markets of fuelwood. One for the wood coming from state forests, with valid data on origin, quantities and values, ant the other, for the fuelwood coming from private forests, which istsold in local "warehouses".

The significance of private forests additionally grows if we bear in mind that the fuelwood in Serbia represents an important energy resource and that 40.9% of households in Serbia use solid fuels for heating (Glavonjic B. at all, 2010). The population mostly uses wood from their own forests, they themselves do the logging and transport. If we take into account the fact that there are more than 0.5 *million* forest owners in Serbia (Gluk Peter et. all., 2011), then it is clearer how significant the use of the fuelwood is and how important it is to have properly regulated wood market.

Furthermore, it should be noted that the Republic of Serbia has committed to increase the share of renewable energy sources in final energy consumption to 27% by 2020, in which the participation of solid biomass is 58%. Current and future trends in the consumption of wood for energy needs open questions relating to the provision of the necessary quantity of fuelwood. The increase in demand for wood for energy needs is now a problem to which the wood sector has not responded appropriately. Discrepancy, which has been found in production and consumption, as well as high levels of consumption of fuelwood, implies the necessity of establishing institutional mechanisms for monitoring the flow of wood, primarily from private forests. However, solving this problem from the aspect of sustainable development is extremely complex. Additional significance the wood for energy needs is getting will surely provide new

revenues to forest owners, which are welcome in conditions of economic crisis, reduce the importof fuels and emission of gasses. On the other hand, provision of the principle of permanence of forest production and preservation of ecological functions of forests must be guaranteed. Establishing control of biomass market, introduction of additional standards and origin certificates may be a part of the solution.

Export and import trends in the wood sector are positive for the national economy. The export of wood products after the decrease in 2009 has continually been growing. The decrease in export in 2009 was the result of impacts of the crisis on global wood market, which started by the end of 2008. According to (UNECE, 2009) the total consumption of wood in countries of the UNECE region dropped by 8.5% which caused the reduction of demand and the fall of prices during 2009. Renewed growth in exports of wood products, after a brief decline, was the result of adaptation of the sector to the EU policy relating to the increase ofenergy efficiency of residential and other buildings, and directly affected the production of joinery and other building materials. Also, the modern use of biomass for energy purposes in the form pellets and wood chips, and the rising demands of the European market in relation to these products, led to a growth in production and exports of these products. On the basis of the data of FAO-start[114], the wood sector of Slovakia recorded decline in export in 2009 and just a temporary rise in 2010. It can be concluded that the global wood market had an equal impact on both wood sectors and that the drop in export in 2009 was not the result of internal factors. However, smaller processing facilities in Serbia were obviously more flexible and ready for the changes on the market and they were more adaptable to changes.

The export of the wood sector of Serbia is welcome from the point of the total export balance of the country, but points to the low level of development of final processing and manufacture of furniture made of solid wood, which is a direct way to reduce possibilities for the employment of labor force in the process of finalization. Value chain analysis presented in chapter 3.1.11 shows that in the total chain of production of finished product in final production 59.1% of workers are engaged, 22.9% in primary production and only 16.5% in forestry (management and forest utilization). If the data related to the number of workers are put in proportion to the export of semi-

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[114] http://faostat.fao.org (the export of the wood sector of Slovakia in 1008 was $1,656 million, in 2009- $1.329 million, in 2010-$2,048 million and in 2011-$1,415 million).

finished products made of beech wood[115], we get the number of 703 workers that can be additionally engaged in activities of final procession[116].

The structure of foreign exchange suggests that it is desirable to improve the level of finalization and to offer the market products with a higher degree of processing. It is certainly not easy and, not only does it require investment but a professional staff of all levels of education as well. This raises the question of competences of the employees to meet the demands of foreign markets. Without a doubt it can be concluded that the largest space for new employment in the wood sector has remained primarily in the final wood processing. Under these circumstances, countries that import lumber and wooden elements by making these products engage their own industry, work force and other professional capacities.

When it comes to the export of the wood sector it must not be forgotten that"less attractive" products such as wooden packaging, accessories, laminated wood products and charcoal, record a continuous growth in export. To perform these activities major investments are not required and they can be important for the development of rural areas.

Regarding import, the import of wood based panels and fibreboards to Serbia is still considerable, although it has been reduced after investments in domestic production. According to the data on import structure, an additional space for substitution of import with domestic production still exists.

Analysis of the value chain, which has been made for the company "Timočka industrija namestaja", pointed out the importance and the representation of some stages of production to create added value. In the related example the participation of technical roundwood (excluding transportation) in the value of the final product was only 13.3%. At the same time, the representation of all the business activities included in the wood sector (concluding with the primary processing) was 33.8%. Residual value added of 66.2% occurred in the process of making the final products and their transportation to the ultimate customer in the EU market.This analysis of value chain would surely provide different results in other companies and cannot be accepted as a universal

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[115] According to the data of the Serbian Chamber of Commerce, 40.902 *m³* was exported in 2012, $18.9 million of goods, or semi-finished products from the group 4407.92 "Wood, processed beech, of thickness over 6cm"

[116] The assessment is aimed to confirm a commonly known fact that the increase of finalization increases the number of engaged workers and can not be reflected to the level of whole Serbia.

model, but it points out the economic and social significance of final processing and production of finished products. This example shows that the value of the roundwood, by its processing to final product, can increase by 6.5 times. This approach, in addition to its socio-economic effects, considerably influences productivity of using forest resources[117].

The present condition of the wood sector is a result of influences of many factors. Transition processes that have been going on in the wood sector in the last two decades should have estblished a competitive, efficient and market-oriented model of business. However, on the basis of current ownership and organizational structure of the sector, it can be assessed that the transition process has formally been over, but many weaknesses considerably hinder its development. Unsatisfactory state of forests and insufficient participation of roundwood, economic sanctions during the 1990s of the last century, the lack of capital investment[118] and support of the state and business banks, have caused numerous technical, technological, organisational, professional, financial and other weaknesses. In addition, many other factors that cannot be influenced have had a considerable impact. Slow adjustment of domestic manufacturers to frequent changes in demands of foreign customers, the loss of furniture market from Italy and the USA, as well as relocation of production from Italy, have caused domestic lumber manufacturers to lose a considerable number of customers and to turn to other markets, including China and Japan. The change of orientation towards new markets has brought with it new problems and it is a very slow process. Nevertheless, large producers and distributors have a dominant position in global trade flows of lumber and other wood products. All this together has resulted in numerous problems in the field of lumbermill wood processing and in weakening of their positions and the wood sector in general. In such circumstances the relation between supply and demand on the market of wood and wood products have been crucial in relation to the socio-economic state in the sector.

Despite all problems, the contribution of the wood sector to the overall economy of Serbia, as seen in the GDP, is not negligable, but is often underestimated by official institutions. Calculation done on the basis of official data shows that it amounts to 1.1%

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[117] Productive use of resources means creating greater value than resources we have (European Commision, 2013).

[118] All investmens vere small and directed towards primary processing. The arrival of the company "Kronospan" in 2008, has been the only capital "green field" investment in the wood sector in Serbia so far.

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compared to the total GDP of the country. For comparison, participation of the wood sector of Slovakia in the total GDP in the amount of 0.81%, together with pulp and paper production, also amounts to 1.1%[119]. This comparison is surely rlative, considering that it largely depends on economic strength of the overall ecomomy, but implies that the wood sector in Serbia should not be neglected by development policies.

Hypothesis H1 set at the beginning of the study, according to which there is a strong causal relationship between the movement of supply and demand in the market of wood and wood products and selected indicators of socio-economic component of sustainable development of the wood sector in Serbia, has been confirmed in most of the selected indicators. The number and structure of companies and entrepreneurs, realized operating income and contribution to public revenue, the results achieved in exporting and export balance, production of biomass and wood for energy purposes, forest certification (as a segment of CSR), reflect the relationship between supply and demand on the market of wood and wood products. However, the impact of the wood market has not been seen in relation to the number of employed workers in the wood industry, which since 2000, has been decreasing. The reasons for this should be sought in the transitional changes that were dominant in relation to employment. In fact, privatization and new market conditions have inevitably led to increasing productivity and rationalization in business activities of companies, which has resulted in reduction in the number of employees. The current growth in exports of wood sector has not been enough to generate new jobs.

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[119] Based on the MCPFE database, including ISIC/NACE 02, 20 and 21 (production of paper, for which, contrary to Serbia, considerable quantities of wood are being used).

5 Conclusions

Like other socialist countries, Serbia entered the period of transition in the 1990s of the last century when the first privatization processes began. That period in the wood sector was marked by consolidation of forestry within a public company for forest management. The second transition cycle, starting in 2000, was characterized by an intensive privatization and liberalization of the market which was left to foreign competition. The transition processes in Serbia led to significant changes in the wood sector. Changes took place within the two processes, in the direction of the state centralization of forest management and in the direction of privatization and defragmentation of jobs in forest utilization and wood processing.

The processes of privatization of the existing factories for wood processing and building new ones were supported by the suitable raw material supply. The average production of industrial wood in the period 2000-2012 was 0,96 million m³, which had a considerable positive impact on the development of the wood sector. As a result of demand and joint business activities of the sector, the export of wood was increasing in 2012 and reached the amount of €183.8 million. The positive balance of only €2 million relating to the import of wood products was recorded in 2011 for the first time after several successive years of deficit. Next year the balance reached €19,5 million. A short-term drop in exports was recorded in 2009 as a result of external factors, namely the global crisis on the wood market. Adapting to market changes again led to an increase in exports which was dominated by the export of joinery, wood-based panels, biomass and biomass products. The short-term reduction in exports resulted in a slight decrease in the number of employees in the wood processing enterprises. Subsequently, in the period from 2011 to the end of 2012 the number of employees remained unchanged.

It is undeniable that the continuous supply of raw material and demand for wood products on foreign markets significantly generated the development of the wood sector. The supply of wood assortments on domestic market and the demand for some types of goods on foreign markets influenced the structure of export and the type of production in wood processing. This was seen in the structure of companies according to the activities they performed, especially in medium and large sized companies, where the predominant activity was production of wood based panels, production of joinery and lumbermill processing. However, medium and large companies participated only by

1.3% in relation to the total number of 10,755 registered companies and entrepreneurs in the section of processing of wood and wood products.

The flow of the supply and demand on the market of wood and wood products influenced the values of most sellected indicators. The number and stucture of companies and entrepreneurs, operating income and contribution to public revenue, results achieved in export and export balance, production of the biomass and wood for energy needs, certification of forests (as a part of CSR), all these represented the reflection of supply and demand on the market of wood and wood products. However the imapct of the wood market could not be seen in the increase in the number of employees in wood processing, which has been decreasing since 2000. This phenomenon could be explained by transition events that had a major impact on employment. In fact, in the period after 2000, the privatisation of wood processing, which by definition brings higher productivity and changes in employment, was completed. In relation to employment transition factors were dominant and, the increase in the export of the wood sector was not enough to generate new employment.

If we analyze the effects of interaction of wood supply and wood demand within Serbia, at the local level, there has been a strong influence of the wood market (primarily demand) to the observed socio-economic indicators. Analysis of wood flows and territorial distribution of companies and employment in the wood sector indicates that the wood processing is substantially located in economically developed areas, especially in Belgrade and Vojvodina, rather than in the areas that are forested and have a larger supply of wood. Obviously, the supply of technical wood has not been motivating enough in all regions for the development of the local wood processing. Despite valuable forest resources (Juzni Kucaj, Stara Planina, and others), these regions are characterized by high outflow of technical wood towards other regions due to a small local demand. Only 3.3% of round technical wood remain within Pirot district, 9.7% in Bor district, and, 18.9% remain in Zajecar district. All these have led to the situation that the number of employees in the region of Southern and Eastern Serbia, working in the section "Processing of wood and wood product", is less by 2.1 times, while the number of companies by 2 times compared to regions of Belgrade and Vojvodina. This has directly been reflected in the actual operating results that were lower by 3.5 times in this region. Only in the area of Western Serbia it can be estimated that there is enough balanced internal relationship between supply and demand for wood, which has created the conditions for long-term sustainable development of the

wood sector in this area. Relocation of wood processing factories to economically developed areas is the biggest consequence of conducted transition, but also a threat to the socio-economic sustainability of the wood sector at current levels. High forest coverage and a good supply of wood is not sufficient to meet socio-economic needs of an area and must be accompanied by appropriate processing, which generates demand for industrial wood, employment and provides a more productive use of resources. Higher employment makes the connection between the population and the area where they live, which is especially important in forested areas that are usually characterized by the outflow of population.

The support of state and municipal budgets for the development of the wood sector in Serbia can have a significant impact on the improvement of forest quality and the quality of the wood supply, employment, development of promising production activities and overall condition of the wood sector. Justification for such investments can be found in the data that the value of round technical material through its processing to the final product can be increased by 6.5 times, which significantly increases the effects of the use of forest resources. As an additional argument, one can note that the contribution of the wood sector to public revenue in Serbia is 6.7 times higher than the state allocations for the development of the wood sector. The contribution of the wood sector, which was possible to directly express and perceive, in 2011 amounted to € 95.5 million. On the other hand, the direct budgetary expenditures for the wood sector amounted to 14.2 million.

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7 Appendix

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7.4 Overview of the export and import of wood products Serbia

Table 54. Export and import of wood products by group of product for the period 2008-2012.

Tariff	Year	Name of tariff	Export in 1,000€			Import in 1,000€			Balance in 1,000€		
			Export	Current – previous year.	Average 2008-2012.	Import	Current – previous year.	Average 2008-2012.	Balance	Current – previous year.	Average 2008-2012.
4401	2008.	Fuelwood in logs, in billets, in twigs, in fagots or in similar forms; wood in chips or particles, sawdust and wood waste and scrap of wood, whether or not agglomerated in logs, briquettes, pellets or similar forms.	2,061			243			1,819		
4401	2009.		4,611	2,549		399	156		4,212	2,393	
4401	2010.		5,566	956		753	354		4,813	602	
4401	2011.		7,356	1,790		838	85		6,518	1,705	
4401	2012.		9,608	2,252	5,841	1,477	639	742	8,132	1,613	5,099
4402	2008.	Wood charcoal (including charcoal from shells), whether or not agglomerated.	2,041			366			1,675		
4402	2009.		2,517	476		463	97		2,054	379	
4402	2010.		2,705	188		221	-242		2,484	430	
4402	2011.		2,669	-37		196	-26		2,473	-11	
4402	2012.		3,631	962	2,712	1,013	817	452	2,618	145	2,261
4403	2008.	Wood in the rough, whether or not stripped of bark or sapwood, or roughly (squared)	5,874			5,133			742		
4403	2009.		2,221	-3,653		3,907	-1,226		-1,686	-2,427	
4403	2010.		5,191	2,970		5,149	1,242		42	1,728	
4403	2011.		5,061	-131		3,996	-1,154		1,065	1,023	
4403	2012.		3,226	-1,834	4,315	3,634	-362	4,364	-407	-1,472	-49
4406	2008.	Railway or tramway sleepers of wood.	1,166			853			313		
4406	2009.		574	-592		487	-366		87	-226	
4406	2010.		583	9		635	148		-52	-139	
4406	2011.		1,681	1,097		1,084	449		596	648	
4406	2012.		1,543	-138	1,109	615	-469	735	928	332	375
4407	2008.	Wood sawn lengthwise sliced or peeled,	33,769			71,159			-37,390		

4407	2009.	whether or not planed, sanded or end-jointed, of a thickness exceeding 6 mm.	22,457	-11,311		46,003	-25,156		-23,546	13,844	
4407	2010.		26,690	4,232		51,446	5,443		-24,757	-1,211	
4407	2011.		29,226	2,537		47,499	-3,947		-18,273	6,484	
4407	2012.		31,852	2,626	28,799	48,757	1,257	52,973	-16,904	1,369	-24,174
4408	2008.	Sheets for veneering (including those obtained by cutting laminated wood), for plywood or for similar laminated wood and other wood, sawn lengthwise, sliced or peeled, planed or nerendisano, cut or uncut, unconnected or end-jointed, of a thickness not exceeding 6 mm.	6,077			6,175			-98		
4408	2009.		2,051	-4,026		4,359	-1,816		-2,308	-2,209	
4408	2010.		1,780	-271		6,917	2,558		-5,137	-2,829	
4408	2011.		3,082	1,302		7,960	1,043		-4,878	259	
4408	2012.		3,764	682	3,351	8,916	957	6,865	-5,152	-274	-3,515
4409	2008.	Wood (including strips and friezes for parquet flooring, not assembled) continuously shaped (tongued and groove, žlebljeno, rounded or the like) along any of its edges, ends or faces, whether or not planed, sanded or end-jointed.	9,610			13,786			-4,177		
4409	2009.		7,909	-1,701		8,583	-5,204		-674	3,503	
4409	2010.		8,573	665		8,733	150		-160	514	
4409	2011.		7,405	-1,168		6,590	-2,143		815	975	
4409	2012.		7,265	-141	8,152	6,477	-113	8,834	788	-27	-682
4410	2008.	Particle board, called "oriented strand board" (OSB) and similar board (for example: "waferboard") of wood or other ligneous (ligninskih) material, whether or not agglomerated with resins or other organic substances.	3,123			59,438			-56,314		
4410	2009.		4,169	1,045		49,177	-10,261		-45,009	11,306	
4410	2010.		10,143	5,974		42,140	-7,037		-31,997	13,011	
4410	2011.		11,256	1,113		35,386	-6,753		-24,131	7,866	
4410	2012.		18,281	7,025	9,394	35,874	488	44,403	-17,593	6,537	-35,009
4411	2008.	Fibreboard of wood or other ligneous materials whether or not agglomerated with resins or other organic substances.	3,597			39,443			-35,845		
4411	2009.		907	-2,690		30,443	-8,999		-29,536	6,309	
4411	2010.		1,565	657		32,717	2,274		-31,153	-1,617	
4411	2011.		4,235	2,670		30,216	-2,502		-25,981	5,172	
4411	2012.		8,395	4,160	3,740	31,417	1,201	32,847	-23,022	2,958	-29,107
4412	2008.	Plywood, veneered panels and similar laminated wood.	5,070			7,402			-2,332		
4412	2009.		4,862	-208		4,399	-3,002		463	2,794	
4412	2010.		6,097	1,235		6,098	1,699		-2	-464	
4412	2011.		5,353	-744		6,867	769		-1,515	-1,513	

Code	Year	Description									
4412	2012.		7,333	1,980	5,743	6,250	-617	6,203	1,082	2,597	-461
4415	2008.	Cases, boxes, crates, drums and similar packings, of wood; drums (reels) cable, made of wood; pallets, box pallets and other load boards, of wood; pallet collars of wood.	10,830			3,143			7,687		
4415	2009.		10,264	-567		2,839	-304		7,425	-263	
4415	2010.		8,550	-1,714		3,183	344		5,367	-2,058	
4415	2011.		9,570	1,021		4,201	1,018		5,370	3	
4415	2012.		12,261	2,690	10,295	4,714	513	3,616	7,547	2,177	6,679
4418	2008.	Builders' joinery and carpentry of wood, including cellular wood panels, assembled flooring panels, shingles and shakes.	43,961			13,404			30,557		
4418	2009.		38,116	-5,845		12,807	-597		25,309	-5,248	
4418	2010.		47,102	8,985		10,509	-2,298		36,592	11,283	
4418	2011.		57,780	10,678		9,605	-904		48,175	11,582	
4418	2012.		59,620	1,841	49,316	9,608	3	11,187	50,013	1,838	38,129
4499	2008.		9,093			5,876			3,216		
4499	2009.		9,518	425		4,990	-886		4,528	1,311	
4499	2010.		14,643	5,125		4,715	-275		9,928	5,400	
4499	2011.		16,313	1,670		4,483	-232		11,830	1,902	
4499	2012.	Cumulative other products.	17,009	696	13,315	5,512	1,029	5,115	11,497	-333	8,200
	2008.		136,273			226,420			-90,147		
	2009.		110,175			168,856			-58,680		
	2010.		139,187			173,218			-34,031		
	2011.		160,986			158,921			2,065		
	2012.	TOTAL	183,788			164,263			19,525		

Source: Database Chamber of Commerce, based on data taken from the database of the Customs Administratio