



RERAM

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Resource Efficiency of the Forest-based Sector in Eastern Europe (ENP-EaP countries)

State and challenges of forestry and woodworking industries
in Ukraine, Moldova, Georgia and Poland and
recommendations for sustainable development



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1. Executive summary

1.1 State of the ENP-EaP forest-based sector

The RERAM project's main objective is to improve resource efficiency and raw material consumption of the forest-based sector in Eastern Europe (ENP-EaP European Neighbourhood / Eastern Partnership countries). It aims at bridging eminent gaps between research and innovation (R2I) among SMEs, science and authorities. The project was funded by the European Commission's FP7 programme from 2014 to 2016 and was carried out by a team of specialists from 11 organisations in Germany, Austria, Belgium, Poland, Ukraine, Moldova and Georgia. This study provides baseline information about the current state and future opportunities of the ENP forest-based sector's resource potentials.

The concept of the forest-based sector has been put forward by the European Union to promote a better understanding of one of its largest industrial sectors¹. The main idea is to unite industries closely related to the common resource 'forest' that can benefit from a shared strategy for sustainable development. The forest-based sector, as defined for this survey, includes four main branches, or subindustries, which are dependant on solid wood as a main raw material: forestry, woodworking industries, furniture manufacturing, carpentry and joinery. The forest-based sector analysis is based on national statistics in terms of turnover, number of enterprises and number of employees for Ukraine², Moldova³ and Georgia⁴ (Table 1, Fig. 1, 2, 3). For a comparison, Poland⁵ was included as an example of a post socialist country that is today a full member of the EU.

The key statistics (Table 1) reveal a particular structure of subindustries within the whole sector of each country. In Ukraine, forestry shows a large share of turnover (25%) and the largest number of employees in the sector. Woodworking and furniture manufacturing represent only 71 % in Ukraine and 55% in Moldova of total turnover. In Poland however, woodworking and furniture manufacturing contribute much more to the sector's value added. The Polish forest-based sector's total sold production is approx. 14.2 billion EUR, while Ukraine's turnover is only approx. 2.4 billion EUR (at 2012 exchange rates⁶). As a first conclusion, the ENP forest-based sectors require a more advanced promotion towards deeper secondary processing and manufacturing of forest products, developing industrial capacities in woodworking, furniture, construction and carpentry, to increase economic effectiveness and employment.

¹ FAO. 2014. Contribution of the forestry sector to national economies, 1990-2011, by A. Lebedys and Y. Li. Forest Finance Working Paper FFSM/ACC/09. FAO, Rome.

² State Statistics Service. 2013. National Accounts. Kyiv, Ukraine. www.ukrstat.gov.ua

³ National bureau of Statistics. 2012. Statistical Yearbook 2012. Chisinau, Republic of Moldova. www.statistica.md/pageview.php?l=en&idc=263&id=2193

⁴ NSO. 2013. Main statistics: Industry. National Statistics Office, Tbilisi, Georgia. geostat.ge/index.php?action=page&p_id=464&lang=eng

⁵ Central Statistical Office. 2013. Forestry 2013. Warsaw, Poland. www.stat.gov.pl/gus/5840_1540_PLK_HTML.htm

⁶ INFOEURO http://ec.europa.eu/budget/contracts_grants/info_contracts/infoeuro/infoeuro_en.cfm

Table 1 The forest-based sector in ENP-EaP countries - key statistics 2012

Main parameters	Sector subindustry ¹				Total national forest-based sector
	Forestry (02)	Woodworking industry (16)	Furniture manufacturing (31)	Carpentry and Joinery (43.91, 43.99, 43.32)	
 Ukraine					
Turnover (billion UAH)	6.1	10.3	7.2	0.8	24.4
Turnover ² (million EUR)	587.3	991.7	693.2	79.0	2,351.2
Enterprises (number of)	991	3,128	1,548	601	6,268
Employees (ths. persons)	66.2	43.1	38.5	3.9	151.7
 Moldova					
Turnover (billion MDL)	0.22	0.22	0.69	0.53	1.66
Turnover ² (million EUR)	13.4	13.9	42.9	32.8	103.0
Enterprises (number of)	27	302	370	77	776
Employees (ths. persons)	3.8	1.4	2.7	0.9	8.8
 Georgia					
Turnover (million GEL)	14.80	93.36	91.58	n.a.	199.74
Turnover (million EUR)	6.91	43.59	42.76	n.a.	93.26
Enterprises (number of)	78	213	387	n.a.	678
Employees (ths. persons)	0.5	1.9	2.7	n.a.	5.1
 Poland					
Turnover ³ (billion PLN)	n.a.	29.56	28.79	n.a.	58.35
Turnover ² (million EUR)	n.a.	7,215.4	7,027.4	n.a.	14,242.8
Enterprises (number of)	19,190	35,957	27,047	n.a.	82,194
Employees (ths. persons)	31.1	101.5	138.6	n.a.	271.2

Notes: ¹ according to the Classification of Type of Economic Activity (NACE Rev.2); ² Turnover figures converted into EUR as per 2012 exchange rates (10.3861 UAH/EUR; 16.0754 MDL/EUR; 2.1418 GEL/EUR; 4.0968 PLN/EUR) http://ec.europa.eu/budget/contracts_grants/info_contracts/infoeuro/infoeuro_en.cfm; ³ the value of sold production is given here instead of turnover; n.a. = data not available

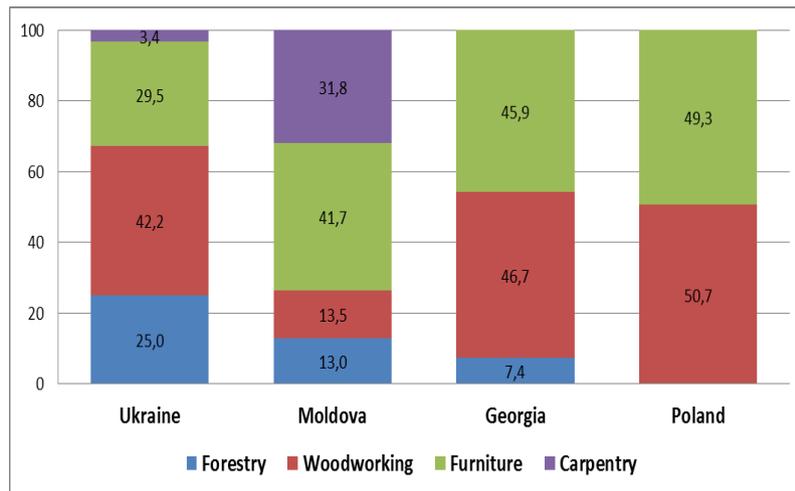


Fig. 1 Forest-based sector structure of subindustries in turnover, 2012

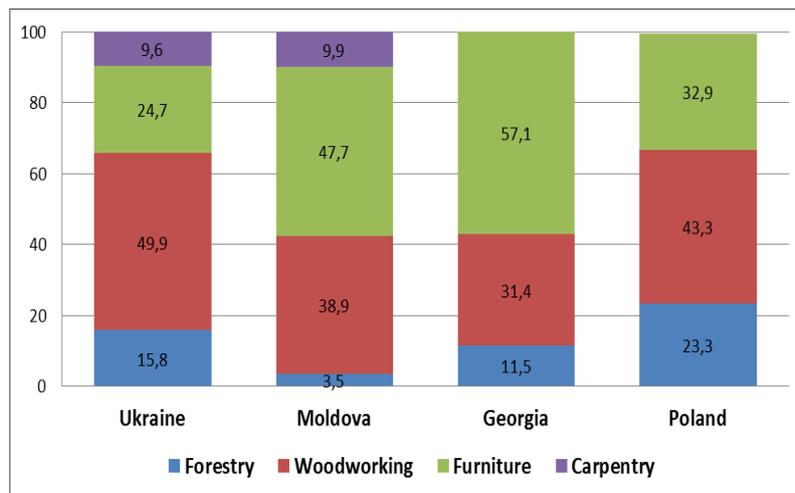


Fig. 2 Forest-based sector structure of subindustries in enterprises, 2012

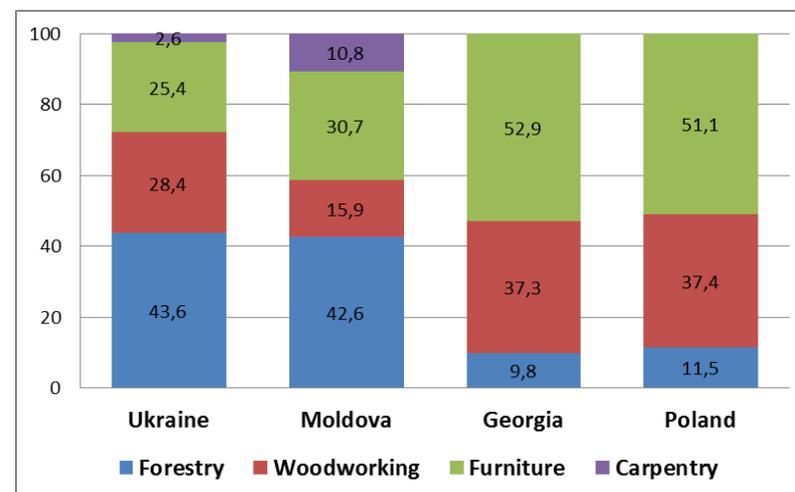


Fig. 3 Forest-based sector structure of subindustries in employment, 2012

Table 2 Forest resources and key indices of ENP-EaP countries, 2012

Parameter	Ukraine	Moldova	Georgia	Poland ¹
Population (million persons)	46.05	3.60	4.40	38.20
Forest land area (million ha)	10.80	0.37	2.82	9.40
Forest land percentage (%)	15.70	12.70	40.50	30.06
Forest land area per inhabitant (ha/person)	0.23	0.10	0.64	0.25
Overall timber stock (billion m ³)	1.80	0.05	0.45	2.40
Timber stock per inhabitant (m ³ /person)	39.09	12.50	103.30	62.83
Timber stock per enterprise(ths. m ³ /enterpr.)	287.17	57.99	670.35	29.20
Turnover per timber stock (EUR/m ³)	1.31	2.29	0.21	5.91
Procured merchantable wood (ths. m ³)	17,506.7	490.0	447.5	37,045.0
Turnover per procurement of merchantable wood (EUR/m ³)	134.30	210.11	208.40	383.31

Data sources: 1. State Statistics Service of Ukraine. 2. State Statistics Service and State Forest Resources Agency of Moldova. 3. Main statistics: Industry. National Statistics Office, Tbilisi, Georgia. 4. Central Statistical Office. 2013. Forestry 2013 (in Polish). Warsaw, Poland.

Note:¹ the value of sold production is given here instead of turnover

Table 3 Macroeconomic position of the ENP-EaP forest-based sectors, 2012

Parameter	Ukraine	Moldova	Georgia	Poland ¹
Sector share of national turnover (%)	1.8	3.47	1.4	5.0
Sector share in national employment (%)	6.6	12.1	1.0	9.0
Sector's share to the overall GDP %	1.68	1.88	0.90	1.60

Note:¹ the value of sold production is given here instead of turnover. Figures consider only wood industry and furniture industry (16+31 acc. to NACE Rev. 2)

The national forest resources are the backbone of these forest-based sectors (Table 2). The analysis reveals decisive differences in the importance of forest resources in relationship to the national forest-based sectors. In absolute figures, Ukraine has the largest resources.

In relative terms, Moldova has scarce forest and timber resources available for wood processing, while Georgia on the contrary holds the most abundant resources (these are however indicative potentials, but in reality are not technically fully accessible). Still, the large contrast to the higher developed Polish sector becomes evident in the key parameters sold production per timber stock and procurement of merchantable wood.

Considerable differences exist also in the enterprise structure. Ukraine shows an average turnover per enterprise that is nearly three times higher than in the other countries (Fig. 4), which confirms a prevalent existence of much larger companies in Ukraine (Fig. 5). However, the overall productivity in terms of turnover per employee is approximately three times higher in Poland than in the ENP countries (Fig. 6).

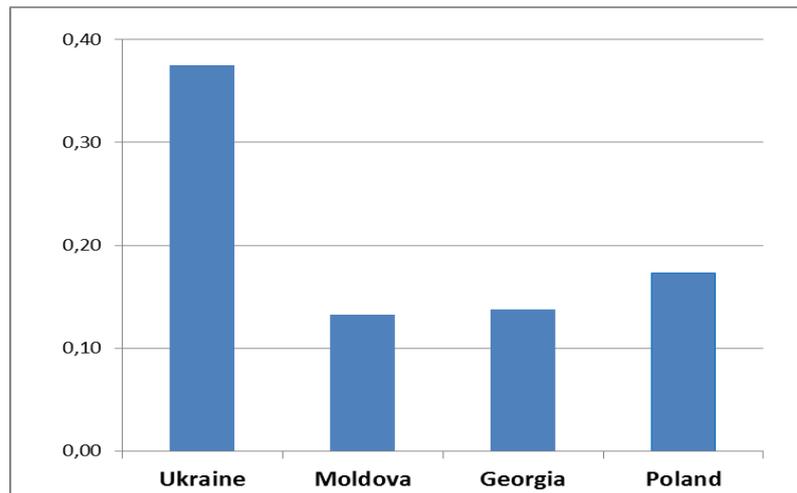


Fig. 4 Average turnover per enterprise in the forest-based sector, 2012

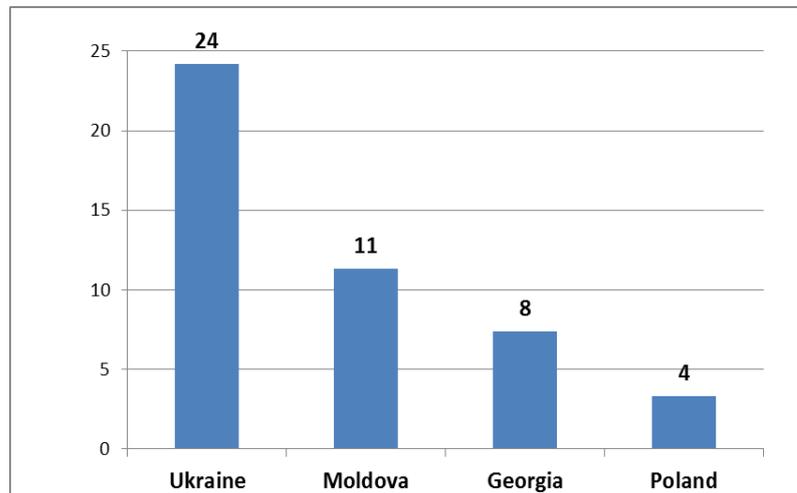


Fig. 5 Average employees per enterprise in the forest-based sector, 2012

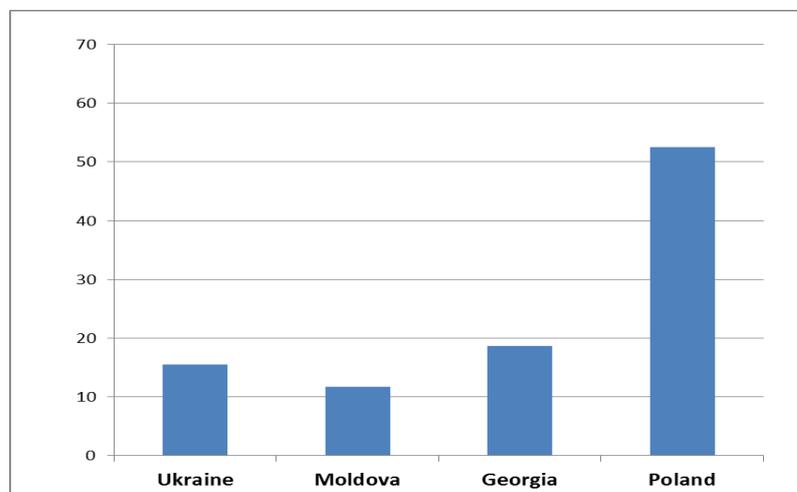


Fig. 6 Average turnover per employee in the forest-based sector, 2012

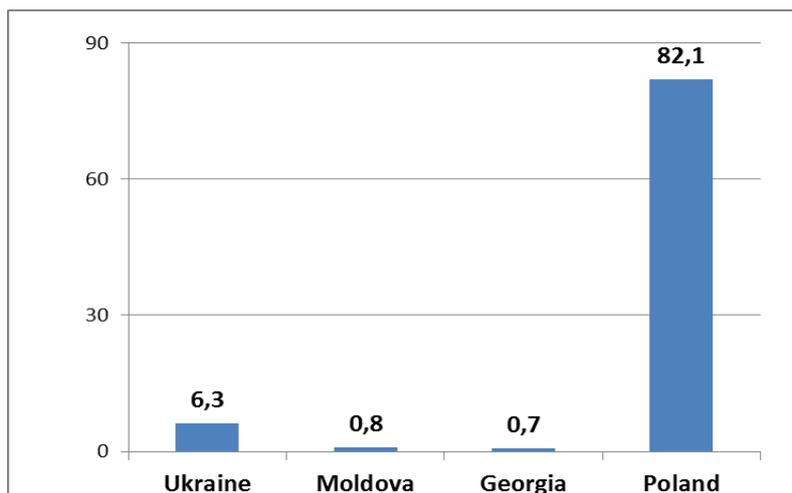


Fig. 7 Enterprises in the forest-based sector, 2012

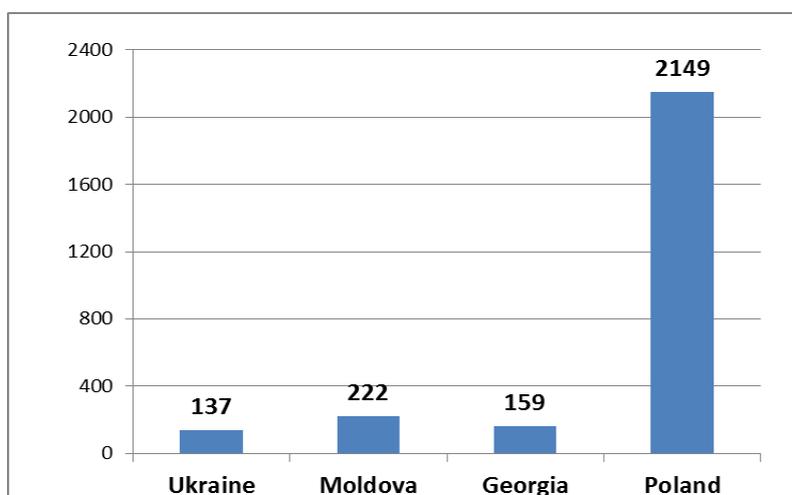


Fig. 8 Enterprises per million inhabitants, 2012

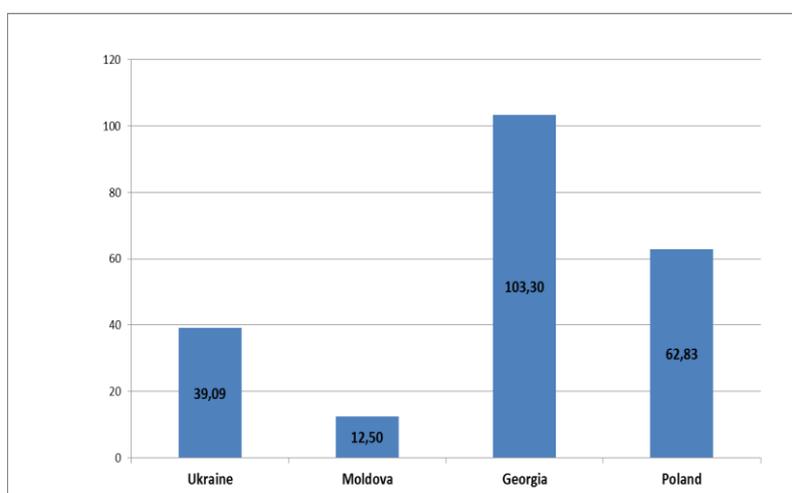


Fig. 9 Timber stock per inhabitant, 2012

The Polish forest-based sector comprises over 82.000 mostly small enterprises (in average 4 employees per enterprise). In contrast, the much larger ENP country Ukraine has only 6.300 enterprises (Fig. 7). Taking into account the countries' dimensions and existing forest resources, we still can observe this large difference in the number of enterprises per million of inhabitants (Fig. 8) and the timber stock per inhabitant (Fig. 9).

These figures illuminate the realities of the forest-based sector in ENP countries, where a large shadow sector exists and where doing business is faced with many difficult, complicated conditions. The main difficulties are, among others, the complicated process of creating and regularisation of a business, the increasingly unpredictable availability of timber in these countries, ineffectiveness of the state ownership in various areas of the forest-based sector, and a complicated and intransparent procedure of timber sales.

The high importance of a favourable framework for business and markets obtains further evidence in the comparison of trends in the sector (Table 4). Ukraine's turnover in the sector increased by +56% from 2008 to 2012, while at the same time the number of enterprises (-49%) and employees (-20%) decreased considerably, indicating a new structural shift towards larger enterprises and a growing shadow sector. In contrast, Georgia's turnover in the sector jumped by +311% in the same period, and the number of enterprises (+19%) and employees (+43%) increased decisively, which is clearly a result of the vital economic reforms currently being implemented. Georgia is notably the only country showing employment growth in the sector.

Table 4 Trends of the ENP-EaP forest-based sector, 2008 - 2012

Country	Turnover ¹ (million EUR)			Enterprises (number of)			Employees (ths. persons)		
	2008	2012	Change (%)	2008	2012	Change (%)	2008	2012	Change (%)
Ukraine	1,502.0	2,349.3	+56.4	1,229.2	6,268	-49.0	189.4	151.7	-19.9
Moldova	99.5	102.6	+3.1	667	776	+16.3	13.1	8.8	-32.8
Georgia	22.7	93.3	+311.0	572	678	+18.5	3.5	5	+42.9
Poland ²	12,668.4	14,230.6	+12.4	8,480.2	8,2194	-3.1	316.4	271.2	-14.3

Notes : ¹ Turnover figures converted into EUR as per 2012. ² sold production instead of turnover.

http://ec.europa.eu/budget/contracts_grants/info_contracts/infoeuro/infoeuro_en.cfmexchangerates

Important results on resource efficiency and productivity provide the analyses of turnover per 1 m³ of procured merchantable wood and per 1 m³ of overall timber stock (Figures 10 and 11). The Polish forest-based sector turns out far much more productive compared to the ENP countries (e.g. turnover per procured merchantable wood in Poland is 2.8x higher than in Ukraine). Of course there is a considerable difference between price levels of forest products in the EU and in the ENP countries, but still it can be concluded that the value added derived per unit of timber is much lower in ENP countries. Furthermore, the forest-based sector's share of the national GDP does not exceed the level of 2% (Fig. 12). This index shows even a tendency of constant decrease, owing to stronger growth in other sectors.

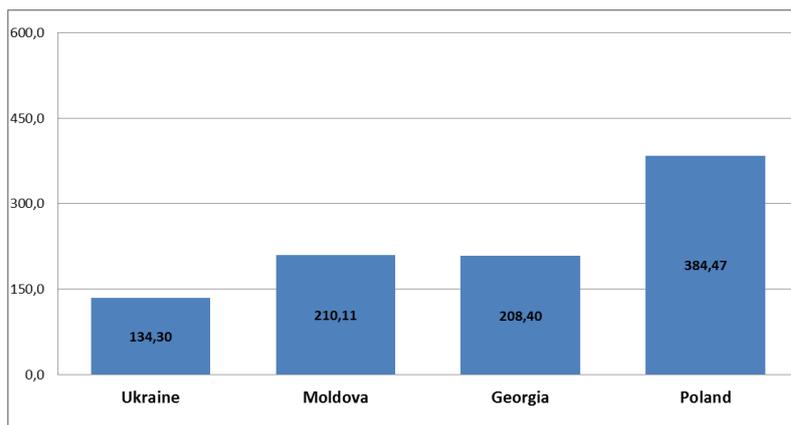


Fig. 10 Turnover per procurement of merchantable wood, 2012

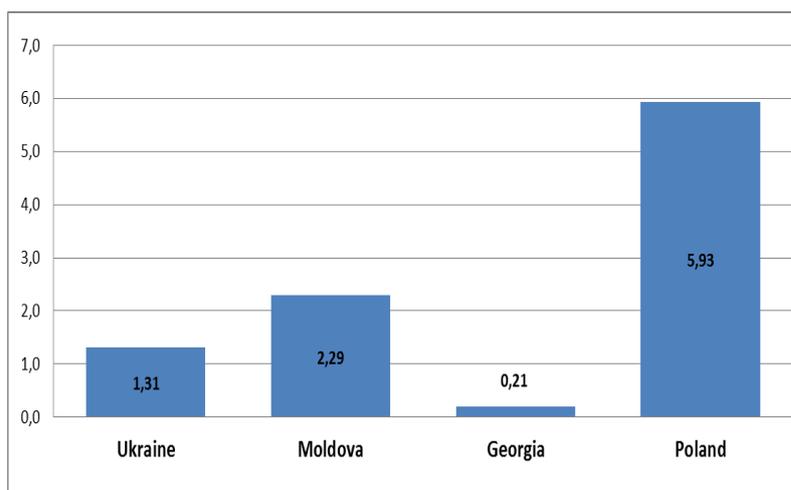


Fig. 11 Turnover per timber stock in the ENP forest-based sector, 2012

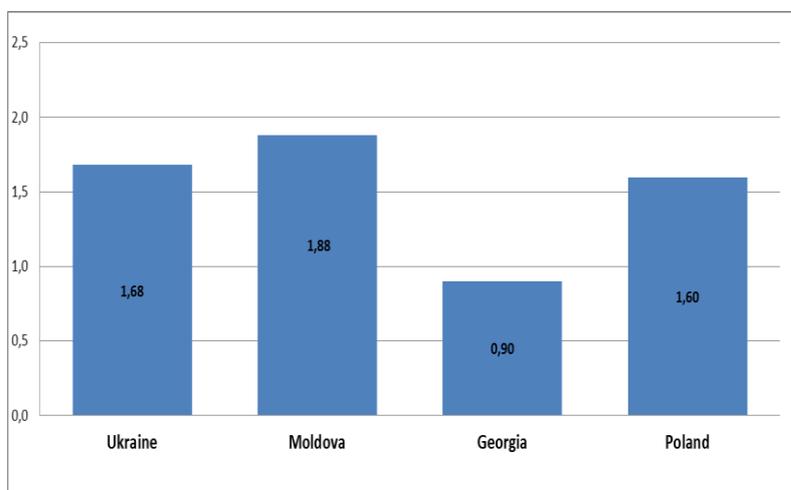


Fig. 12 Forest-based sector's share of national GDP, 2012

1.2 Main challenges

The RERAM baseline study identified the following main barriers and challenges for the forest-based industry in Eastern Europe.

1. **Undervalued raw materials:** Wood-based processing and manufacturing largely decreased, deteriorated or collapsed in most ENP countries following the end of the socialist era. Today the forest-based sector in Eastern Europe relies largely on timber raw material extraction, only basic processing and export.
2. **Undersized sector:** The forest-based sector in ENP countries is of small size compared to the national wood resource potential. The number of enterprises is small because of very difficult business conditions, unreliable availability of timber, non-effectiveness of state ownership and intransparent, complicated procedures for timber sale.
3. **Low productivity, low resource efficiency:** The production efficiency in ENP countries, e.g. in terms of output per employee, is in general much lower than in the EU. They produce less products in terms of turnover from 1 m³ of procured merchantable wood and from 1 m³ of overall timber stock.
4. **Lack of higher value added:** Capacities of secondary processing are not developed, which is a main barrier to promote growth in the sector. To catch up, ENP countries need considerable investments, effective hands-on support programmes to implement and upgrade new technologies, tools, equipment, market innovations and restructuring measures.
5. **Globalised markets:** ENP countries hold considerable, yet less developed forest resources with a comparatively average lower land use pressure than in Western Europe. A constantly growing demand for wood raw materials in European markets lead to higher raw material imports and growing pressure on forests that hold substantial, unexploited wood resources in neighbouring Eastern Europe. Bilateral industry initiatives, cooperative supply chains, market promotion and international knowledge transfer between ENP and EU countries are needed, to develop domestic capacities. A key challenge here is the regulatory framework that needs to be enhanced and enforced.
6. **Macroeconomic role and conscience:** The forest-based sector's share of the national GDP in ENP countries is, similar to EU countries, below 2%. A common understanding as a vital sector of the economy, which unites all subindustries, which are connected to the resource 'forest', is still inexistent in ENP countries. The main challenge is to initiate a coordinated effort of market actors and stakeholder to develop and promote adapted sustainable management regimes for the abundant resource. This is extremely important to ensure a viable balance of economic, social and environmental principles. Without such a common understanding, the forest-based sector will be unable to keep a balance between industrial growth and long-term sustainability.

1.3 Main recommendations

The following main recommendations for the development of sustainable production and a modern, competitive forest-based sector in Eastern Europe have been identified.

1. ***Formation of a joint forest-based sector initiative***

- To promote a better understanding and collaboration of the forest-based industries as one economic sector (which can also be termed an economic complex, a cluster, or a unified supply chain), a new organisation or institution needs to be set up with the mission to unite and join the forces of the various subindustries and stakeholders.
- It is important that the initiative is in principle inclusive to all subindustries, that means from forestry to all woodworking industries, furniture, pulp and paper industries, wood energy, non-wood forest products, green tourism, ecosystem services, etc.
- Its purpose shall be to assess the sector's status, barriers and potentials, and to develop a common vision, priorities and innovative actions for sectoral support.
- The second main purpose is to raise awareness and improve public perception of the sector's potentials for sustainable growth and climate protection in the bioeconomy.

2. ***Promoting resource efficiency in the forest-based industries***

- One main direction of activity for the joint initiative is to develop targeted support programmes that help small and medium enterprises in the sector to implement cleaner production and sustainability principles in their business models.
- These programmes should aim at the reduction of wasted raw materials and energy, higher recycling rates, less environmental pollution and the technological modernisation of the industry.
- Innovation vouchers and grants, enterprise checks and audits, competitions and prizes as well as joint market promotion tools are effective methods to facilitate the broader market uptake of resource efficiency solutions in the sector.
- Dedicated training and qualification programmes are also important to upgrade knowhow and competence of company managers and technical staff.

3. ***Stimulate higher value adding and improve business climate***

- 'From volume' to value added': Today the forest-based sector of Eastern Europe is undersized, unproductive and depends largely on the export of unprocessed raw timber or low grade products. Therefore another important direction is the promotion of new investments into higher level manufacturing and higher domestic value adding.
- Specific promotion programmes need to be developed to support local woodworking companies in the acquisition of new technologies, tools and equipment, the preparation of new investments and the implementation of innovations and upgrade production systems and competence.
- A main objective of these programmes should also be to stimulate new foundations of enterprises and to create higher employment in local communities.

1.4 Outlook

The forest-based sector in Eastern Europe (ENP-EaP countries) has real perspectives. There are at least a few reasons for a cautiously positive outlook.

1. Wood is a remarkably versatile material with at least four extraordinary properties, so-called 4-R properties of wood, as a unique material:
 - Wood is a renewable material (natural regrowing resource)
 - Wood is a reusable material (conversion in value chains)
 - Wood is a recyclable material (zero waste, zero emission)
 - Wood is a refineable material (value added, upgraded products)
2. Industries that work with solid wood have a potential to be united as a forest-based sector, which can be considered as very important, because it offers a simple way to reduce CO₂ emissions that are the main cause of Climate Change, through:
 - Carbon sink effect of the forests (CO₂ absorption by trees)
 - Carbon storage effect of wood products (for hundreds of years)
 - Substitution of carbon-intensive materials (innovative wood products)
3. Wood is today a globalised commodity. A constantly growing demand for wood raw materials in European markets leads to higher raw material imports and growth in the EU, with decisive structural changes in the sector – within the EU and beyond.
4. The wood-based industries, emerging anew in post-socialist economies, can play a key role in this context, as they could develop an even stronger impact on regional production, employment and value adding – based on their regional natural resources.
5. The forestry and woodworking sector in ENP eastern countries shows decisive opportunities for improvement of the current state, notably through increase of raw material efficiency and technological upgrading.
6. It is therefore paramount to identify the main challenges for increased sustainable production in the woodworking industries in Eastern Europe and to elaborate concrete measures and initiatives, which allow for gradually solving and avoiding all identified disadvantages.

The forest-based sector is comprised of a large number of SMEs, mostly lacking proper organisational structures and staff to implement efficiency measures. Improvements are however urgent, because this SME-dominated sector consumes huge amounts of raw material per employee, which is currently harvested in an unsustainable manner. The focus to promote new strategies and solutions is therefore: resource efficiency.

2. Objectives and methods

The main objectives of the present survey are:

- Analyse the main economic parameters of the forest-based sectors of Ukraine, Moldova, Georgia and Poland
- Analyse the forest resources in these countries
- Analyse the contribution of these forest-based sector to national GDP
- Identify the main challenges for development of the ENP forest-based sector

The survey is based on a comparison of the three selected ENP countries on the one side and Poland on the other. This choice is motivated by the following reasons:

- Ukraine, Moldova and Georgia are among the most important countries in economic terms in the Eastern Partnership.
- They have declared their commitment towards a European way of development and it is important to evaluate the forest-based sector's opportunities early on from the beginning.
- Poland is a prime case of a post-socialist country that developed into a leading member of the European Union.
- Many similarities exist between the forest-based sectors of Ukraine and Poland.

The four countries were analysed on national level. In addition, two selected subregions were analysed, to obtain a more appropriate baseline for the regional context: a) the Carpathian Region of Ukraine, which comprises four administrative districts (oblasts) of Western Ukraine, and b) the Wiekopolski region of central Poland.

Several parameters about forest resources are assessed. The main parameters addressing the forest-based industries are turnover, number of enterprises and number of employees, which are analysed for all four countries for the five-year time period from 2008 to 2012. Absolute and relative changes were investigated (year 2008 as basis). Furthermore, several relative indices are analysed for 2012:

- Turnover per enterprise in manufacturing
- Turnover per employee in manufacturing
- Number of enterprises per 1 million inhabitants
- Average number of employees per enterprise.

The methodology for the forest-based sector analysis was elaborated by the UNFU team (cf. deliverables D2.1 and D2.2). The national and regional data collection and surveys were conducted by national teams of the RERAM project, who are co-authors of this report.

3. State of the forest-based sector in ENP-EaP countries

3.1 Ukraine

3.1.1 Forest and wood resources

Table 5 Forest resources of Ukraine, 2012⁷

Index number	Index name	Value
1	Square of the forest land, million hectares	10.8
2	Overall timber stock, billion m ³	1.8
3	Forest land percentage, %	15.7
4	Average annual timber growth per hectare, m ³ per hectare	4
5	Overall annual timber growth for country, million m ³	35 ⁸
6	Percentage of annual timber growth usage, %	50 ⁹

Table 6 Wood resources of Ukraine, 2008-2012¹⁰

Year	Value		
	Procurement of merchantable wood, ths m ³		Wood output, sawn or split, more than 6 mm wide, ths m ³
	Total value	Including main felling	
2008	15,723.7	6,996.8	2,266.3
2009	14,221	6,704	1,753.5
2010	16,145.6	7,239.0	1,736.0
2011	17,510.3	8011.7	- ¹¹
2012	17,506.7	7,790.2	-

3.1.2 Forest property structure

Nearly 99 % of Ukrainian forest belongs to state property. For performing forest management forests are given for permanent use to different Ministries and agencies¹². Among them: State Forestry Committee – 7.5 mio. ha (68%), Ministry of Agrarian Policy and Food – 1.8 mio ha (17%), Ministry of Defense – 0.2 mio ha (2%), Ministry of Emergency Situations – 0.2 mio ha (2%), Ministry of Environment and Natural Resources – 0.1 mio ha (1%), Ministry of Infrastructure – 0.1 mio ha (1%), other ministries and Agencies – 0.2 mio ha (2%), forests on state reserve lands – 0.7 mio ha (7%).

⁷ State Forest Resources Agency of Ukraine

⁸ estimated data

⁹ estimated averages, depending on the amount of logging

¹⁰ State Statistics Service of Ukraine

¹¹ dataset is not available

¹² State Forest Resources Agency of Ukraine

Table 7 Harvesting of marketable roundwood in Ukraine, 2012 ¹³

Index name	Value
Procurement of merchantable wood, ths m ³	17,506.7
Round timber (from total procurement), ths m ³	7,850.8
for sawn timber	5,879.0
for the plywood and veneer production	427.0
for building	383.2
for pulp and paper production	1,025.9
Wood for technological purposes, ths m ³	4,398.8
Firewood	4,584.2

Table 8 Wooden wastes in Ukraine (ths tons), 2011/2012 ¹⁹

Year	Generated ¹⁴	Utilized, processed	Incinerated to generate energy
2011	712.4	101.9	244.5
2012	767.5	88.8	359.2


Fig. 13 Map of Ukraine on the European Forest Map ¹⁵
¹³ State Statistics Service of Ukraine

¹⁴ Including wastes from households

¹⁵ Schuck, A., Van Brusselen, J., Päivinen, R., Häme, T., Kennedy, P. & Folving, S. 2002. Compilation of a Calibrated European Forest Map Derived from NOAA-AVHRR Data. Joensuu. p. 44.

3.1.3 Markets and players

MAIN PLAYERS OF THE UKRAINIAN FORESTRY SECTOR

As for the division of executive powers, it is the State Forest Resources Agency of Ukraine that is in charge of the forest branch, while the wood-processing and furniture branches are overseen by the corresponding department of the Ministry of Industrial Policy of Ukraine.

1. State Forest Resources Agency is the main state authority in forest and hunting management.
2. Association of furniture and woodworking enterprises and organizations of Ukraine “Mebelderevprom”.
3. Ukrainian Association of Furniture Manufacturers.
4. Ukrainian Association of Wood Processing Equipment.
5. Ukrainian Association of the professional woodworkers.
6. Researching and educational institutions (2 researching institutes, 4 high educational universities, 15 colleges and 2 forest schools).

There are several factors that stipulate the importance of developing the forest and wood based industries in the country’s economy:

- There is always a great demand for the products of the forest and wood based industries. This demand is grounded by a number of factors: if the economy of the country (region) is developing, it is necessary to supply the construction branch with the products of the forest and wood based industries (furniture, floor, windows, doors, wooden (timber) building structures etc); philosophical and psychological necessity for combining personality and nature stimulates growing demand for the products of the forest and wood based industries; even though most of the products of the forest and wood based industries are for long-term use, their physical and moral aging generates extra demand;
- Out of theoretical considerations, an industry that uses relatively “unlimited” resources will always have priority over an industry that taps finite resources, both raw materials and energy resources;
- Countries (regions) with the existing forest reserve always have deep historical traditions in regard to the development of the forest and wood based complex. Consequently, there are dynasties, schools, crafts, enterprises, complexes, and the necessary educational infrastructure for supplying this complex with human resources. Therefore, the effective development of the forest and wood based complex can stimulate social well-being;
- The development (technical and technological re-equipment and upgrading) of the forest and wood based industries requires small investments in comparison with other industries.

MARKET POSITION

Before independence, the annual harvesting level in Ukraine was 15 million m³. The total use of roundwood equivalent was 36–38 million m³. Hence, imports from Russia and Belarus were significant¹⁶.

The current roundwood removals and foreign trade is presented in Fig. 6. According to official statistics, the level has recently been in the region of 17 million m³ per year. It is worth noting that a great proportion of roundwood removals is low-quality wood, which is used as firewood or for other purposes with low quality requirements. This is caused by the significant amount of sanitary cuttings where the quality is poor. Often high-quality roundwood is exported, and lower-quality logs are processed by the State Forest Enterprises and semi-processed products as unprocessed sawnwood are exported. Consumption of forest products per capita in Ukraine is significantly below the European average.

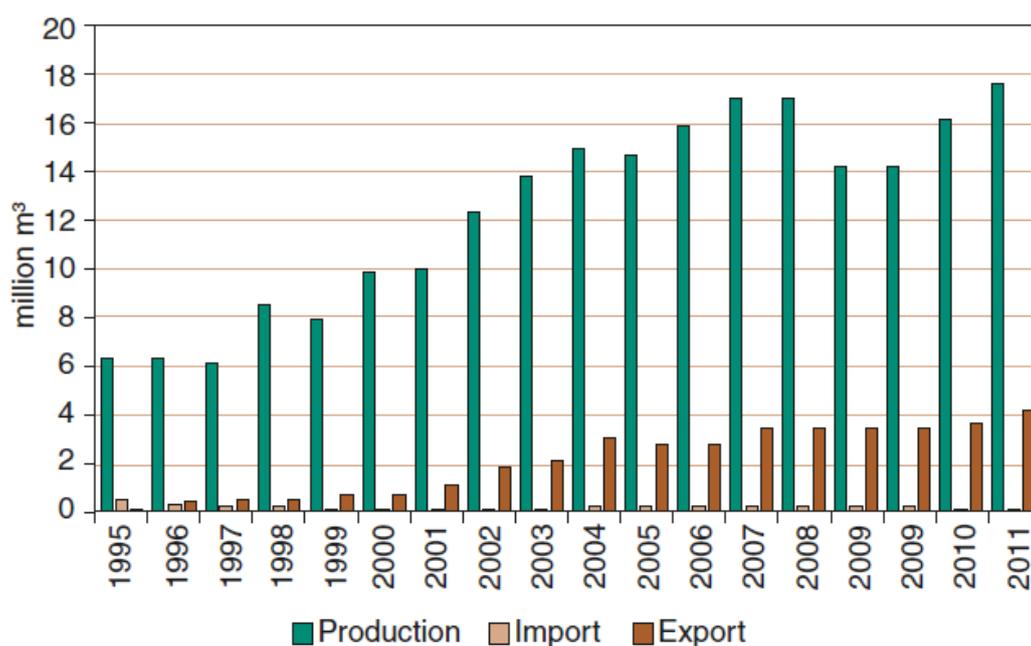


Fig. 14 Removals and foreign trade of roundwood in Ukraine, 1995-2011¹⁷

Since 2000, the forest industry of Ukraine has been developing steadily¹⁸. The main drivers for development were the export of processed timber and growth in the construction business. Ukraine is a net exporter of roundwood, sawnwood and plywood. The main export products (roundwood and sawnwood) are unprocessed or marginally processed, and hence there is a significant potential for further processing within the country. Import and export of particle board are roughly balanced. However, Ukraine is a net importer of fiberboard. The domestic production of fiberboard decreased during the 2000s.

¹⁶ Buksha, I. 2004.

¹⁷ FAOSTAT, 2011

¹⁸ Lopatin et al. 2011.

3.1.4 Forest-based sector

Key results

1. Ukraine's forest-based sector in 2012 we can characterize by the following indexes: turnover – 23.6 bil. UAH (1EUR ≈ 11 UAH); enterprises – 5667; employees – 151, 7 ths persons.
2. Average enterprise of Ukraine's forest-based sector is enterprise which we can characterize by the following indexes: average turnover – 3.9 mio. UAH; average number of employees – 24 persons.
3. From 2008 to 2012 we observe three trends in Ukraine's forest-based sector: turnover increasing, number of enterprises decreasing and number of employees decreasing.
4. There is no comprehensive understanding of national forest-based sector in Ukraine in reference to common definition, main goals and strategy.

Table 9 National forest-based sector of Ukraine, 2008 -2010 ¹⁹

Main parameters	Year	Subindustry ²⁰				Total national forest-based sector
		Forestry (02)	Woodworking industry (20)	Furniture manufacturing (36.1)	Carpentry (45.22) + Joinery (45.42)	
1	2	3	4	5	6	7
Turnover, bil. UAH	2008	2.9	6.8	5.4	0.5	15.6
Enterprises, units		1,626	8,990	1,676	- ²¹	12,292
Employees, ths. persons		83.7	50.7	51.3	3.7	189.4
Turnover, bil. UAH	2009	2.8	6.4	3.9	0.6	13.7
Enterprises, units		1,612	8,963	1,700	-	12,275
Employees, ths. persons		74.6	43.9	39.8	3.5	161.8
Turnover, bil. UAH	2010	3.6	7.4	4.9	0.4	16.3
Enterprises, units		1,694	9,436	5,539	-	16,669
Employees, ths. persons		72.1	43.6	38.7	2.9	157.3

Note * - global analyses of the Ukraine's forest-based sector require two steps (tables) because of different classification systems in 2008-2010 and in 2011-2012

¹⁹ State Statistics Service of Ukraine

²⁰ according to the Classification of Type of Economic Activity (ДК 009:2005) (NACE Rev.1.1)

²¹ dataset is not available

Table 10 National forest-based sector of Ukraine, 2011-2012²²

Main parameters	Year	Subindustry ²³				Total national forest-based sector
		Forestry (02)	Woodworking industry (16)	Furniture manufacturing (31)	Wood products installation (43.32) +Flooring, wall covering (43.33) + Roofing (43.91)	
1	2	3	4	5	6	7
Turnover, bil. UAH	2011	6.6	10	6.2	0.77	23.6
Enterprises, units		934	3,126	1,512	713	6,285
Employees, ths. persons		69.2	42.8	37.1	3.99	153.09
Turnover, bil. UAH	2012	6.1	10.3	7.2	0.82	24.42
Enterprises, units		991	3,128	1,548	601	6,268
Employees, ths. persons		66.2	43.1	38.5	3.91	151.71

Table 11 Average forest-based sector's enterprise in Ukraine, 2012

Name	Parameter	Value
T_{ent}	Turnover per enterprise in the national scale, mio. UAH/unit	3.9
T_{emp}	Turnover per employee in the national scale ths UAH/person	161
N_{empl}	Average number of employees per enterprise in the national scale, persons/unit	24

Notes:

T_{ent} - turnover per enterprise in the national scale ($T_{ent} = T_{ov} / N_{ent}$;

T_{ov} – overall national forest-based sector turnover; N_{ent} – number of the enterprises in the national forest-based sector);

T_{emp} - turnover per employee in the national scale ($T_{emp} = T_{ov} / N_{emp}$;

T_{ov} – overall national forest-based sector turnover; N_{emp} – number of employees in the national forest-based sector);

N_{empl} – average number of employees per enterprise in the national scale ($N_{empl} = N_{emp} / N_{ent}$; N_{emp} – number of employees in the national forest-based sector; N_{ent} – number of the enterprises in the national forest-based sector).

²² State Statistics Service of Ukraine

²³ Classification of Types of Economic Activity (State Classifier 009:2010) (NACE Rev.2)

UKRAINE'S FOREST-BASED SECTOR CONTRIBUTION TO THE NATIONAL ECONOMY

Table 12 Turnover of the main industries in Ukraine, 2011²⁴

Industry	Turnover, mio. UAH	Percentage, %
Electric power, gas, water	295,164.8	23.3
Metallurgy, hard wares	242,525.9	19.2
Food products, drinks, wares of tobaccos	222,387.8	17.6
Extractive industry	146,085.7	11.6
Machine building	133,469	10.6
Coke, products of oil industry	77,783.4	6.2
Chemical industry	57,315.2	4.5
Other non-metal mineral products	56,624.3	4.5
Forest-based sector	23,600	1.9
Light industry	9,679.3	0.8

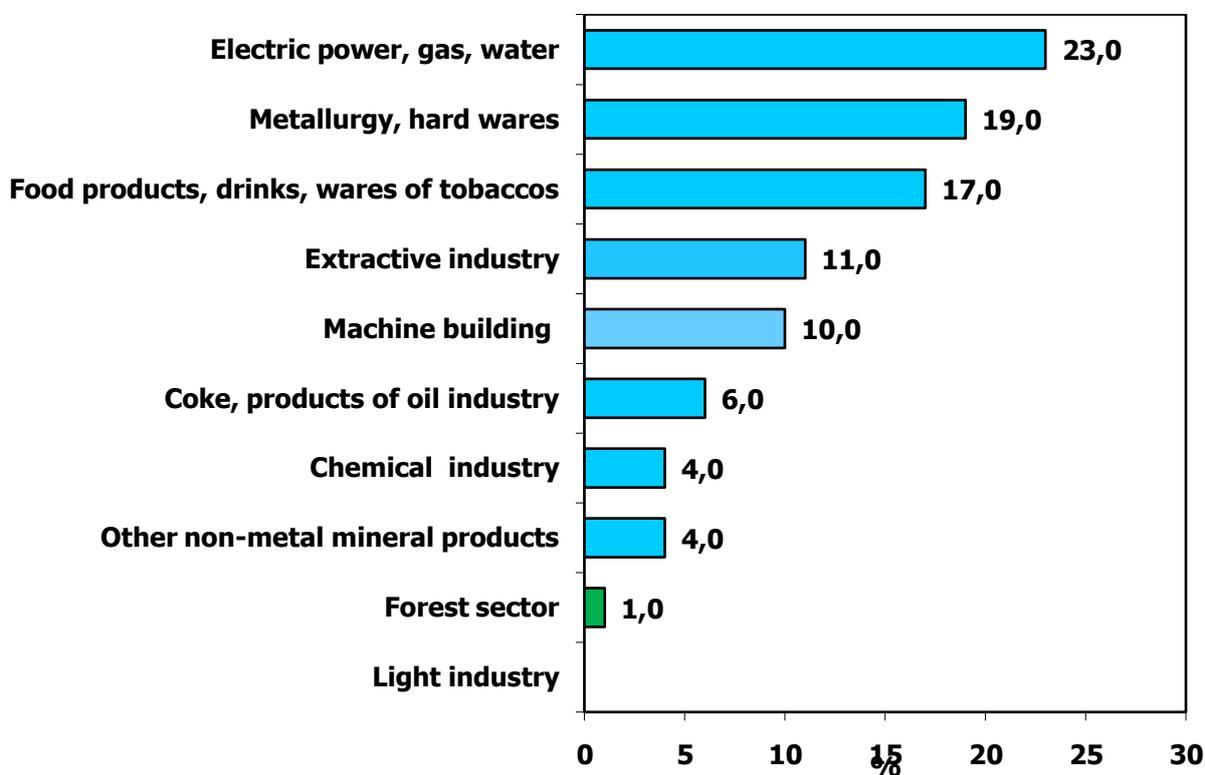


Fig. 15 Relative ranking of the major industries of Ukraine in turnover, 2011

²⁴ State Statistics Service of Ukraine

Table 13 Turnover of the main industries in Ukraine, 2012²⁵

Industry	Turnover, mio. UAH	Percentage, %
Electric power, gas, water	344,067.9	25.9
Food products, drinks, wares of tobaccos	254,459.9	19.1
Metallurgy, hard wares	223,832.5	16.8
Extractive industry	146,588.5	11.0
Machine building	143,533.1	10.8
Coke, products of oil industry	63,129.5	4.8
Chemical industry	60,011.1	4.5
Other non-metal mineral products	59,767.1	4.5
Forest-based sector	23,600.0	1.8
Light industry	9,876.1	0.7

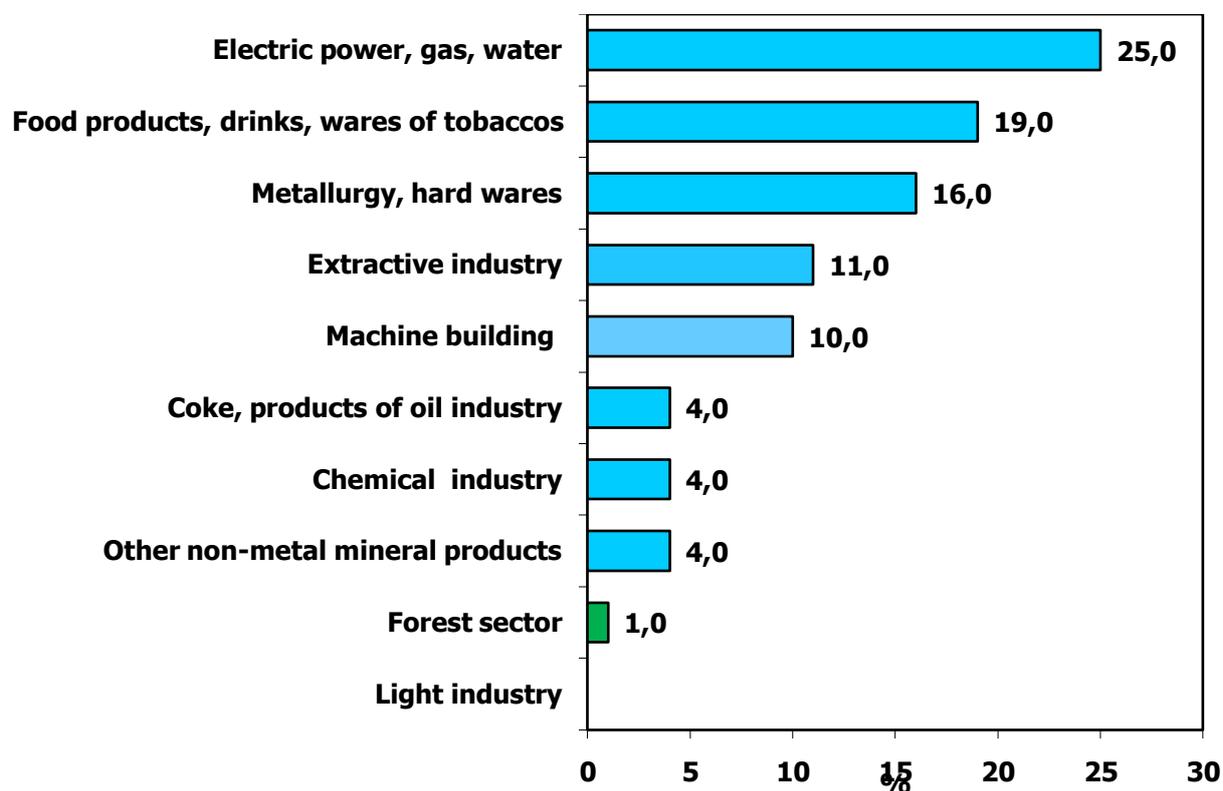

Fig. 16 Relative ranking of the major industries of Ukraine in turnover, 2012
²⁵ State Statistics Service of Ukraine

Table 14 Employees of the main industries in Ukraine, 2011 ²⁶

Industry	Employees, ths.	Percentage, %
Electric power, gas, water	500.5	21.3
Extractive industry	441.3	18.8
Food products, drinks, wares of tobaccos	363.5	15.5
Metallurgy, hard wares	323.9	13.8
Machine building	248.2	10.6
Forest-based sector	153.1	6.5
Chemical industry	105.3	4.5
Other non-metal mineral products	102.7	4.4
Light industry	77	3.3
Coke, products of oil industry	35.7	1.5

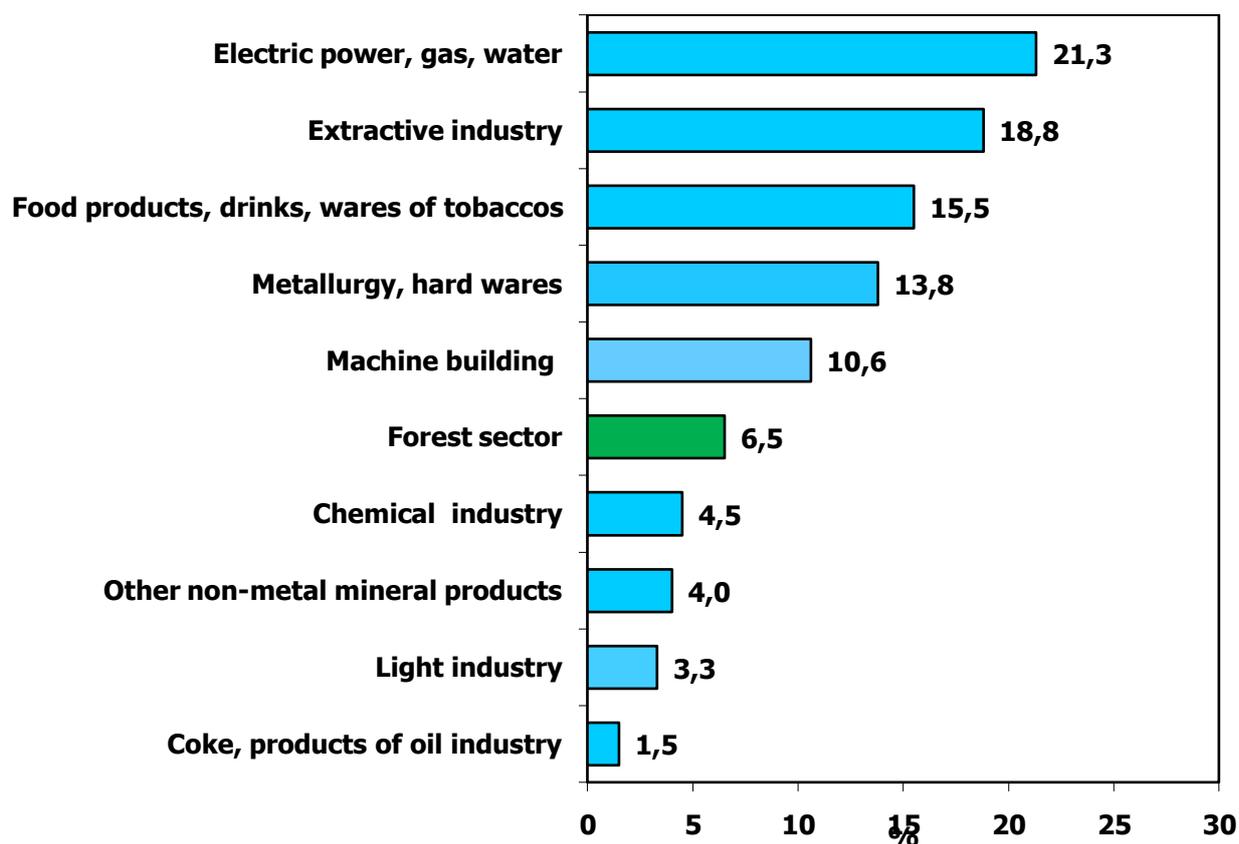


Fig. 17 Relative ranking of the major industries of Ukraine in employees, 2011

²⁶ State Statistics Service of Ukraine

Table 15 Employees of the main industries in Ukraine, 2012²⁷

Industry	Employees, ths.	Percentage, %
Electric power, gas, water	501.1	21.9
Extractive industry	424.2	18.6
Food products, drinks, wares of tobaccos	362.7	15.9
Metallurgy, hard wares	310.9	13.6
Machine building	236.2	10.3
Forest-based sector	151.7	6.6
Chemical industry	101.4	4.4
Other non-metal mineral products	93.5	4.1
Light industry	72.5	3.2
Coke, products of oil industry	31.1	1.4

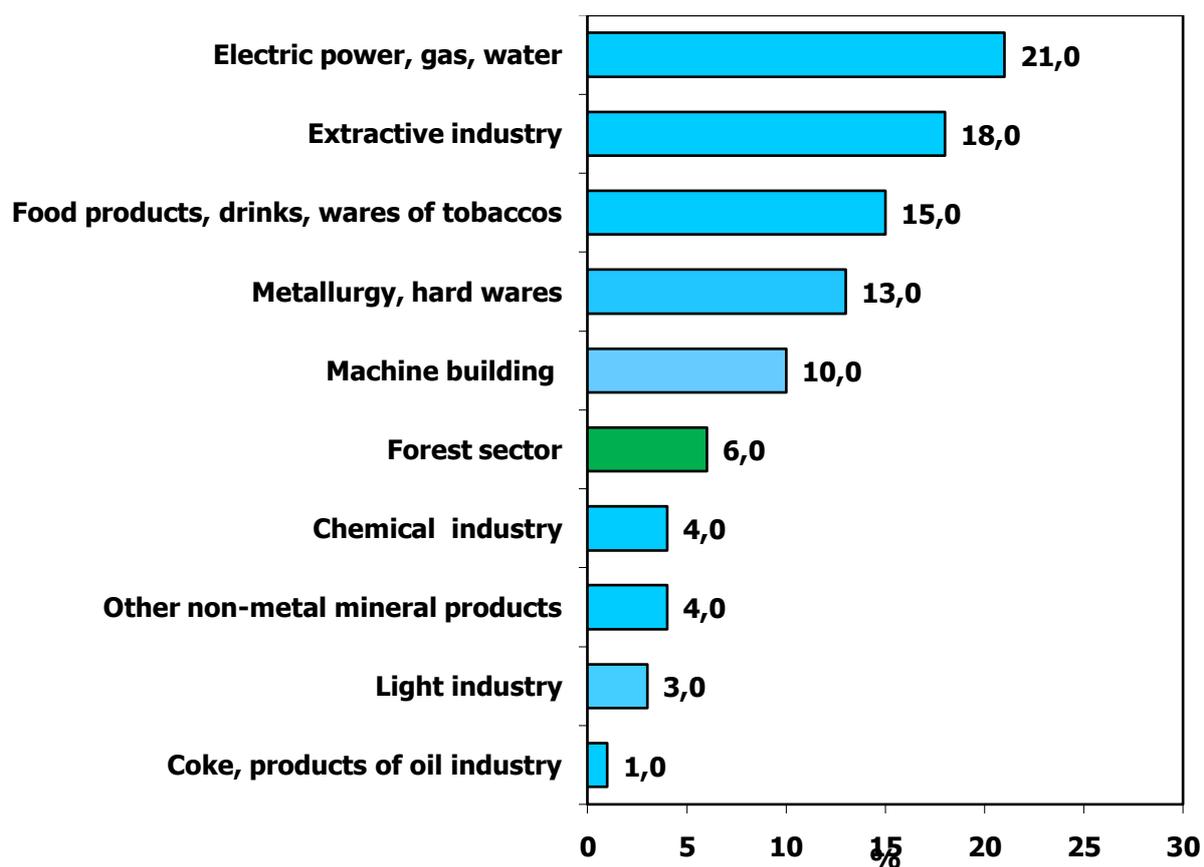

Fig. 18 Relative ranking of the major industries of Ukraine in employees, 2012
²⁷ State Statistics Service of Ukraine

Table 16 Ukraine's GDP and forest-based sector's turnover, 2008-2012

Year	GDP of Ukraine, mio. UAH	Turnover of the Ukrainian forest-based sector, mio. UAH	Share of the forest sector to GDP, %
2008	948,056	15,600	1.65
2009	913,345	13,700	1.50
2010	1,082.569	16,300	1.51
2011	1,316.600	23,600	1.79
2012	1,408.889	23,600	1.68

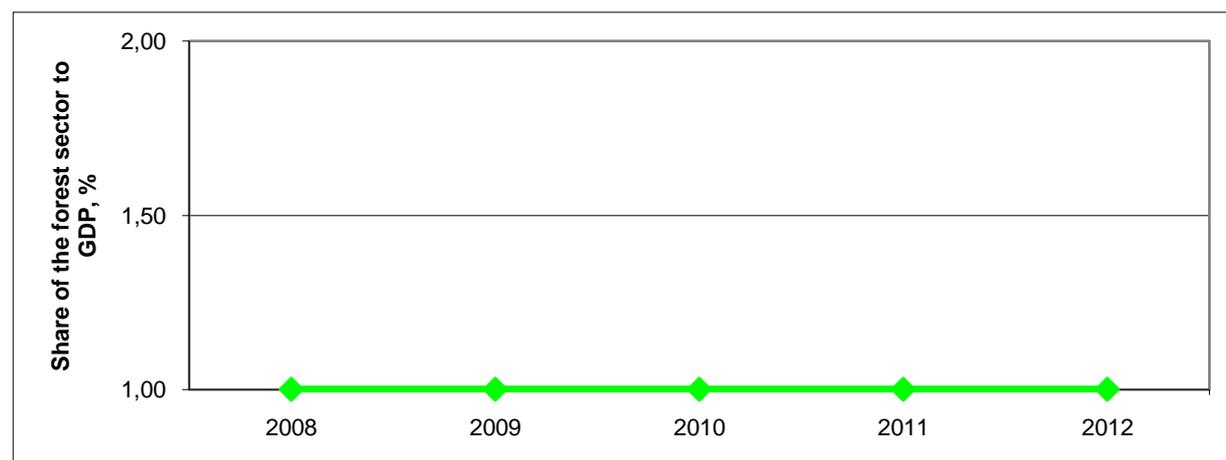
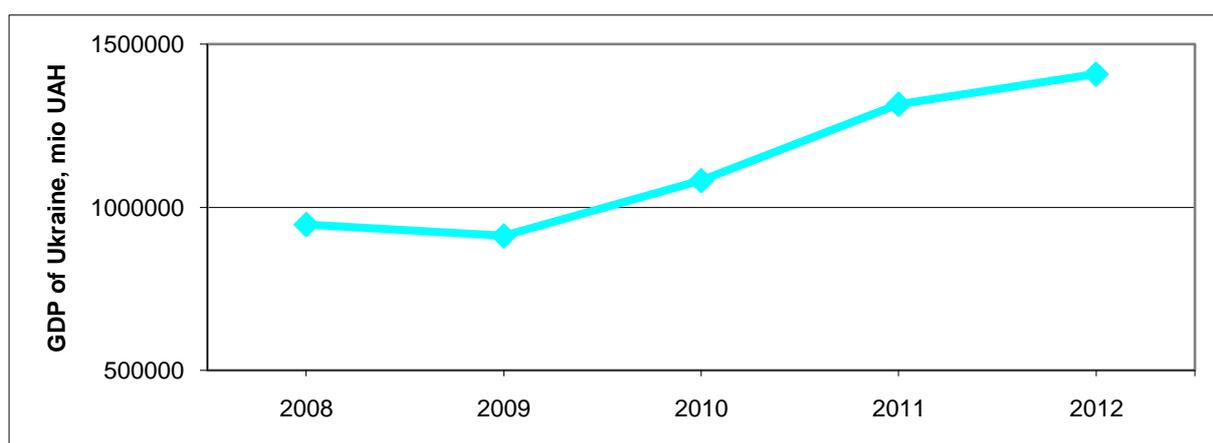


Fig. 19 Trends of GDP and forest-based sector's share in Ukraine, 2008-2012

3.1.5 Forest and wood resources of the Carpathian region of Ukraine

We have chosen as a region for RERAM analyses the Carpathian region of Ukraine, which includes 4 areas (districts/oblasts). The total area of the region covers 56.5 ths. km² or 9.4 % of the territory of the state. The Carpathian socio-economic region unites the south-west oblasts of Ukraine and borders with Volyn in the north, and Podillia in the east socio-economic regions. It coincides with the state border of Ukraine in the west and in the south. It enables the development of the industries, which would produce export products or provide their transit. In Ukraine, the region monopolises the market of bus, lift truck, diamond instruments, sulphur, and potassium fertilizers production. Such location creates the advantages of economic and geographic position of the region. The close bordering of the region with the European states favours co-operative relations both at the level of enterprises and entire industries. About 6.1 million people live on the territory of the region, which is 13 % of the population of Ukraine.



Fig. 20 Map of the Carpathian region of Ukraine

Wood resources in the Carpatian region of Ukraine

The forestland percentage of the area makes up 39.3%.

- Transcarpathian oblast – 51.2%;
- Ivano-Frankivsk oblast – 41.4%;
- Chernivtsi – 29.4%;
- Lviv oblast – 28.7%.

The overall growing timber stock amounts to 0.52 billion cubic meters. The average annual growth of forestland is 4.3 cubic meters per hectare. Forests of region produce about 9 million m³ of wood annually. The current harvest in in the forests of the State Forestry Agency of Ukraine in region amounts to 4.9 million m³ (63% of the annual growth).

Table 17 Wood resources of the Carpathian region of Ukraine, 2008-2012²⁸

Year	Value		
	Procurement of merchantable wood, ths m ³		Wood output, sawn or split, more than 6 mm wide, ths m ³
	Total value	Including main felling	
2008	4,459.1	1,831.2	664.0
2009	4,035.9	1,697	535.6
2010	3,933.6	1,617	505.7
2011	5,129.2	2,095.9	- ²⁹
2012	5,190.7	2,182.8	-

Table 18 Volume of illegal (unwarranted) felling in the Carpathian region of Ukraine³⁰

Source of data	Volume [mio. m ³]
State Forest Committee of Ukraine*	0,01
Research of the World bank	0,25-0,3
Experts estimation of project	1,0-1,25

* Note: referring to the forests of the State Forestry Committee of Ukraine

²⁸ State Statistics Service of Ukraine

²⁹ dataset is not available

³⁰ UNFU, FORZA, IIWH, 2008

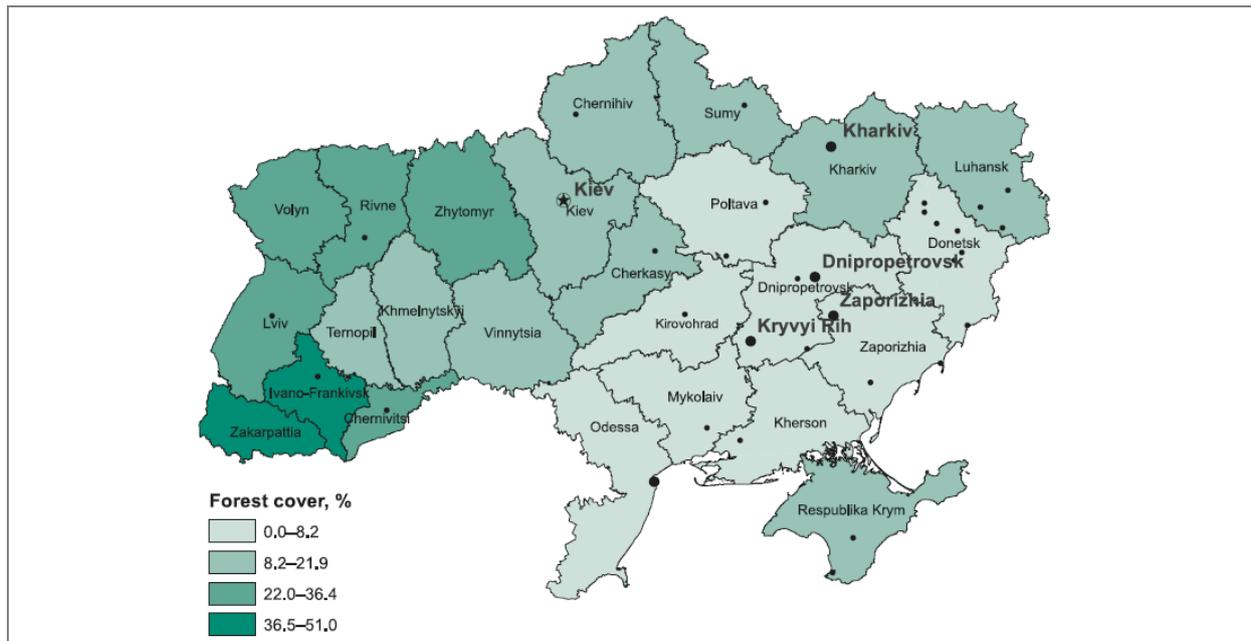


Fig. 21 Map of forest cover per oblasts of Ukraine ³¹

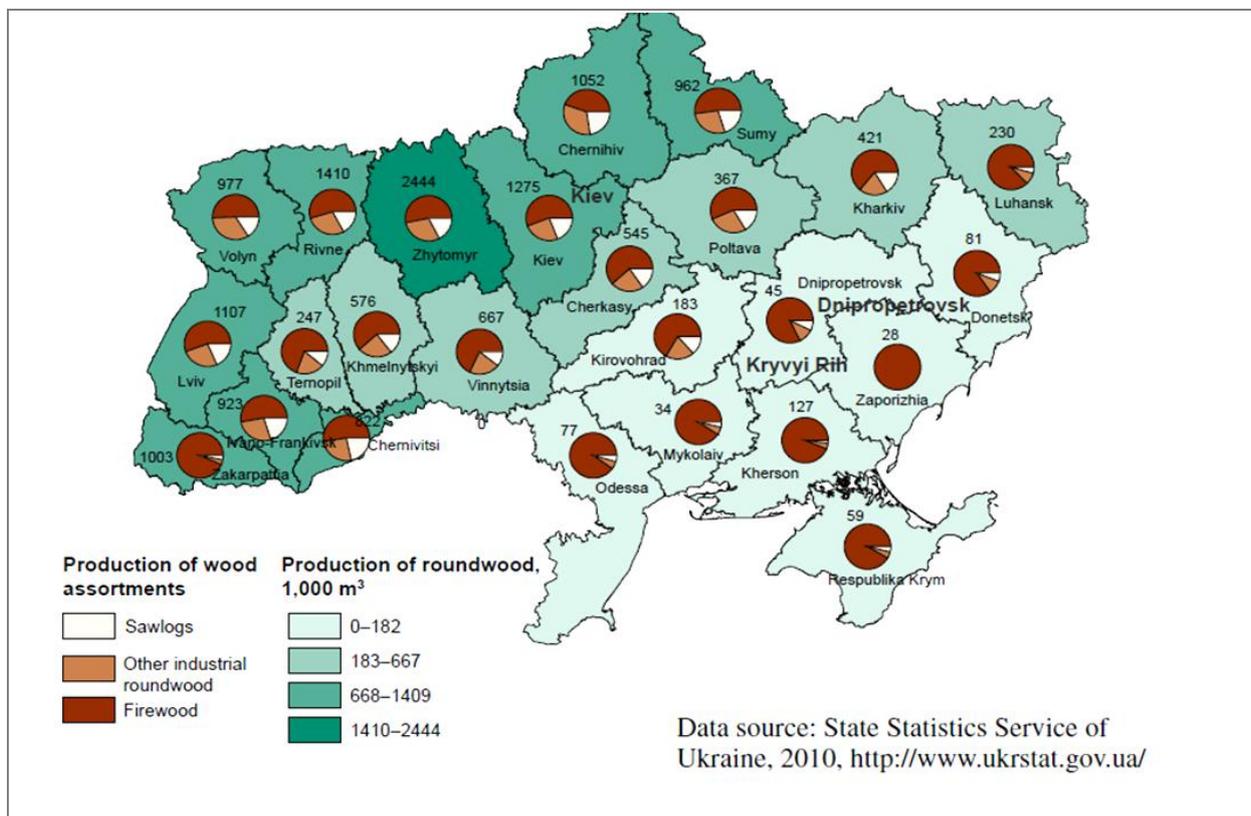


Fig. 22 Map of actual harvest volume per oblasts of Ukraine, 2010 ³³

³¹ State Statistics Service of Ukraine, based on remote sensing data

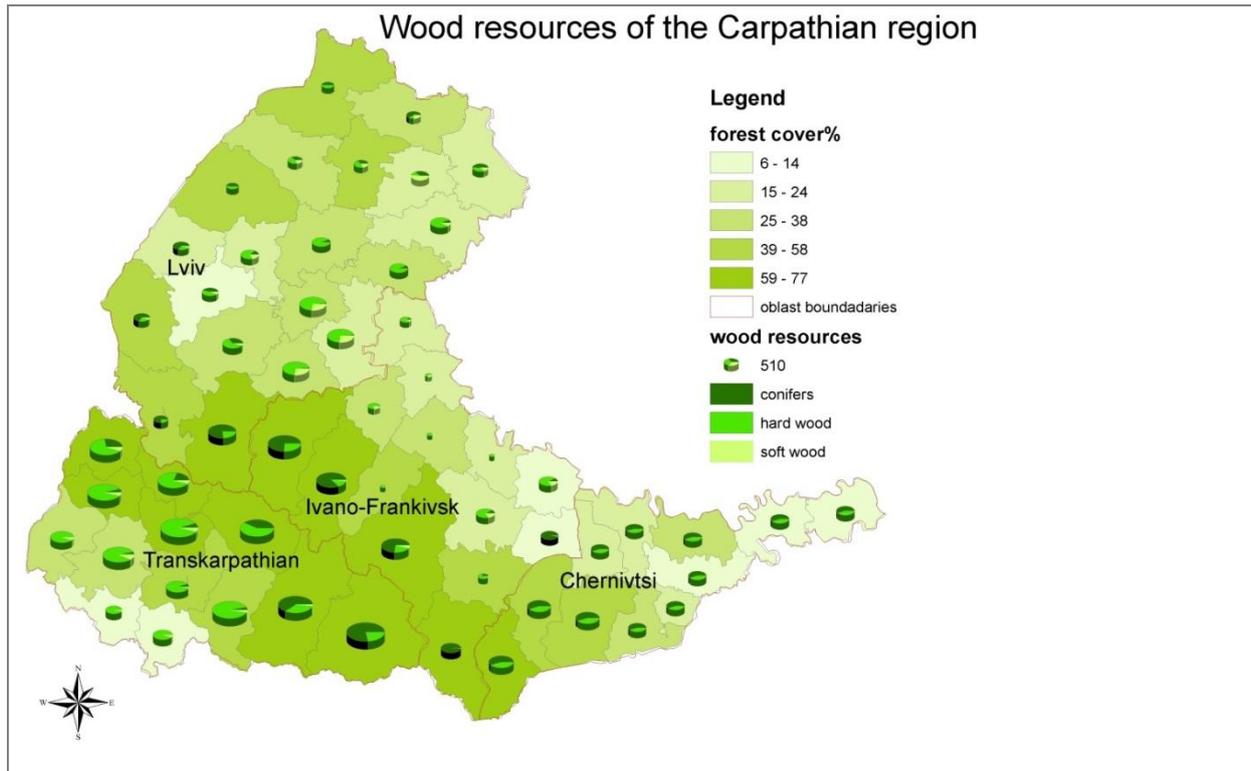


Fig. 23 Map of forest resources of the Carpathian region of Ukraine³²

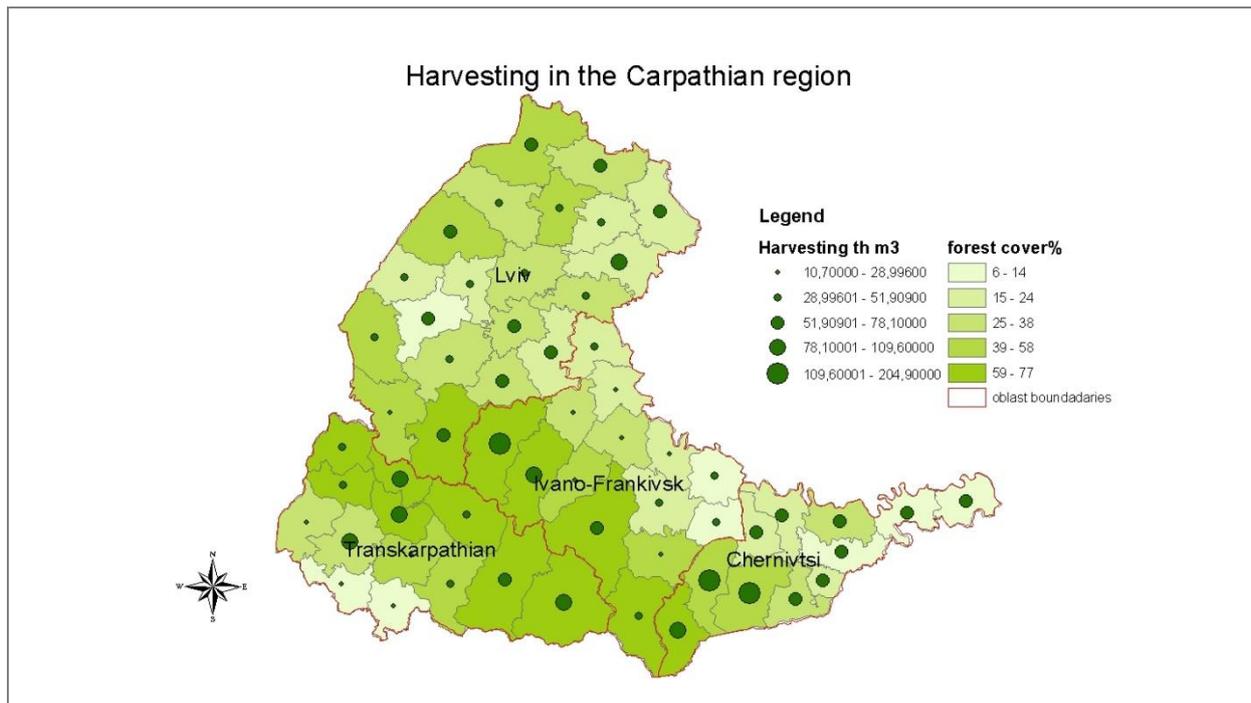


Fig. 24 Map of harvesting volumes in the Carpathian region of Ukraine³⁴

³² UNFU, FORZA, IIWH, 2008

3.1.6 Forest-based sector of the Carpathian region of Ukraine

Key facts

1. The Carpathian regional forest-based sector in 2012 we can characterize by the following indexes: turnover – 5.92 bil. UAH (25% from Ukraine’s forest-based sector); number of enterprises – 1465 (25% from Ukraine’s forest-based sector); number of employees – 37.7 ths persons (24.9% from Ukraine’s forest-based sector).
2. Average enterprise the Carpathian regional forest-based sector is enterprise which we can characterize by the following indexes: average turnover – 4.0 mio. UAH; average number of employees – 26 persons.
3. From 2008 to 2012 we can observe such three trends in the Carpathian regional forest-based sector: turnover increasing, number of enterprises decreasing and number of employees decreasing.
4. There is no comprehensive understanding in regard to a role of the Carpathian regional forest-based sector in the regional development.

Table 19 Forest-based sector of the Carpathian region of Ukraine, 2008-2010 ³³

Main parameters	Year	Subindustry ³⁴				Total regional forest-based sector
		Forestry (02)	Woodworking industry (20)	Furniture manufacturing (36.1)	Carpentry (45.22) + Joinery (45.42)	
1	2	3	4	5	6	7
Turnover, bil. UAH	2008	0.74	2.7	0.85	0.03	4.32
Enterprises, units		598	2,283	777	- ³⁵	3,658
Employees, ths. persons		19.1	18.1	11.3	0.35	48.85
Turnover, bil. UAH	2009	0.70	2.5	0.74	0.03	3.97
Enterprises, units		580	2,241	772	-	3,593
Employees, ths. persons		17.0	15.8	9.7	0.43	42.93
Turnover, bil. UAH	2010	0.87	2.7	0.83	0.017	4.417
Enterprises, units		578	2,291	774	-	3,643
Employees, ths. persons		16.8	15.0	9.8	0.29	41.89

³³ State Statistics Service of Ukraine

³⁴ Classification of Type of Economic Activity (ДК 009:2005) (NACE Rev.1.1)

³⁵ dataset is not available

Table 20 Forest-based sector of the Carpathian region of Ukraine, 2011 - 2012³⁶

Main parameters	Year	Subindustry ³⁷				Total regional forest-based sector
		Forestry (02)	Woodworking industry (16)	Furniture manufacturing (31)	Wood products installation (43.32) + Flooring and wall covering (43.33) + Roofing (43.91)	
1	2	3	4	5	6	7
Turnover, bil. UAH	2011	1.27	3.15	1.05	0.01	5.48
Enterprises, units		233	887	244	52	1,416
Employees, ths. persons		15.2	13.7	8.6	0.59	38.09
Turnover, bil. UAH	2012	1.35	3.36	1.2	0.012	5.92
Enterprises, units		254	900	263	48	1,465
Employees, ths. persons		14.7	13.4	9.0	0.58	37.68

Table 21 Average forest-based sector's enterprise at regional level, 2012

Index	Parameter	Value	Relative change compared to national parameter, %
t_{ent}	Turnover per enterprise in the regional scale, mio. UAH/unit	4.0	+2.5 %
t_{emp}	Turnover per employee in the regional scale ths UAH/person	157.11	-2.5 %
n_{empl}	Average number of employees per enterprise in the regional scale, persons/unit	27	+12.5%

Notes:

t_{ent} - turnover per enterprise in the regional scale ($t_{ent}=t_{ov}/n_{ent}$; t_{ov} – overall regional forest-based sector turnover; n_{ent} – number of the enterprises in the regional forest-based sector);

t_{emp} - turnover per employee in the regional scale ($t_{emp}=t_{ov}/n_{emp}$; t_{ov} – overall regional forest-based sector turnover; n_{emp} – number of employees in the regional forest-based sector);

n_{empl} – average number of employees per enterprise in the regional scale ($n_{empl} = n_{emp} / n_{ent}$; n_{emp} – number of employees in the regional forest-based sector; n_{ent} – number of the enterprises in the regional forest-based sector).

³⁶ State Statistics Service of Ukraine

³⁷ Classification of Types of Economic Activity (State Classifier 009:2010) (NACE Rev.2)

FOREST-BASED SECTOR CONTRIBUTION TO THE REGIONAL INDUSTRY
Table 22 Turnover of the main industries in the Carpathian region of Ukraine, 2011³⁸

Industry	Turnover, bil. UAH	Percentage, %
Electric power, gas, water	16.7	26.3
Food products, drinks, wares of tobaccos	13.6	21.4
Machine building	6.9	10.9
Forest-based sector	5.5	8.7
Other non-metal mineral products	5.4	8.5
Chemical industry	4.9	7.7
Extractive industry	4.7	7.4
Coke, products of oil industry	2.1	3.3
Metallurgy, hard wares	1.9	3.0
Light industry	1.8	2.8

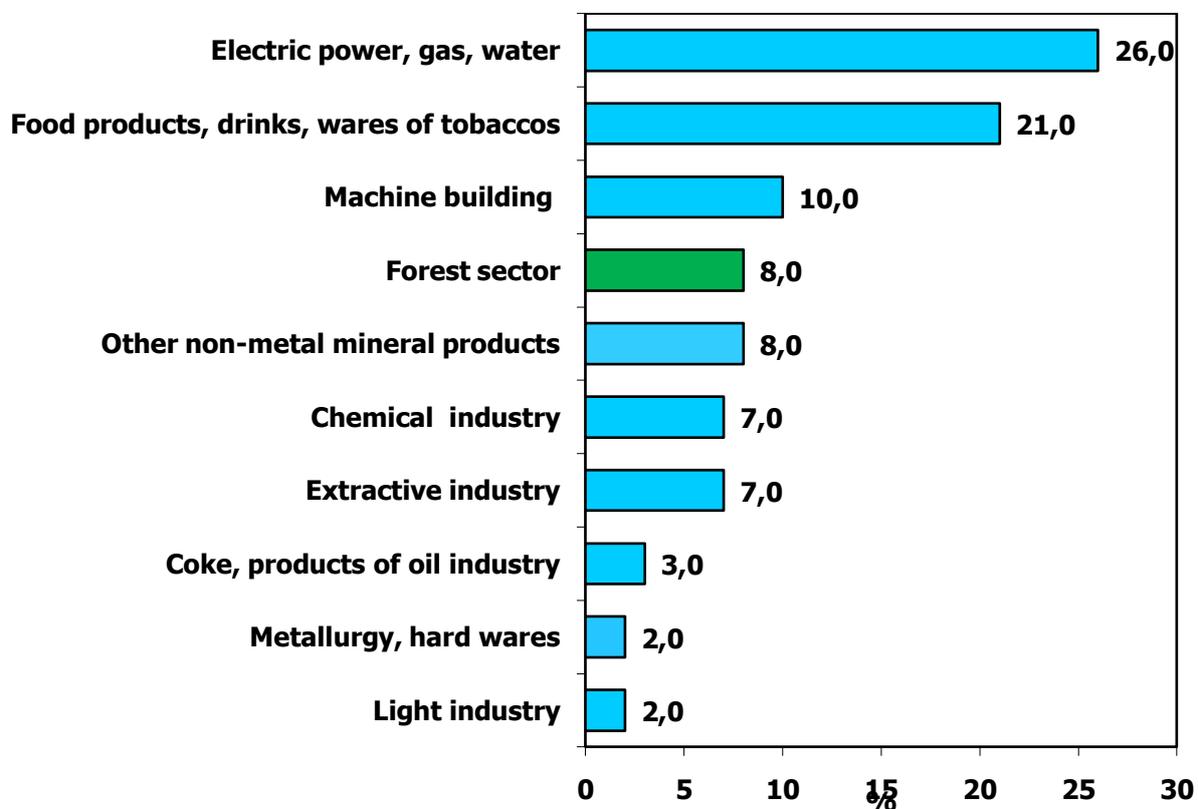

Fig. 25 Relative ranking of the major industries of the Carpathian region of Ukraine in turnover, 2011
³⁸ State Statistics Service of Ukraine

Table 23 Turnover of the main industries in the Carpathian region of Ukraine, 2012³⁹

Industry	Turnover, bil. UAH	Percentage, %
Electric power, gas, water	19.7	27.5
Food products, drinks, wares of tobaccos	16.6	23.2
Machine building	8.1	11.3
Other non-metal mineral products	6.1	8.5
Forest-based sector	5.9	8.2
Chemical industry	5.5	7.7
Extractive industry	4.3	6.0
Coke, products of oil industry	1.9	2.7
Metallurgy, hard wares	1.7	2.4
Light industry	1.8	2.5

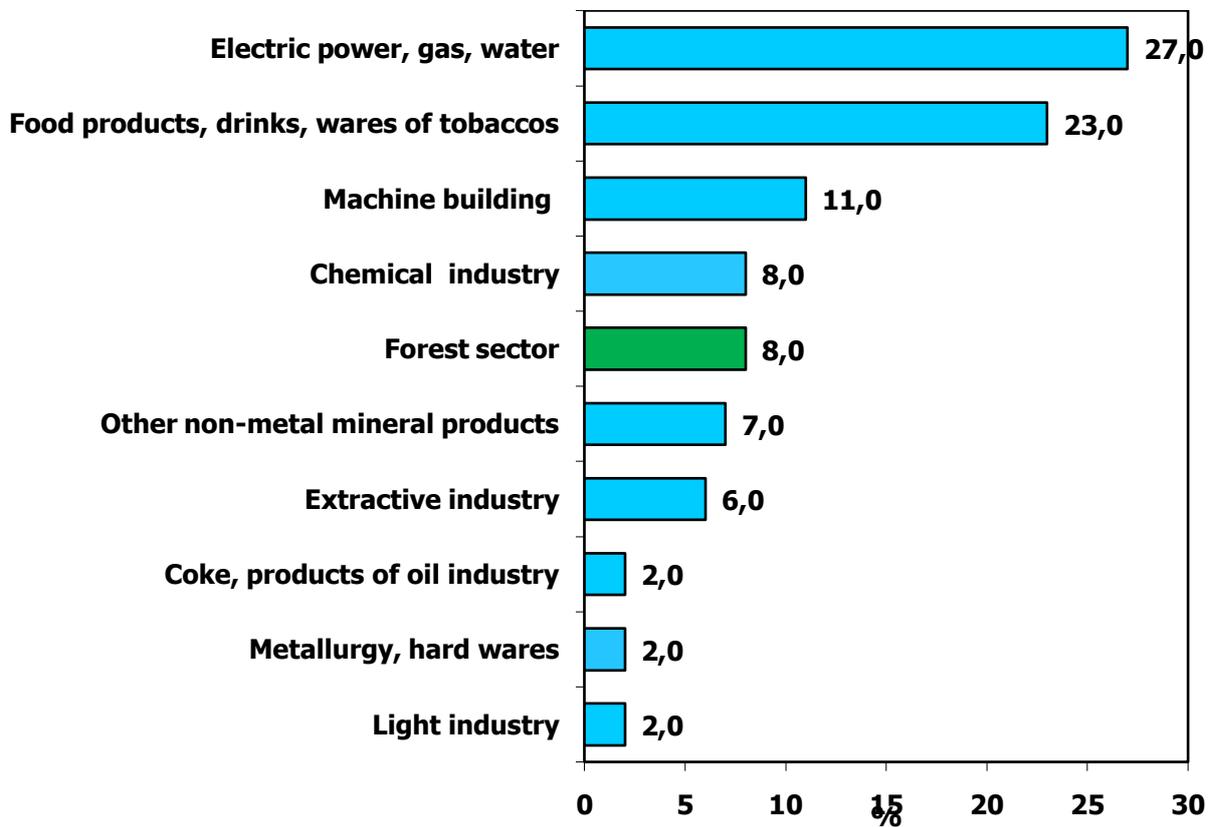


Fig. 26 Relative ranking of the major industries of the Carpathian region of Ukraine in turnover, 2012

³⁹ State Statistics Service of Ukraine

Table 24 Employees of main industries in the Carpathian region of Ukraine, 2011⁴⁰

Industry	Employees, ths.	Percentage, %
Electric power, gas, water	41.1	17.6
Forest-based sector	38.1	16.3
Machine building	37.8	16.2
Food products, drinks, wares of tobaccos	35.1	15.0
Light industry	26.9	11.5
Other non-metal mineral products	20.2	8.6
Extractive industry	15.5	6.6
Metallurgy, hard wares	9.9	4.2
Chemical industry	5.8	2.5
Coke, products of oil industry	3.4	1.5

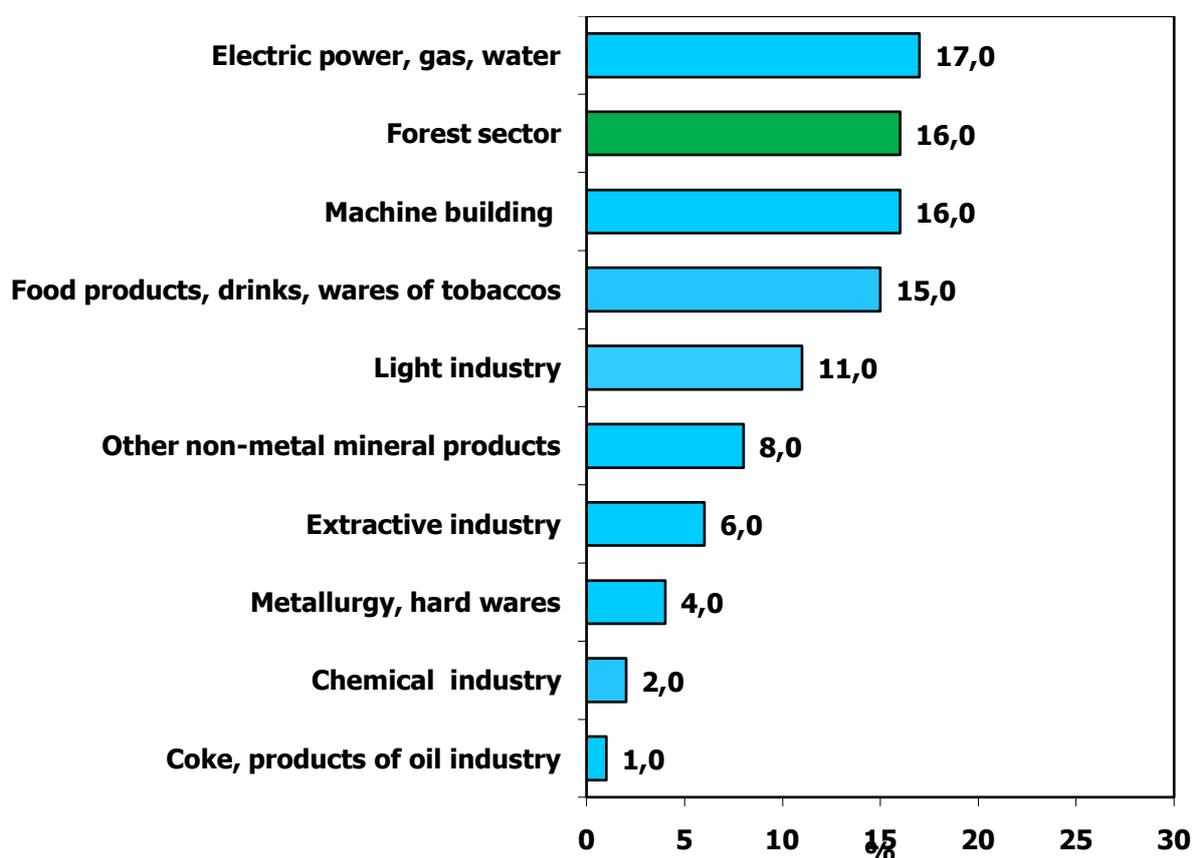

Fig. 27 Relative ranking of the major industries of the Carpathian region of Ukraine in employees, 2011
⁴⁰ State Statistics Service of Ukraine

Table 25 Employees of the main industries in the Carpathian region of Ukraine, 2012⁴¹

Industry	Employees, ths.	Percentage, %
Electric power, gas, water	40.1	17.8
Machine building	37.7	16.8
Forest-based sector	37.9	16.7
Food products, drinks, wares of tobaccos	32.5	14.4
Light industry	25.3	11.2
Other non-metal mineral products	19.0	8.4
Extractive industry	15.6	6.9
Metallurgy, hard wares	9.3	4.1
Chemical industry	5.5	2.4
Coke, products of oil industry	2.8	1.2

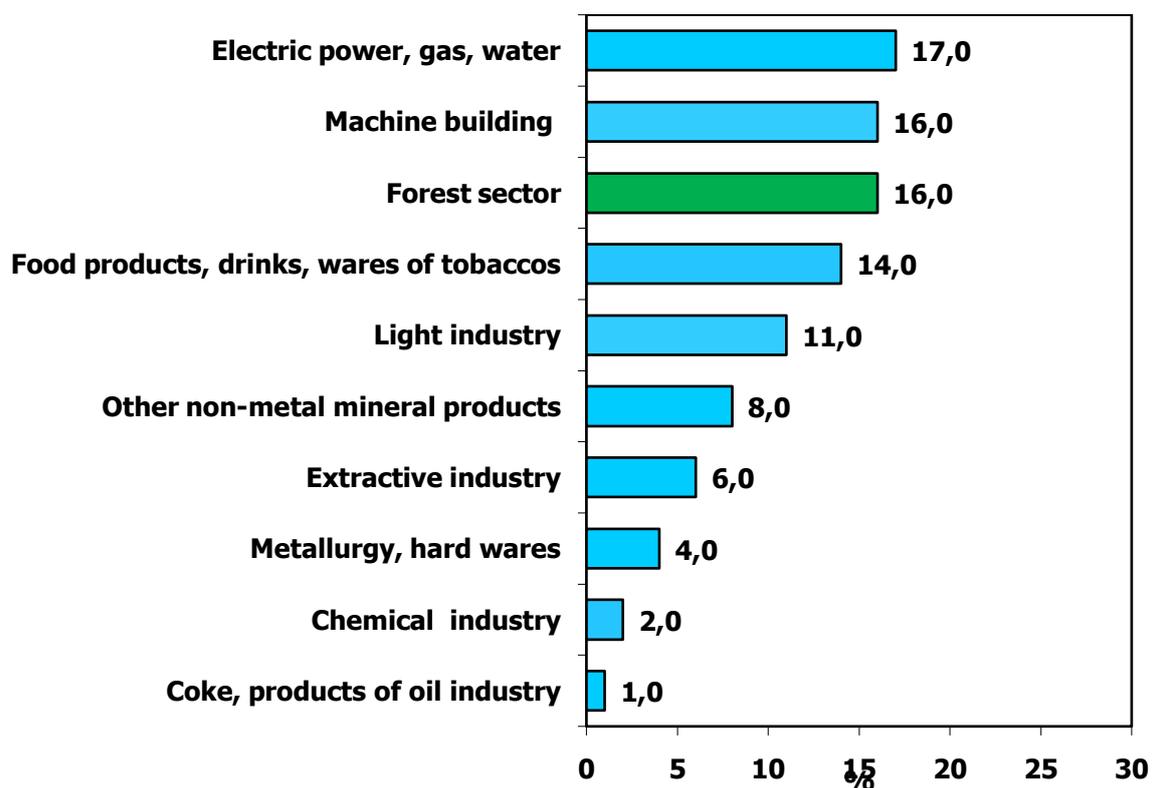
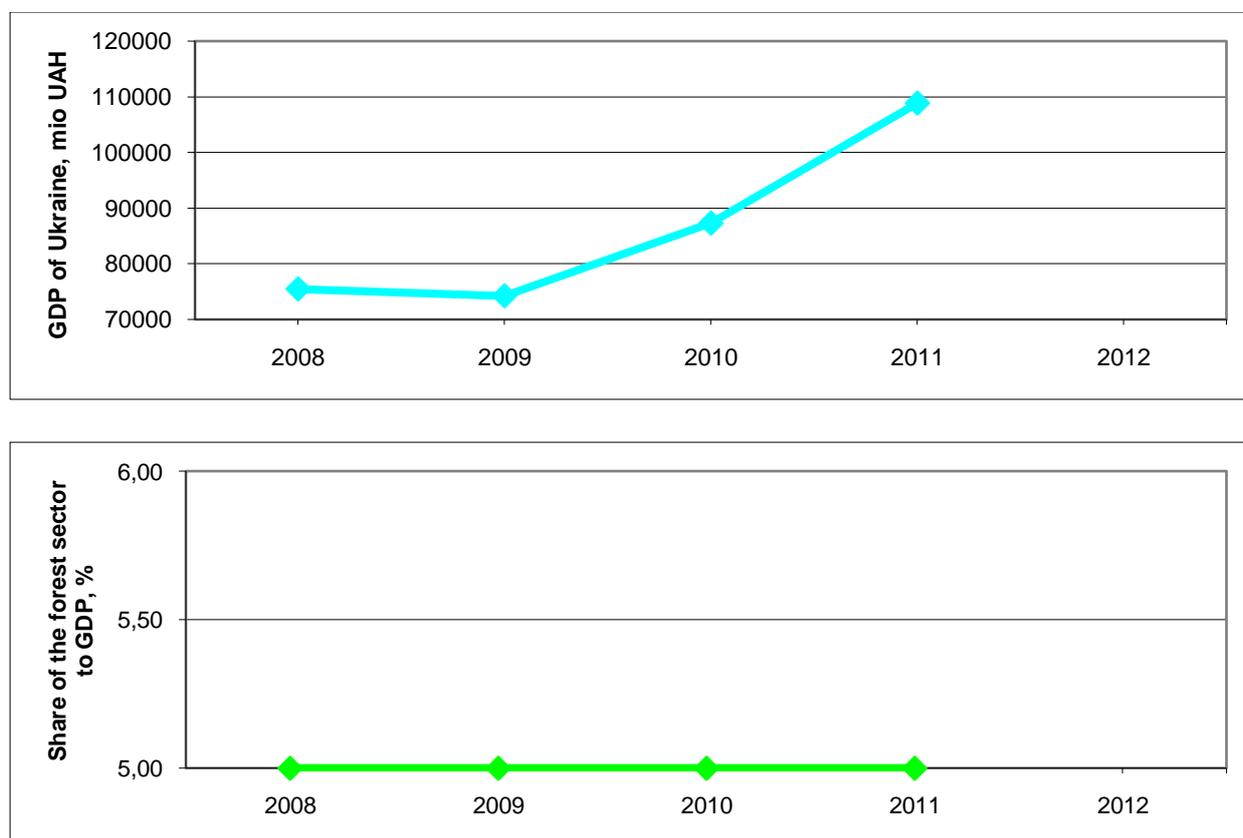


Fig. 28 Relative ranking of the major industries of the Carpathian region of Ukraine in employees, 2012

⁴¹ State Statistics Service of Ukraine

Table 26 GDP vs. forest-based sector's turnover of the Carpathian region of Ukraine

Year	The Carpathian region of Ukraine GDP	Turnover of the Carpathian region of Ukraine forest-based sector, mio. UAH	Share of the forest sector to the regional GDP, %
2008	75,458	4,320	5.73
2009	74,222	3,970	5.35
2010	87,292	4,420	5.06
2011	108,878	5,480	5.03
2012	- ⁴²	5,910	-


Fig. 29 Carpathian region of Ukraine GDP and its forest-based sector's share development

⁴² dataset is not available

3.1.7 Main conclusions and recommendations

SWOT OF UKRAINE'S NATIONAL FOREST-BASED SECTOR

Strengths

- Availability of high-quality raw materials
- Historical traditions of wooden production, which is a serious source of employment for the local population
- Presence of manufacturers within the framework of wood products value added chain
- Neighbouring Europe
- FSC certified forests
- High education, scientific and research potential of forest-based sector (Ukraine has 53 position out of 131 countries around the world according to GCR 2008)
- Source of employment for the local population

Weaknesses

- Lack of low impact harvesting technology, underdeveloped infrastructure of roads
- Low coordination within sector
- Over centralized management system in the forest-based sector
- Absence of clear strategy of sustainable forest development
- Insufficient financial resources for the sector development, lack of state support
- Considerable share of the “shadow” sector, lack of updated consistent information on the resources of all permanent forest users
- Low percentage of forest cover land in
- Low demand for innovative products and technologies on domestic markets (in contrast to the high demand for raw timber on foreign markets)
- Low level of copyright protection (imperfect state legislation)
- Low income of population and a high cost of wood products
- A low quality of internal production, partly caused by the “shadow” sector
- Absence of separate standards, norms, legislations in wood productions

Opportunities

- Stable demand on dwelling areas and intensive development of green / rural tourism
- Increasing demand for woodworking products on the domestic and foreign markets; customer tastes are changing in favor of genuine wood products (change in the customer mentality ecology wise)
- Intensive development of green tourism, bioenergy, non-timber forest products branches
- Intensive development of cooperation projects with EU (as opportunity to find new markets and to adopt useful experience)
- Forest-based sector reforms in the context of sustainable development
- Increase of cooperation within sector (clusters, networks), involvement of communities
- Incentives at governmental level (privileged loans, budget financing) for increasing of wooden building
- Increasing purchasing power of the population, increase awareness of population on renovation with timber

Threats

- Emerging would-be competitors on the market with higher quality and lower costs of production, growing consumer demands
- Inconsistency with the EU laws as market of agricultural lands and private forests is absent (or poorly developed) in Ukraine
- Competition (external, internal)
- Sharp expansion of protected areas on expense of commercial forests
- High level of public reproach of forest management as results of recent flooding (people tend to blame forest management in floods)
- The negative influencing of natural hazards on the afforestation
- Possible changes in government policies
- Decreasing of forest-based sector share in the whole industrial complex
- Standards of EU and Ukraine are not harmonized

RECOMMENDATIONS FOR IMPROVEMENT OF RESOURCE EFFICIENCY

Ukraine and the Carpathian region of Ukraine should understand that main strategy for increasing wood production and growth is a complex use of wood, and not an increased harvesting and selling of raw timber resources.

- The forest-based sector is of exclusive significance for Ukraine in view of favorable factors of economic and social nature and restricting factors of ecologic character;
- The branches of the forest and wood based complex of Ukraine have between them weak and non-systematic cooperation links;
- The forest and wood based complex of Ukraine has the resource potential the restriction of which leads to real slowdown of growth rates in commercial output volume of the branches of the complex;
- The impeding factors in the wood processing industry growth can be considered to be the following ones: non effective usage of raw materials; considerable export of unprocessed timber; illegal (shadow) manufacturing;
- The impeding factors in the furniture manufacturing industry growth in Ukraine can be considered to be the following ones: the absence of efficient and powerful national production of accessories, lining and finishing materials, MDF; a considerable share of “shadow” production; balance in the import-export structure;
- The total volume of foreign investment in the branch of the forest and wood based complex can be considered insufficient;
- Opportunities to obtain added value in the forest and wood based industries as the use of non-timber forest resources, ‘green’ tourism and obtaining energy from wood remain underestimated in Ukraine.
- Forest complex of each Ukrainian subregion is a very important part of whole region economy and therefore this forest complex need more attention from regional authorities; Each region (country) need compulsory coordination in the framework of region forest complex (this coordination can have different forms: joined structure,

consultative organization and so on, since now we have only different branches of forest complex which exist as different structures that are unuseful and unfruitful work;

- A very important task (may be main task) of each regional (country) forest complex is installation and keeping of balance between creating of protection forest area and needs of forest production;
- Nowadays any forest-based sector of any country cannot develop using only market methods since any forest complex has a very important ecological, social and economic leading part and therefore we should think about effective methods of this interference from authority side;
- We should think about determination of priority branches for each forest complex since as a rule there is not opportunity to promote all branches of whole forest complex. For example: we have some branches in the forest complex of the Carpathian region of Ukraine. Among them are such: forestry, woodworking, wooden board materials, furniture, pulp and paper industry and so on. And after that we have one very interesting question – which subindustries of our forest complex should we promote? Or which subindustries of our forest complex should we propose to regional authorities for promotion and priority development?
- We can use three ways. The first – we can say that we should choose priority branches using EU experience: energy from biomass (because there is shortage of energy resources) and other similar things. The second – we have region with a huge excess amount of forest resources and therefore we can say – you must use only market methods. The third - we have region or country with a shortage of forest resources (Ukraine) and therefore we should determine priority branches for such forest complex (wooden board materials because it helps to save some forest resources or energy from biomass because it helps to save some energy expensive resources).
- We think that priority branch of the forest complex of the Carpathian region of Ukraine is timber construction industry since we should promote all subindustries of our forest complex (all they need promotion and considerable development) and this branch can take out all other subindustries (new wooden houses need new wood-working products, new wooden board materials and new furniture);
- Any forest cluster has a lot of differences from other clusters. The main our idea in this field is such: many scientists say that for creating of any cluster we should use only successful enterprises which are leaders in this region and they must conduct successful export activity. We think that any forest-based sector or his part needs transformation itself in forest cluster because we should say about not only economic but also other kinds of benefits too. Only forest complex or forest cluster has considerable ecological importance.

3.2. Republic of Moldova ⁴³

3.2.1 Forest and wood resources

National Forest Land (NFL) accounts for roughly 12.7% of country territory (see Table 1). The majority of forestland (87.2%) is under state property, with the rest owned by municipalities (12.2%) and only 0.6% by private owners. Despite a relatively insignificant share, privately owned forest resources are growing continuously - these have tripled in size and share. Forests managed by other owners (57.1 ths. ha or 13.6% of national forests) fall under the category of land and soil protection forests, and protection against harmful industrial and climate factors. Community and private forests can be characterised as small bodies scattered outside rural and urban localities, with acacia as the main species, and partially observed forestry regime. Only 25% have forest management plans, which are applied case by case and with delays. These forests are affected by illegal grazing, logging and waste pollution. Forest vegetation outside the NFL includes protection belts located on agricultural land and in river and water basin protection areas; also, protection belts and tree and shrub plantations along passageways; groups of trees and solitary trees in cities and towns.

Table 27 Forest resources of Moldova, 2012 ⁴⁴

Index number	Index name	Value
1	Square of the forest land, million hectares	0.37
2	Overall timber stock, billion m ³	0.045
3	Forest land percentage, %	12.7
4	Average annual timber growth per hectare, m ³ per hectare	3.3
5	Overall annual timber growth for country, million m ³	1.085
6	Percentage of annual timber growth usage, %	11.1

Table 28 Wood resources of Moldova, 2008-2012 ⁴⁵

Year	Value		
	Procurement of merchantable wood, ths m ³		Wood output, sawn or split, more than 6 mm wide, ths m ³
	Total value	Including main felling	
2008	200	-	-
2009	180	-	-
2010	170	-	-
2011	180	-	-
2012	190	-	-

⁴³ Main data inputs and coauthorship of this chapter by:

Vadim Iatchevici, AITT Agency for Innovation and Technology Transfer, Chisinau, Republic of Moldova, vadim.iatchevici@aitt.md, www.aitt.md

⁴⁴ State Forest Resources Agency of Moldova

⁴Data is not available

⁴⁵ State Forest Resources Agency of Moldova. In 2012 Moldova produced 380 ths m³ of fire wood. The amount of produced merchantable wood is small. Various data are not available.

The Republic of Moldova has 49.1 ths. ha of forest vegetation (see Table 2) outside the NFL, expressed as 29.8 ths. ha of protection belts (for agricultural fields, roads, rivers and water basins, etc.) and 19.2 ths. ha of other types of forest vegetation, which can also substantially contribute to preserving the ecological balance. This land covered with forest vegetation is largely not developed and managed based on well-justified and evidenced plans and designs. It is managed with violations of forestry technologies and in non-compliance with ecological and forestry requirements.

The composition of Moldova's forests is dominated by the following species: deciduous (97.8%), including oaks - 143.8 ths. ha (39.6%), ashes - 16.6 ths. ha (4.6%), hornbeams - 9.4 ths. ha (2.6%), acacias - 131.0 ths. ha (36.1%), poplars - 5.7 ths. ha (1.6%), etc., with only 2.2% covered with coniferous species. Oaks are the most valuable forest trees. Out of their total area, 27% grew from seeds and 73% from shoots (coppice). The large share of oaks from shoots is a consequence of the coppice management throughout several centuries. Such situation influences also the productivity of oak stands, of which 43% are of high-yield stands and 57% are low-yield forests.

The total volume of standing wood in Moldova's forests is roughly 45 million m³, with an average of 124 m³ per ha. Average forest increment accounts for 3.3 m³/year/hectare, and the total average increment is about 1085 ths. m³/year. The average yield class is 2.3. The age structure of all forest species is unbalanced, for lower yield species in particular. The main manager of forests under public property is Agency Moldsilva, which owns 82.1% or 336.6 ths. ha of the total NFL. The remaining land covered with forests and forest vegetation is owned by I- and II-tier LPAs, Ministry of Transport and Road Infrastructure, Agency Moldova Waters. This land is primarily represented by forest belts for agricultural field protection, road protection belts, and forest belts for water protection, as well as forests in rural areas administered by municipalities and district councils.

Table 29 Harvesting of marketable wood in Moldova, 2012⁴⁶

Index name	Value
Procurement of merchantable wood, ths m ³	190
Round timber (from total procurement), ths m ³	70 ⁴⁷
for sawn timber	40 ⁴⁸
for the plywood and veneer production	-
for building	150 ⁴⁹
for pulp and paper production	-
Wood for technological purposes, ths m ³	-
Firewood	-

⁴⁶ State Forest Resources Agency of Moldova

⁴⁷ Estimated data from total amount of wood procurement

⁴⁸ Estimated data from total amount of wood procurement

⁴⁹ Estimated data from total amount of wood procurement

Table 30 Wooden wastes in Moldova, 2011-2012 (ths tons)

Year	Generated ⁵⁰	Utilized, processed	Incinerated to generate energy
2011	45	-	30
2012	40	-	30

FOREST ECOLOGY OF MOLDOVA

In Moldova's forestland, as many as 28 types of forest ecosystems (or forest formations) were identified, some of them being as biologically as economically the most important for the country, such as formations of pedunculate oak, sessile oak, pubescent oak, beech, flooded forest, black locust and many varieties of all these and other species.

The "forest oak with cherry" type is widespread in the north of the country and covers an area of 11600 ha. It is characterized by mono-dominant stands of pedunculate oak (*Quercus robur*) with high presence of wild cherry (*Prunus avium*). Its floristic composition includes about 350 species of vascular plants, with 10 rare species. This type of ecosystem is currently under high influence of dry conditions and its natural regeneration is very weak.

The type of "sessile oak and pedunculate oak with beech" forest in the central Moldova covers about 160000 ha. Floristic diversity of these ecosystems is the richest in the country and includes over a thousand species of vascular plants. 17 species of plants are included in the Red Book of Moldova, such as: purple toothwort (*Dentaria glandulosa*), annual honesty (*Lunaria annua*), spindletree (*Euonymus nana*), elegant crown vetch (*Coronilla elegans*), forest peony (*Paeonia peregrina*), bird cherry tree (*Padus avium*), service tree (*Sorbus domestica*), sword-leaved helleborine (*Cephalanthera longifolia*), lady's-slipper orchid, (*Cypripedium calceolus*) etc. The highest diversity of vascular plants is found in the nature reserves Codrii (with 945 species) and "Plaiul Fagului" (with 720 species).

Ecosystems of pubescent oak are present in the south of the country and cover about 7000 ha. Their floristic diversity comprises circa 400 species of vascular plants, some included in the Red Book of Moldova, such as: angelescu cornflower (*Centaurea angelescui*), greater pasque flower (*Pulsatilla grandis*), wild pear (*Pyrus elaeagnifolia*), and others (*Gymnospermium odessanum*, etc.).

Azonal forest ecosystems of willow, poplar and pedunculate oak (which are flooded forest type) of the lower Prut river basin cover an area of 15000 ha. Their floristic diversity comprises about 400 species of vascular plants, including rare species in Moldova, such as: black alder (*Alnus glutinosa*), white alder (*Alnus incana*), forest grape vine (*Vitis sylvestris*), snake's head (*Fritillaria meleagris*), southern adderstongue (*Ophioglossum vulgatum*) etc.

About 1140 species of vascular plants are recorded in the forestland and forest-steppe areas of the country, which represents over 60% of all plant species in Moldova (i.e. 1832 species of vascular plants). The plant communities within the ecosystems determine what animal communities exist within those systems. Forest ecosystems of Moldova are inhabited by 172 species of terrestrial vertebrates (47.8% of the total species of Moldova), of these 47 species are mammals, birds - 106, reptiles - 9, and amphibians – 10 species.

⁵⁰ State Forest Resources Agency of Moldova

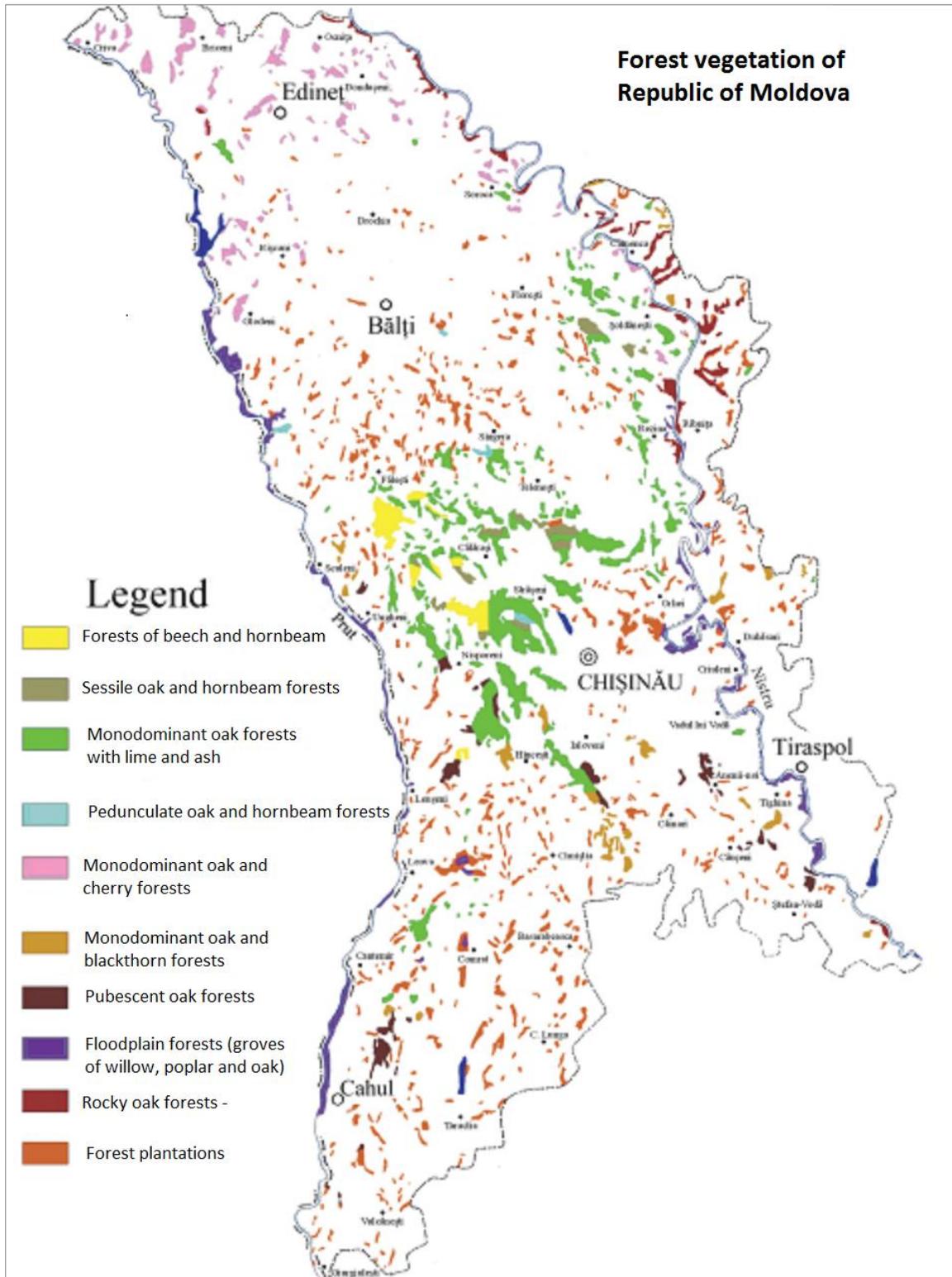


Fig. 30 Landcover map of Moldova ⁵¹

⁵¹ Analytical study on the consumption of wood in Republic of Moldova / Agency “Moldsilva” ; elab.: Arcadie Capcelea, Aurel Lozan, Ion Lupu [et al.]. - Ch. : Agenția “Moldsilva”, 2011. – 48 p.

The Diversity of invertebrates is even higher, including more than 9000 species with a number of species listed in the Red Book data of Moldova. Forest ecosystems of the Central Codri are defined by a high compactness index, which creates conditions for the most diverse flora and fauna in the country.

Rocky ecosystems are unique forms of relief (limestone) are widespread in northern Republic and occupies insignificant (from Lipcani to Braniște) - 23 000 ha (0.68%). The biodiversity of these ecosystems is the lichen and moss, steppe vegetation, forests (total 252 species) and different groups of terrestrial vertebrate animals (38 species). On the slopes of the river Dniester river Raut Ikel, Vilia, Draghiște and Racovat on clay-limestone soils, formed the rocky forest areas and on open spaces - areas of steppe vegetation. Landscape Structures cave (underground cavities) are the caves, grottoes, Steward. In the Republic of Moldova significant lengths meet caves and karst cave "Emil Racoviță" is considered important monument of nature. The cave complexes living organisms have a wide spread, the main representative's bats, mushrooms and invertebrates.

However, forest biodiversity is increasingly threatened worldwide as a result of deforestation, fragmentation, climate change and other stressors. Natural forest biodiversity of Moldova is under huge pressure from various human activities. Improper forest management over the last century caused a decrease in forest genetic resources to Moldovan forests. The decline of the three native oak formations (*Quercus robur*, *Q. petraea*, *Q. pubescens*) in Moldova is heavily accompanied with the intrusion of other non-native species. Both human activity (plant harvesting, mushrooms collection, forest management activities, pollution etc.) and the decline in available food sources (gophers, other small rodents) are continuing to adversely affect the large species of prey birds, such as the large spotted eagle (*Aquila clanga*), lesser spotted eagle (*Aquila pomarina*), saker falcon (*Falco cherrug*) etc. The relationships between humans and forest resources are under risks of deep alteration, unless a rational co-existence with forests is established.

3.2.2 Markets and players

State Forest Resources Agency "Moldsilva" is the central public administration body on state policy in forestry and hunting in the country. The general task of the Agency is to implement the constitutional prerogatives and international ratified obligations of the Republic of Moldova on development, promotion and implementation of its policy in forestry and hunting, directed on the international trends of socio-economic sustainable development, rural development, rural employment, sustainable forestry, development, guarding, forests and wildlife protection, maintenance and conservation of biodiversity, professional training, access to environmental benefits and forestry research and education.

MAIN PLAYERS IN THE MOLDOVA'S FOREST-BASED SECTOR

1. Government
2. State Forest Resources Agency "Moldsilva" is the central public administration body on state policy in forestry and hunting in the country.

3. Academy of Science of Moldova (Botanical Garden (Institute); Institute of Zoology; Institute of Ecology and Geography; Institute of Genetics, Plant Physiology and Protection)
4. Forest Research and Management Institute
5. Forest enterprises
6. Forest-hunting enterprises
7. Nature reserves

There are several factors that stipulate the importance of developing the forest and wood based industries in the country's economy:

- Wildlife is as a component part of forest ecosystems, playing an important role in maintaining ecological balance. A number of animal species serve as sources for obtaining industrial, medicinal raw materials, food and other material goods to satisfy the needs of the population and the national economy, other species are used for scientific, cultural, educational and aesthetic purposes;
- Hunting management is one of the branches of the use of natural resources, the main tasks being protection, rational use and reproduction of the state hunting resources (animals of hunting interest and many hunting grounds);
- Over the recent years there has been a relative improvement in the hunting area situation, a number of measures being taken to improve food conditions for hunting. In accordance with the Action Plan on the organization of farming for pheasants and wild boar reproduction (Government Ordinance No. 1033-976 of 15.12.2005), in 2007 the pheasant farm situated in ISC "Sil-Rezeni", with a capacity of 14000 pieces annually was rebuilt and two aviaries for pheasants maintenance in ISC "Cimislia" and "Straseni" built. Thanks to this, in the hunting resources managed by Agency Moldsilva, there is an improvement in the dynamics of the main species of animals and birds of hunting interest, the indicators for 2010 mostly being over the average indicators of the last decade;
- These improvements are also due to the implementation of new forms of wildlife sector management by awarding hunting resources to use based on a lease agreement, under the Government Decision No. 187 of 20.02.2008 approving the Regulation on the forests rent for hunting management and/or recreation. According to present records, 9400 ha hunting resources managed by the Agency Moldsilva are leased to legal persons based on public tenders.

MARKET POSITION

For analysis of timber import and export we came with a request to National Customs Office and National Bureau of Statistics in order to present data related to the export and import of wood. Based on data received from the institutions mentioned total export and import volume assessment is difficult because the track of the products was carried in several units (m³, m², tons, etc.). Raw timber volume was in 2003 - 205 m³, 2004 - 464 m³, and in 2005 it was 691 m³. Importing raw wood during the time was in 2003 to 26.230 m³, in 2004 to 33.232 m³, and in 2004 it was 35 054 m³. The National Bureau of Statistics data shows that the volume of timber exported, expressed in units value is increasing from \$ 707.300 in 2003

to 3.064.000 in 2008 \$. The similar situation is observed in the import of timber from \$ 6.386.000 in 2003 to 30.515.000 in 2008. The increase in mentioned period is about 5 times in both compartments.

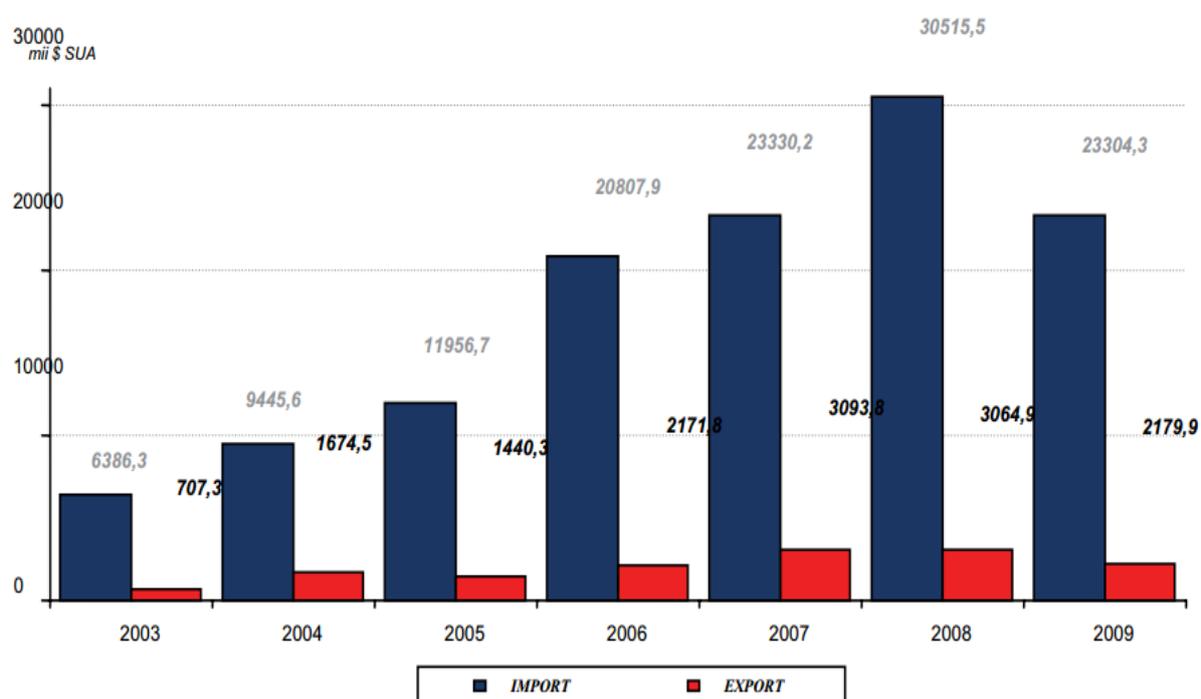


Fig. 31 Foreign trade of raw timber in Moldova, 2003-2009 (ths \$)

3.2.3 Forest-based sector

Key results

1. Moldova's forest-based sector in 2012 we can characterize by the following indexes: turnover – 1.65 bil. MDL (1EUR ≈ 18 MDL); Number of enterprises – 776; Number of employees – 8.8 ths persons.
2. Average enterprise of Moldova's forest-based sector is enterprise which we can characterize by the following indexes: average turnover – 2.1 mio. MDL; average number of employees – 11 persons.
3. From 2008 to 2012 we can observe such three trends in Moldova's forest-based sector: turnover decreasing and then increasing, number of enterprises increasing and number of employees decreasing.
4. There is no comprehensive understanding of national forest-based sector in Moldova in reference to common definition, main goals and strategy.

Table 31 National forest-based sector of Moldova, 2008 -2012⁵²

Main parameters	Year	Subindustry ⁵³				Total national forest-based sector
		Forestry (A02)	Woodworking industry (D20)	Furniture manufacturing (D36.1)	Carpentry (D21) + Joinery (D21)	
1	2	3	4	5	6	7
Turnover, bil. MDL	2008	0.163	0.281	0.64	0.565	1.649
Enterprises, units		24	350	225	68	667
Employees, ths.		5.63	1.98	3.6	1.84	13.05
Turnover, bil. MDL	2009	0.13	0.19	0.55	0.47	1.34
Enterprises, units		23	335	275	80	713
Employees, ths.		4.3	1.82	3.3	1.27	10.7
Turnover, bil. MDL	2010	0.153	0.18	0.61	0.513	1.45
Enterprises, units		24	319	327	82	752
Employees, ths.		4.1	1.62	3.5	1.14	10.36
Turnover, bil. MDL	2011	0.188	0.225	0.72	0.527	1.69
Enterprises, units		26	310	362	82	780
Employees, ths.		3.8	1.4	2.5	1.1	8.8
Turnover, bil. MDL	2012	0.215	0.223	0.69	0.527	1.655
Enterprises, units		27	302	370	77	776
Employees, ths.		3.75	1.4	2.7	0.95	8.8

Table 32 Average forest-based sector's enterprise in Moldova, 2012

Index	Parameter	Value
T_{ent}	Turnover per enterprise in the national scale, mio. MDL/unit	2.1
T_{emp}	Turnover per employee in the national scale ths MDL/person	188.1
N_{empl}	Average number of employees per enterprise in the national scale, persons/unit	11

Notes:

T_{ent} - turnover per enterprise in the national scale ($T_{ent}=T_{ov}/N_{ent}$;

T_{ov} – overall national forest-based sector turnover; N_{ent} – number of the enterprises in the forest-based sector);

T_{emp} - turnover per employee in the national scale ($T_{emp}=T_{ov}/N_{emp}$;

T_{ov} – overall national forest-based sector turnover; N_{emp} – number of employees in the forest-based sector);

N_{empl} – average number of employees per enterprise in the national scale ($N_{empl} = N_{emp} / N_{ent}$; N_{empl} – number of employees in the national forest-based sector; N_{ent} – number of the enterprises in the forest-based sector).

⁵² State Statistics Service and State Forest Resources Agency of Moldova

⁵³ according to the Classification of Type of Economic Activity (CAEM)

MOLDOVA'S FOREST-BASED SECTOR CONTRIBUTION TO THE NATIONAL INDUSTRY
Table 33 Turnover of the main industries in Moldova, 2011⁵⁴

Industry	Turnover, mio. MDL	Percentage, %
Manufacture of food products and beverages	14,199.7	41.53
Electric power, gas, water	5,374.4	15.72
Manufacture of other non-metallic mineral products	2,805.6	8.2
Manufacture of wine	2,073.8	6.06
Production, processing and preserving of meat and meat products	1,924.8	5.63
Processing and preserving of fruits and vegetables	1,821.7	5.33
Manufacture of dairy products	1,391.2	4.07
Crude oils, not modified chemically	1,306.4	3.82
Forest-based sector (Manufacture of furniture, of wood and wood products, of paper and paperboard)	1,246.7	3.65
Manufacture of textiles	1,104.8	3.23
Other	945.3	2.76

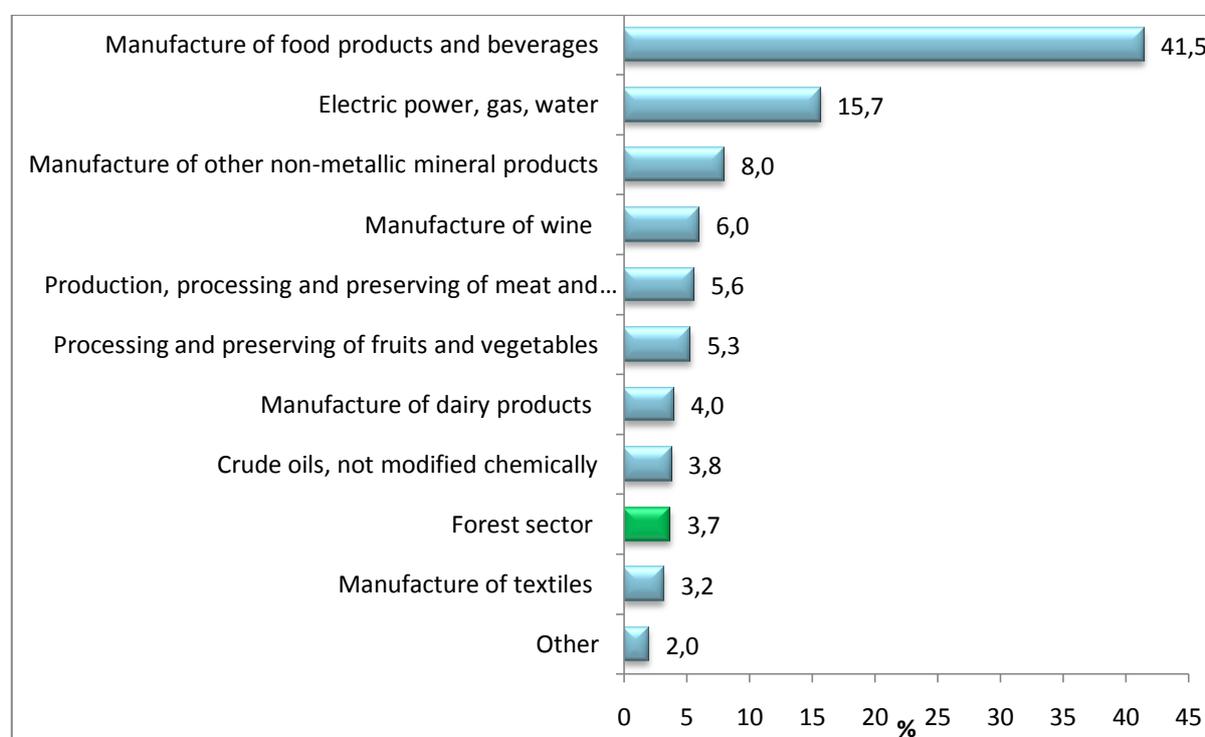

Fig. 32 Relative ranking of the major industries of Moldova in turnover, 2011
⁵⁴ State Statistics Service of Moldova

Table 34 Turnover of the main industries in Moldova, 2012 ⁵⁵

Industry	Turnover, mio. MDL	Percentage, %
Manufacture of food products and beverages	15,587.6	42.9
Electric power, gas, water	5,636.4	15.5
Manufacture of other non-metallic mineral products	2930.8	8.1
Production, processing and preserving of meat and meat products	2,435.5	6.7
Manufacture of wine	2,315.4	6.4
Crude oils, not modified chemically	1,624.71	4.5
Processing and preserving of fruits and vegetables	1,608.2	4.4
Manufacture of dairy products	1,533.7	4.2
Manufacture of textiles	1,314.5	3.6
Forest-based sector (Manufacture of furniture, of wood and wood products, of paper and paperboard)	1,262.5	3.5
Other	114.0	0.3

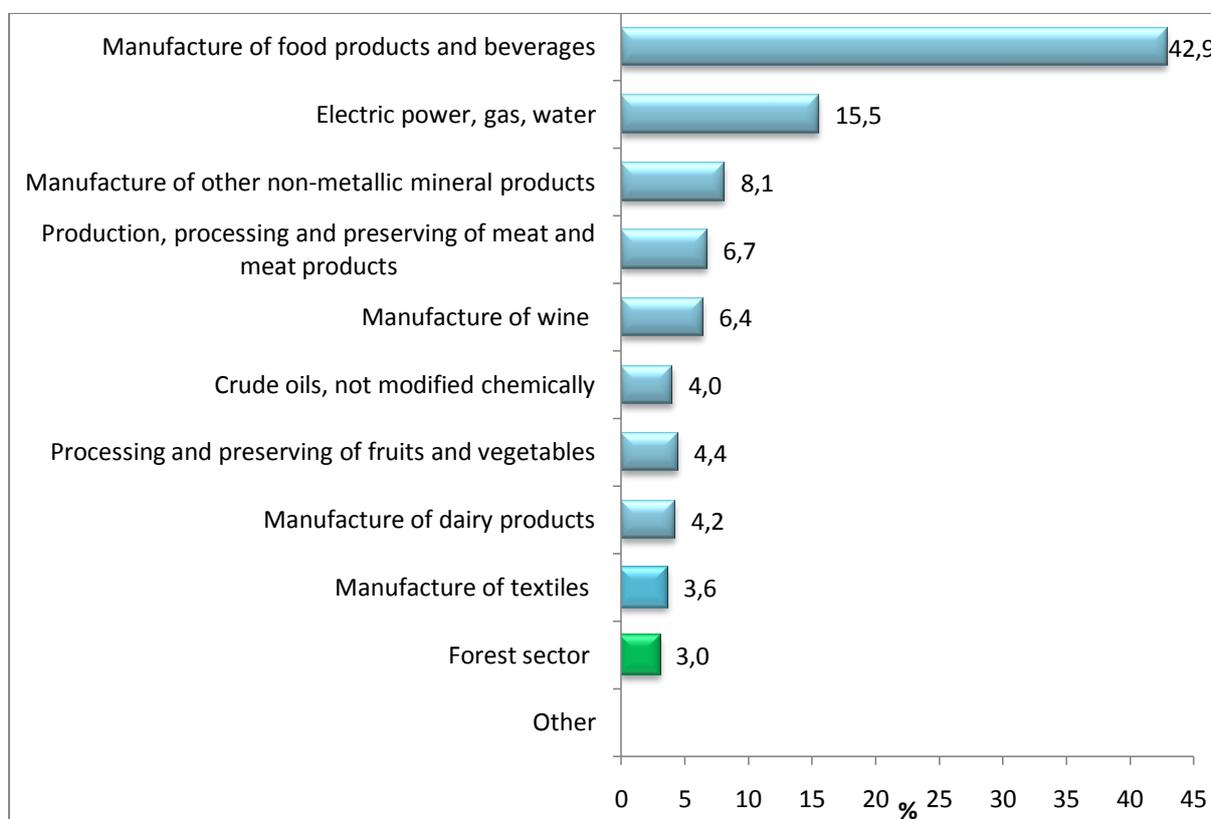
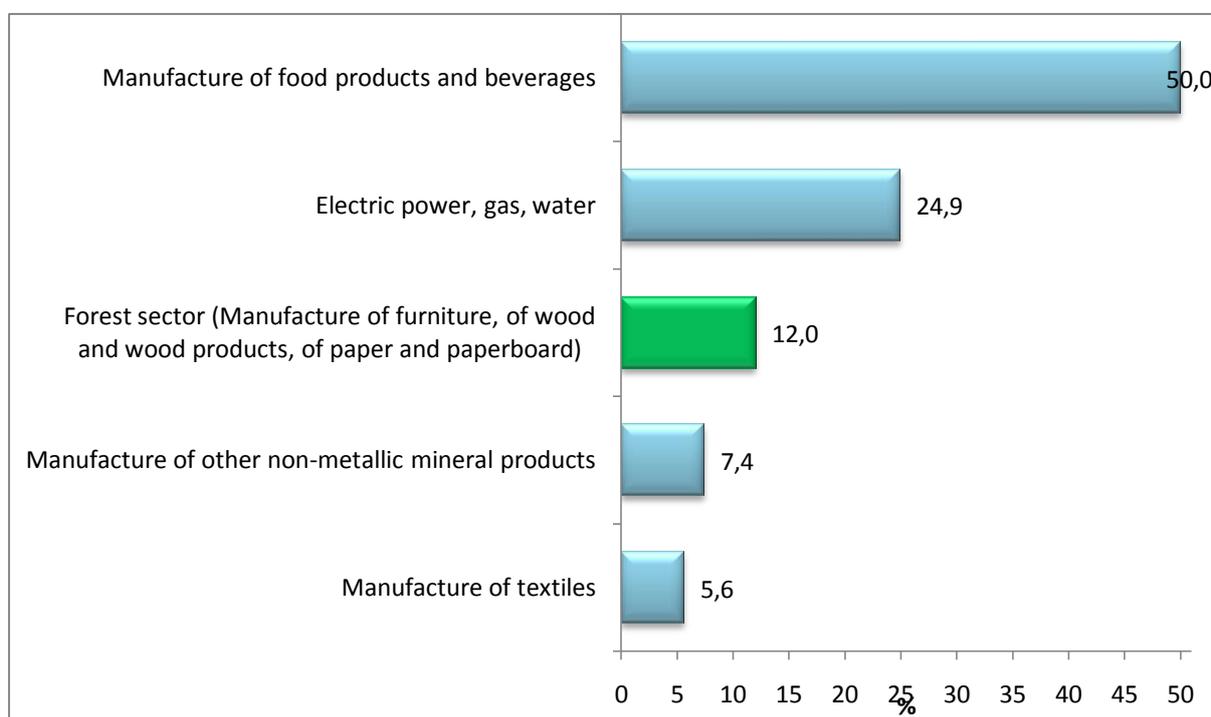


Fig. 33 Relative ranking of the major industries of Moldova in turnover, 2012

⁵⁵ State Statistics Service of Moldova

Table 35 Employees of the main industries in Moldova, 2011 ⁵⁶

Industry	Employees, ths	Percentage, %
Manufacture of food products and beverages	36.6	50.0
Electric power, gas, water	18.2	24.9
Manufacture of wine	⁵⁷	-
Production, processing and preserving of meat and meat products	-	-
Crude oils, not modified chemically	-	-
Processing and preserving of fruits and vegetables	-	-
Manufacture of dairy products	-	-
Forest-based sector (Manufacture of furniture, of wood and wood products, of paper and paperboard)	8.8	12.0
Manufacture of other non-metallic mineral products	5.4	7.39
Manufacture of textiles	4.1	5.61


Fig. 34 Relative ranking of the major industries of Moldova in employees, 2011
⁵⁶ State Statistics Service of Moldova

⁵⁷ Data is not available separately. Data is included in total amount of Manufacture of food products and beverages

Table 36 Employees of the main industries in Moldova, 2012 ⁵⁸

Industry	Employees, ths	Percentage, %
Manufacture of food products and beverages	36.3	50.0
Electric power, gas, water	18.4	25.4
Manufacture of wine	⁵⁹	-
Production, processing and preserving of meat and meat products	-	-
Crude oils, not modified chemically	-	-
Processing and preserving of fruits and vegetables	-	-
Manufacture of dairy products	-	-
Forest-based sector (Manufacture of furniture, of wood and wood products, of paper and paperboard)	8.8	12.1
Manufacture of other non-metallic mineral products	4.9	6.8
Manufacture of textiles	4.1	5.7

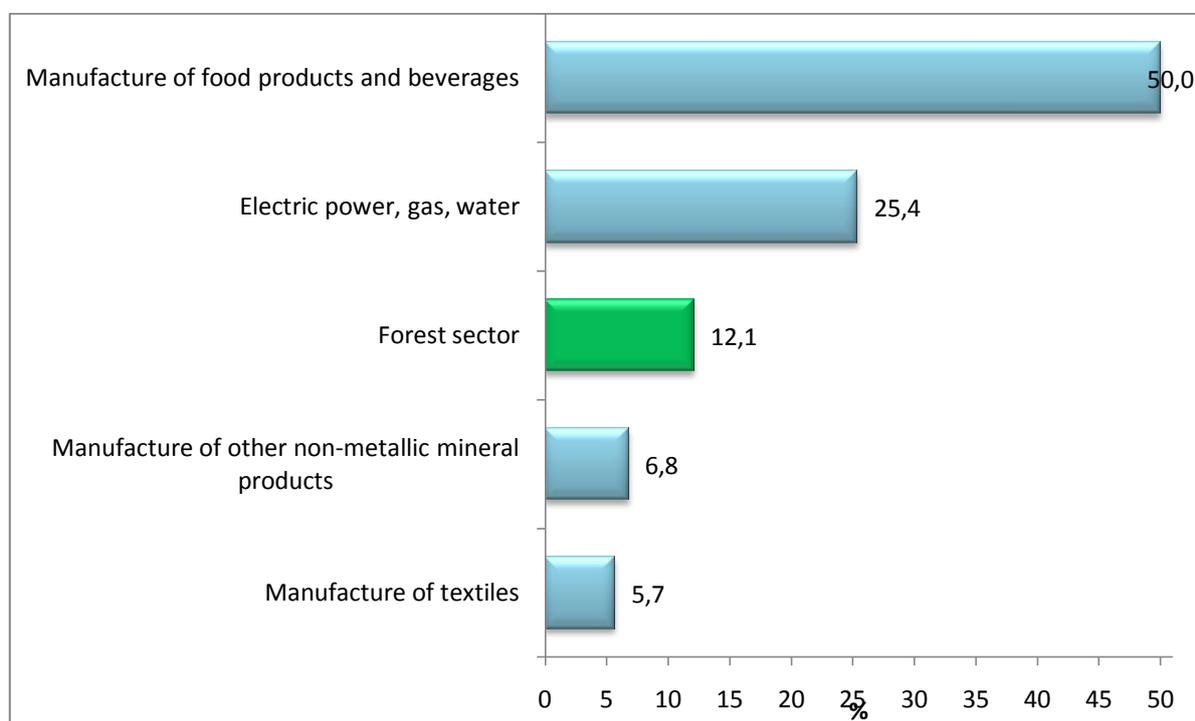


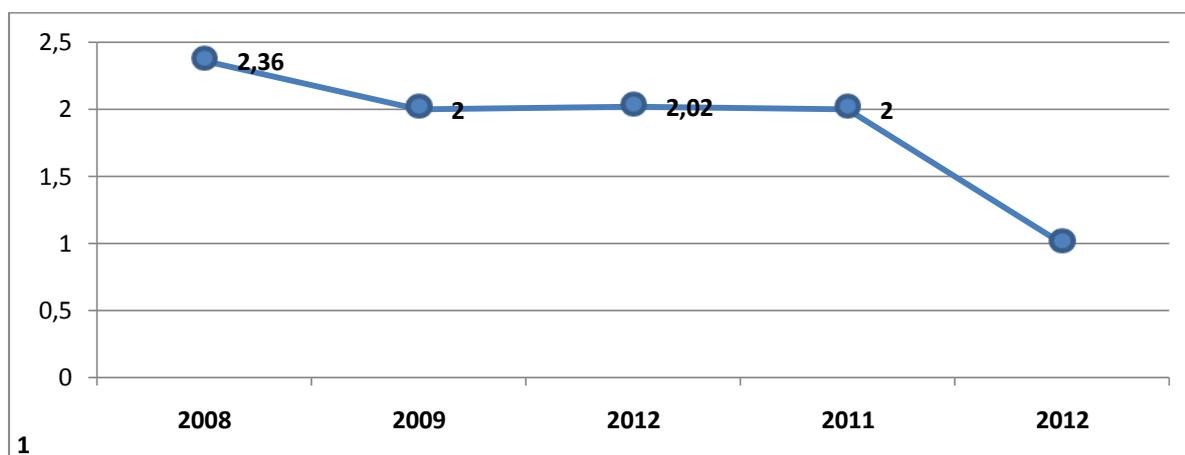
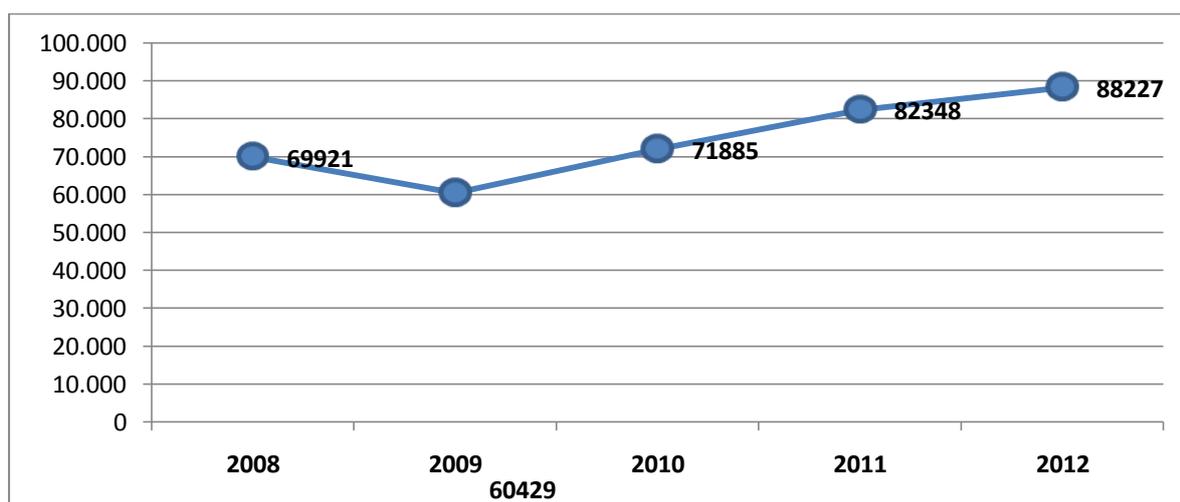
Fig. 35 Relative ranking of the major industries of Moldova in employees, 2012

⁵⁸ State Statistics Service of Moldova

⁵⁹ Data is not available separately. Data is included in total amount of Manufacture of food products and beverages

Table 37 GDP vs. forest-based sector's turnover of Moldova, 2008-2012

Year	GDP of Moldova, mio. MDL	Turnover of the Moldavian forest-based sector, mio. MDL	Share of the forest sector to GDP, %
2008	69,921	1,649	2.36
2009	60,429	1,340	2.22
2010	71,885	1,450	2.02
2011	82,348	1,690	2.05
2012	88,227	1,655	1.88


Fig. 36 GDP vs. forest-based sector's share trends in Moldova, 2008-2012

3.2.4 Main conclusions and recommendations

SWOT OF MOLDOVA'S NATIONAL FOREST-BASED SECTOR

Strengths

- A new stage of forest management planning development since 2004
- Implementation of various national programs and international grants that involved ICAS specialists
- Implementation of GIS technology for creating landscape maps
- Neighbouring Europe
- Source of employment for the local population
- Research within academic scientific institutions

Weaknesses

- Small number of SME's in woodworking sector
- Low coordination within sector
- Over centralized management system in the forest-based sector
- Absence of clear strategy of sustainable forest development
- Insufficient financial resources for the sector development, lack of state support
- Considerable share of the "shadow" sector, lack of updated consistent information on the resources of all permanent forest users
- Low percentage of forest cover land in
- Low demand for innovative products and technologies on domestic markets (in contrast to the high demand for raw timber on foreign markets)
- Low level of copyright protection (imperfect state legislation)
- Low income of population and a high cost of wood products
- A low quality of internal production, partly caused by "shadow" sector
- The degree of instability of forest ecosystems caused by various natural factors
- Considerable damage to forests and forest nurseries caused by common diseases
- Annual utilization rate of forest biomass is about 40%, representing an indicator below the limits practiced in other neighboring countries.

Opportunities

- Permanent development of forest monitoring (ICP forests) within the European forest monitoring network and 680 surveys within the national network
- New forms of wildlife management by awarding hunting based on a lease agreement
- Increasing the security of forest lands
- Increasing the harvesting wood collecting process in the forests
- Increasing wood processing capacity
- Growing value of non-timber forest products (NTFP), e.g. fruits, berries, herbs etc.
- Increasing the income in forestry and from the auxiliary-industrial activity
- Tax developments in the forestry sector
- Evolution of staffing in the forestry sector
- Evolution of the wage scale in the forestry sector
- Increasing of planning and coordination of scientific investigations

- Increasing of forest biodiversity conservation
- Intensive development of green and rural tourism
- Intensive development of cooperation projects with EU new markets/experience
- Forest-based sector reforms in the context of sustainable development
- Increase of cooperation within sector (clusters, networks), involvement of communities
- Incentives at governmental level (privileged loans, budget financing) for increasing of wooden building
- Increasing of the population's solvency, increase awareness of population on renovation with timber

Threats

- Continuous degradation of forest ecosystems, habitat fragmentation and alteration.
- Forests shrinking, poor conditions for rare and endangered types of forest ecosystems (such as beech, pubescent oak, rocky formations etc.).
- Low quality of forest habitats
- Insufficient and inappropriate stand regeneration and ecological reconstruction aimed to improve forest composition and to promote ecotypes resistant to climate change, replace the introduced species and reestablish the natural types of forests
- Lack of interconnection corridors between scattered forest bodies
- Continuous erosion of forest biodiversity
- Ineffectiveness of currently used methods and techniques of forest tending, regeneration, conservation and reconstruction of forest stands
- Inefficient integration of achievements of forest biodiversity conservation into the theory and practice of forest management planning
- Continuous degradation, fragmentation, destruction, spontaneous management without planning imposed by the forest regime of forests owned by municipalities.

RECOMMENDATIONS FOR IMPROVEMENT OF RESOURCE EFFICIENCY

The adjustment of the protected areas system to the requirements of forest ecosystems representativeness is needed. It is also recommended to establish an ecological forests network with a higher secure protection and forests of special interest in order to conserve and restore representative forest ecosystems or to protect those under risk. Priorities and recommended options to improve the situation in forestry are:

1. National policies and strategies

- Adjustment of national forest policy to the recommendations of the specialized international flora;
- Updating and modernizing the Sustainable Development Strategy for the National Forestry Sector and implementation of the regulatory framework;

2. Legal and regulatory framework

- Developing the new version of the Forest Code (including new chapters as: forest payments, municipal and private forestry sector etc.);

- Develop important components of forest normative base as integral parts of the forest regime (maintenance and conservation of forest resorts, conservation of forest genetic resources, certification of forests, forest products and management systems etc.);

3. Institutional framework

- Deep structural reform, based on new social and economic realities, strategic objectives in line with the changes throughout the national economy;
- Promoting effective forest management, transformations and performance, to encourage investment, including private allocations, and to stimulate competition, free initiative, risk taking and to discourage the underground economy;
- Establishing the personnel responsible for managing organization of forests and forest vegetation owned by municipalities and private sector, and providing primary logistical support;
- Create real conditions for strengthening community forestry sector and establishing a viable private forestry sector;

4. Conservation and development of forests and other vegetation types

- Implementing the principles of sustainable management of all forests;
- Diversification, intensification and modernization of forestry techniques;
- Careful and proper management of rare and endangered ecosystems;
- Expanding forest management planning throughout the whole country regardless the ownership, application of an unique forest management system, ensuring a record of all forest resources, achieving maximum assigned functions etc.;
- Diversification, intensification and modernization of forestry techniques and differentiated approaches based on ecological and site/habitat principles;
- Increased volumes and environmental efficiency of forest tending, regeneration felling, conservation and ecological restoration applied in forests;
- Creating a network of forest belts, small bodies of forests to reduce distances between existing forest areas;
- Developing local plans on the use, conservation and development of natural resources (forests, other types of forest vegetation, pastureland), establishment of ecological networks at municipal level, taking into account the geographical particularities, ecological, landscape etc., including in the context of prevention/reduction of natural hazards;
- Economic evaluation of forest values and gradual implementation of special payments for forest beneficiaries (landowners, curative institutions etc.), and the establishment of economic infrastructure and a market of forest products;

5. Renewable energy sources (biomass for energy)

- Creating forest energetic plantations;
- Rational evaluation of the potential for wood biomass production;

6. Rural development

- Increase the contribution of the forestry sector to rural development;

- Poverty reduction and job creation in the community and private forestry sector, improvement of living conditions;
- Ensuring ecological balance, improve national and local landscape;
- Increase the contribution of forestry to food security;

7. Research and innovation

- Assess genetic variability of the main forest species to ensure a seed source and conservation of forest genetic resources;
- Description of natural forest ecosystems for proper execution of forestry work and establish their vulnerability level;
- Develop methodologies/technologies for ensuring adaptability of forest ecosystems to climate change phenomenon;

8. Public participation in decision-making and access to information

- Develop and implement a collaborative mechanism between land owners, forestry and environmental authorities, and local communities;
- Develop a national public information system, raise awareness about forests, decisions made, and public participation in the implementation of such decisions;
- Modernization of existing informational resources and developing a modern information system based on advanced technologies (improving evidence of information, GIS implementation, etc.);

9. Professional training and eco-forestry education of the population

- Modernization of professional training process of specialists, and retraining the existing staff in accordance with new economic conditions, based on the current challenges of the national forestry sector (strengthening education within forestry institutions, strengthening the National Center for retraining forestry personnel, etc.);
- Developing and implementing training programs for forest owners and other types of community or private forest vegetation;
- Public awareness on the role of forestry and foresters for the society as well as situation in the forestry sector, developing and implementing of informational programs in order to increase the eco-forestry awareness among people, create a positive image and increase the prestige of the profession of forester;
- Strengthening the communication capacity of state forestry bodies in order to establish a sustainable social partnership with local communities through public administrations.

3.3 Georgia⁶⁰

3.3.1 Forest and wood resources

Georgia (Georgian: Sakartvelo) is a country in the Caucasus region, bounded to by the Black Sea, Russia, Turkey, Armenia, and Azerbaijan. It is a very mountainous country, with the Greater Caucasus Mountain Range forming the northern border. The country covers a territory of 69.700 km², being home to a population of almost 5 million. The capital Tbilisi is the largest city having a population of 1.3 million.

Because of its high diversity in topography, climate and landscapes, Georgia is one of the world's biodiversity hotspots, with a rich variety of unique forest ecosystems. International efforts are under way to designate a major share as protected forest.

Scenarios for future timber demand and supply in Georgia prognose a continued overexploitation and an emerging huge deficit of wood resources, for solid wood uses, and especially for fuelwood. Local wood industries and wood products import-export have largely declined. Intelligent, alternative approaches of sustainable resource use are critical and urgently needed.

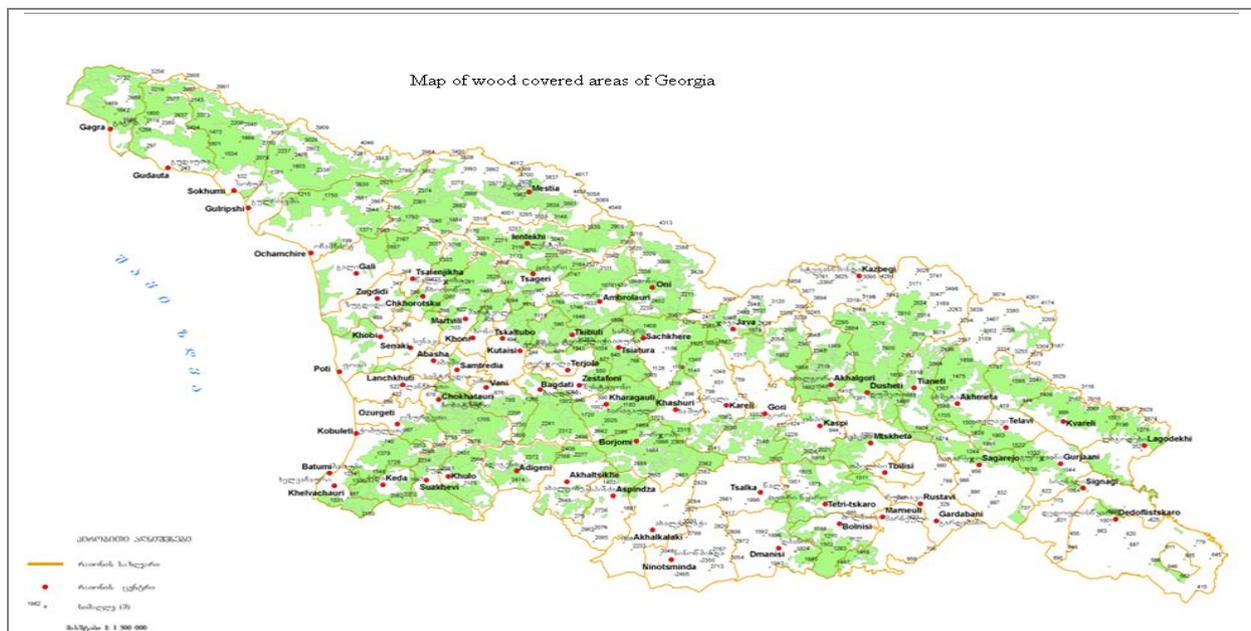


Fig. 37 Map of forest cover of Georgia

⁶⁰ Main data inputs and coauthorship of this chapter by:

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The state currently owns all forests of Georgia. In Georgia, around 2.82 million ha are covered with forests, i.e. 40.5% of the country's territory – including an estimated 0.5 million ha of primary forests, 2.2 million ha of natural modified forests and 60.000 ha of protective artificial plantations. Total standing volume amounts to 445.5 million m³, and average annual forest growth measures approximately 4.06 million m³. At the same time, forests in Georgia are distributed unevenly and with some regions rich in forests there are numerous scarcely forested regions where the covering of the territory by forest does not exceed 10 %.

Management of forests is carried out by the following organizations: National Forest Agency, Agency of Protected Areas, Forest District of Adjarian Autonomous Republic and Tbilisi City Hall. Monitoring is not carried out on the territories of Autonomous Republic of Abkhazia and Samachablo.

As of 2014, there are 50 protected areas (14 Strict Nature Reserves, 8 National Parks, 14 Natural Monuments, 12 Managed Natural Reserves and 2 Protected Landscapes) covering 7.1% of the total area of the country (493.988 ha).

Georgian forests are divided by landscape conditions into mountain and plane forests. Mountain forests cover 98% and plane forests – 2% of the total wooded area. Information concerning wooded areas and strong wood reserves classification by prevailing sorts represented the following situation: coniferous forest covered area 365.297 ha (15.8%), with reserve of 105.717.0 cub m (27.3%); deciduous forest covered 1687297 ha (72.9%), reserve 264550.5 cub m (68.5%); soft leafy wood cover 199892 ha (8.5%), reserve 14310.1 cub m (3.7%) and other species – 11396 ha (0.5%), reserve 588.1 cub m (0.1%). Remaining species cover 3335 ha (0.1%) with reserve of 61.8 cub m (0.2%).

The forests of Georgia are highly diverse. Considerable difference between the climates of Western and Eastern Georgia determine the variation in vegetation. Semi-arid and arid forests vegetation layer simply does not exist in Western Georgia. There are four main vertical layers of forests in Western Georgia: forests (up to 1.900m above sea level), sub-alpine (1.900-2.500m); alpine (2.500-3.100m) and nival (>3.100m). Whereas there are six zones in Eastern Georgia: semi-deserts; dry grasslands (valleys) and arid, thin, lucid forests (150-600m above sea level); forests (600-1.900m); sub-alpine (1.900-2.500m); alpine (2.500-3.000m); sub-nival (3.000-3.500m); and nival (>3500m). See diagrams 2.3

In mountain forests and alpine zones, forestless formations of semi-arid ecosystems are also found. Georgia's forests consist of the following species: eastern beech – 1.164.000 ha (42%); hornbeam- 298.000 ha (11.8%); oak – 281.000 ha (11.2%); alder – 200.000 ha (7.2%); chestnut – 105.000 ha (3.8 %); and coniferous species – (Caucasian Silver fir, Eastern fir, pine etc.) – 455.000 ha (17.4%). 22.3% of Georgia's forests are altitudes from 0-500m above sea level, 23.5% from 501-1.000m above sea level, 16.6% from 1.001-1.500 meters, 17.4% from 1.501-2.000 meters and 19.8% above 2.001 meters.

Most of forests of the country are located on the slopes of the Major and Minor Caucasus. 3.8% of the forest area are located on the slopes from 0-100, 16.4% on the slopes from 11-200, 17.0% on the slopes from 21-250, 18.6% on the slopes from 26-300, 20.1% on the slopes from 31-350 and 24.1% on the slopes steeper than 350.

Table 38 Forest resources of Georgia, 2012

Index	Parameter	Value
1	Square of forest land, million ha	2.82
2	Overall timber stock, billion m ³	454.5
3	Forest land percentage (%)	40.5
4	Average annual timber growth per ha m ³ per ha	1.44
5	Overall annual timber growth for country, million m ³	4.06
6	Percentage of annual timber growth usage, %	62.5

Table 39 Forest area of Georgia, 2012 (ths. ha)

Region	Forest area	Covered by forest	Forest percentages	
			Forest area	Covered by forest
Georgia, total	3,007.6	2,822.5	43.2	40.5
Abkhazia AR	507.1	479.9	58.3	55.2
Adjara AR	193.6	188.4	66.7	64.9
Samegrelo-Zemo Svaneti Region	308.6	289.3	41.5	38.9
Guria Region	101.7	98.9	50.1	48.7
Imereti Region	353.5	345.2	53.9	52.7
Racha-Lechkhumi and Qvemo Svaneti mxare	278.4	265.6	56.2	53.6
Shida Qartli Region	254.3	231.5	41.0	37.3
Mtskheta-Tianeti Region	274.8	257.5	40.5	37.9
Kakheti Region	382.7	347.8	33.8	30.7
Qvemo Qartli Region	169.5	152.7	26.0	23.4
Samtskhe-Javakheti Region	183.4	165.7	29.5	25.8

Table 40 Forest are in Georgia, 1985-2012

Year	Million hectares	Percent of national territory	Timber volume m3
1985	2.77	39.7	419.0
1995	2.75	39.6	434.0
2000	2.77	39.9	451.7
2005	2.77	39.9	451.7
2008	2.77	39.9	451.7
2009	2.77	39.9	451.7
2010	2.77	39.9	451.7
2011	2.77	39.9	451.7
2012	2.82	40.5	454.5

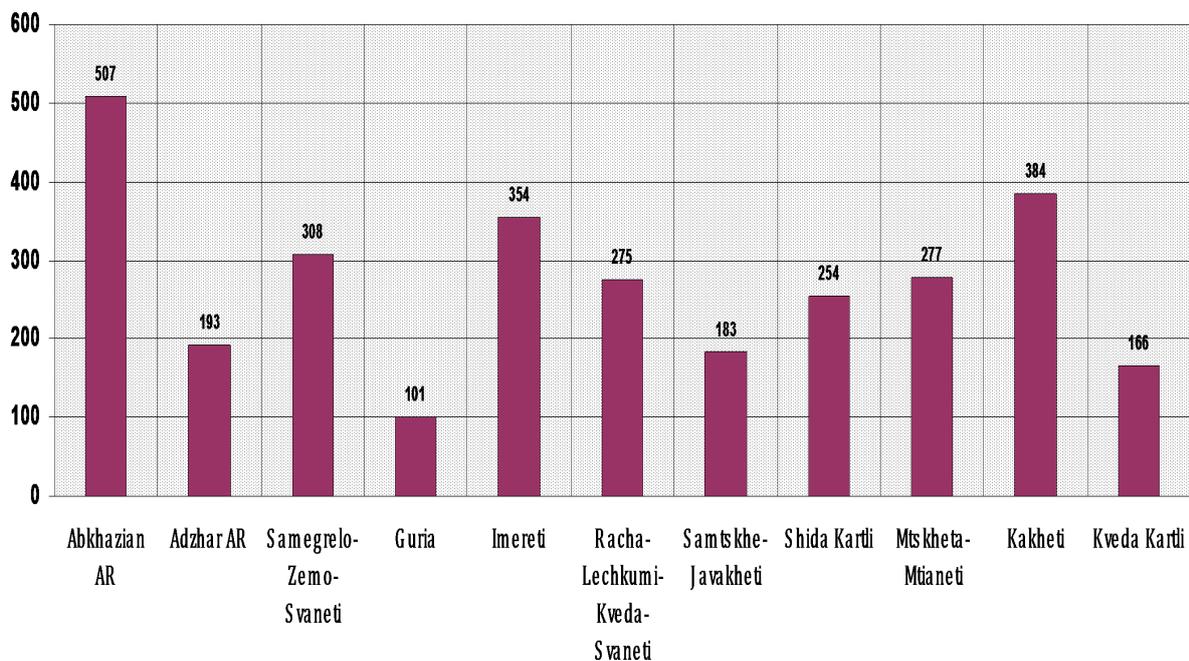


Fig. 38 Forest area of Georgia per regions (ths. ha)

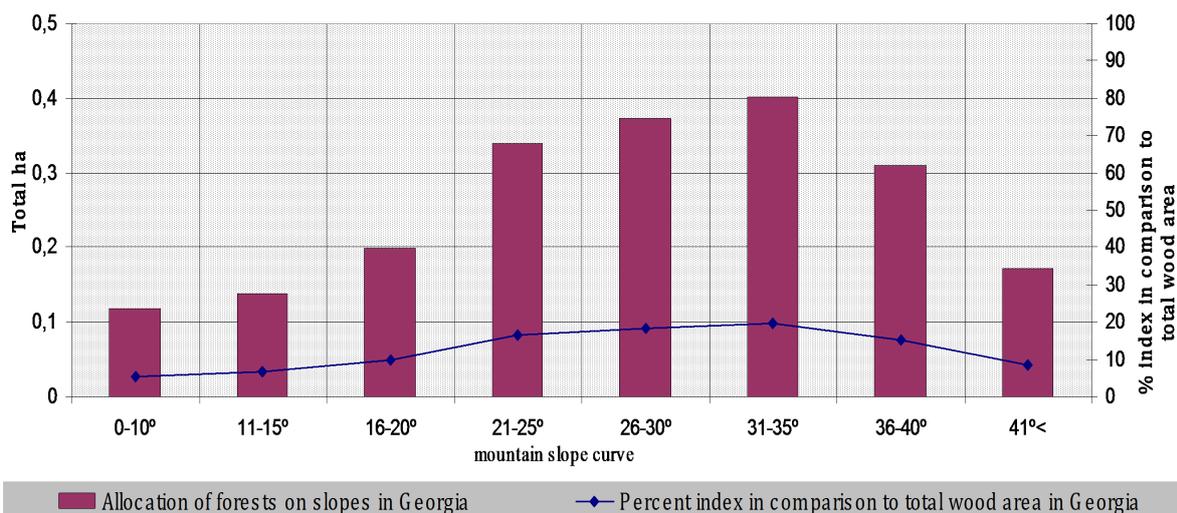


Fig. 39 Forests on mountainous slopes in Georgia (ths. ha)

Table 41 Wood resources of Georgia, 2008-2012

Year	Value		
	Producing of merchantable wood, ¹² ths. m ³		Wood output, sawn or split, more than 6 mm wide, ths. m ³
	Total value	Including main industrial felling	
2008	-	818.2	-
2009	-	697.5	-
2010	-	789.9	-
2011	-	594.4	-
2012	-	447.5	-

Table 42 Use of marketable wood resources in Georgia, 2012

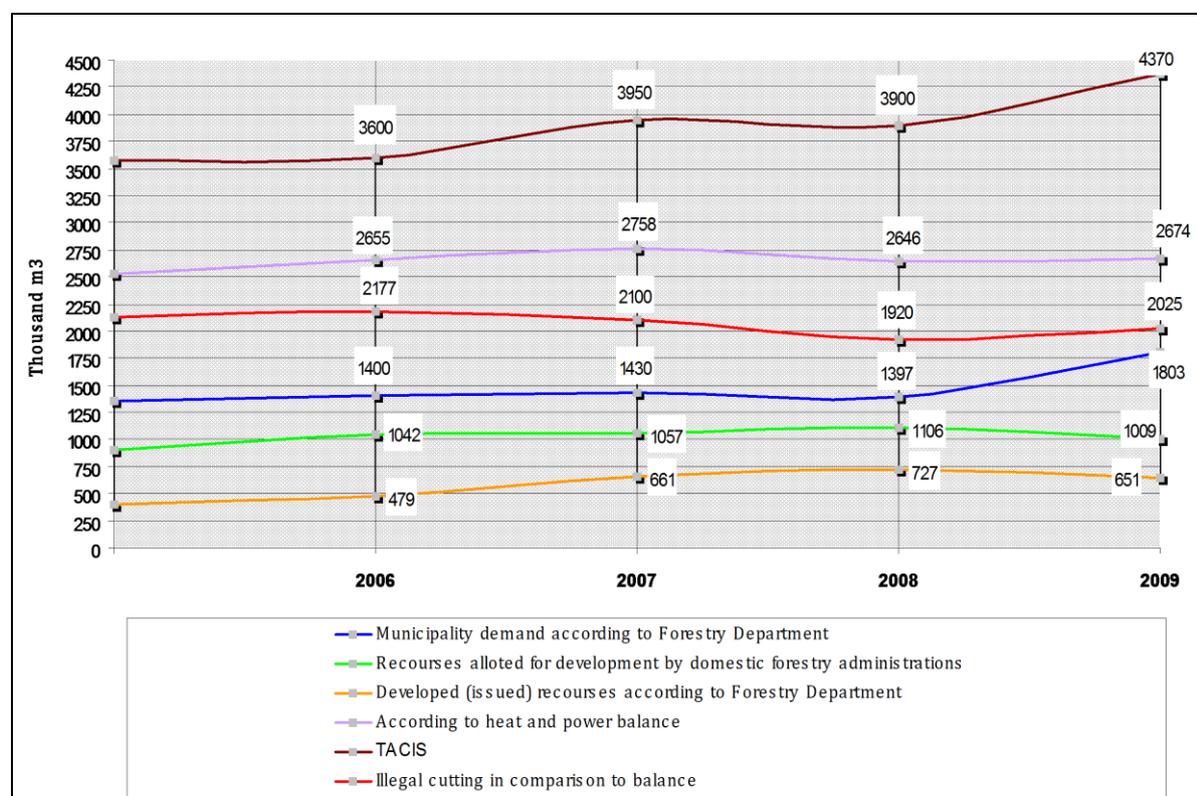
Parameter	Value
Producing of merchantable wood, ths. m ³	2,500.0
Export	90
Round timber (from total procurement), ths m ³	460.0
Including:	
For wood processing industry	138.0
For building	184.0
For pulp and paper production	65.0
Other purposes	73.0
Firewood	2,000.0

Table 43 Main indices of timber resources consumption in Georgia, 2011-2012

Timber sortiment	Share in total timber resources, %	Timber fuel supply, ths. m ³	Physical unit price per last consumer, GEL	Total cost per last consumer, ths. GEL	High price coeffi- cient
1. Wood	78.0	2,090.0	-	123,832.5	-
Including totally					
- Split wood	17.0	355.3	80.0	28,424.0	2.3
- Whole timber	83.0	1,734.7	55.0	95,408.5	1.6
2. Rests after wood preparation	10.5	281.34	62.0	17,443.08	1.8
3. Rests after wood processing (as it is)	8.5	227.75	34.0	7,743.5	1.0
4. Timber rests in agriculture (cut back, cuts in protective areas)	1.8	48.23	48.0	2,315.04	1.4
5. Recuperated / used timber	1.2	32.15	65.0	2,089.75	1.9
In total	100	2,679.5	56.1 (in average)	150,423.8 7	-

Table 44 Wooden wastes in Georgia, 2012

Year	Generated		Utilized, processed		Incinerated to generate energy
	ths tons	ths m ³	ths tons	ths m ³	
2011-2012 (average per year)	885	470	588	205	75%


Fig. 40 Indices of wood timber demand and supply in Georgia, 2005-2009 (m³)

3.3.2 Market and players

For the regulation of forest-based sector identified the following main players:

- Government
- Environmental Protection And Natural Recources Committee
- National Forest Agency, a state sub-agency organization of the Ministry of Environment Protection and Natural Resources of Georgia
- National Environmental Agency, a legal entity of public law in the system of the Ministry of Environment Protection of Georgia
- Agency of Protected Areas
- Forest Faculty of Agricultural University.

Producing and processing of wood products in Georgia is carried out by private sector and there is no relevant body in the Forest-based sector. It should be noted that after the Independence, organizations of special purposes such as forest inventory organization, a research institute of forest industry were abolished. V. Gulisashvili Institute of Mountain Forestry lost its independence and material basis. Since 2008-2012, serious problems were identified, where the major factors were lack of funds and capacity as well as frequent reorganization and changes of priorities within the sector.

National Forest Agency is a legal entity of public law in the system of the Ministry of Environment and Natural Resources Protection of Georgia. Official functions of National Environmental Agency are protecting of forest fund, carrying of forest restoration activities, elaborating of state policy in forest use, protecting forest from fires, illegal cuttings, diseases and pests. Implementing of activities like maintaining climate regulation, sanitary, recreation and other functions of forests, also monitoring of areas of state forest as well. Establishing and strengthening cooperation with local non-governmental and international non-governmental organizations.

Increasing of budget from 2006 was connected to the regulations of salaries and significant decrease of staff in the forest-based sector. Currently, the main problems in the forestry sector include unsustainable (and often illegal) forest use, excessive grazing, forest fires, pests and diseases, improper hunting and climate change. Poorly planned infrastructure development also poses a serious threat to Georgia's forest ecosystems. All of these factors have a negative effect on forest biodiversity and its resources.

Table 45 National Forestry Agency operation expenditures, 1995-2012 (ths GEL)

	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Amount	2,081	940	3,237	6,743	7,271	6,193	6,651	6,574	8,512	10,524

The share of forest industry in GDP was 4-5% in Georgia. Before 1990 inside of forest-based sector, share of wood producing was about 14%, wood processing industry- 66% and paper-pulp industry – 17%. During the 1990ies, privatization was carried out woodworking industry. Number of enterprises also changed from 572-678; 2008 – 572 and 2012-678. In addition, changes occurred with regard of employment, in 2008 the number of employees was 3.46 ths. and 2012- 5.08 ths..

Table 46 Georgian woodworking enterprises according to size, 2014

Index	Size class of enterprises	Value
1	Large enterprises	16
2	Average enterprises	36
3	Small enterprises	537
	Total	589

Some conclusions with regard to main parameters of Georgian National forest-based sector: In 2014 in Georgia, number of registered small companies was 537, i.e. 91.2% and the number of Ltd companies was 398, i.e. 67.5%. Only one company represents branch of foreign production, in Georgian forestry sector. In the past, post-soviet period wood and paper-pulp industry was supplied with the raw material from Russia. Because of this system

after moving to the market economy, forest sector faced serious problems, importing of raw materials stopped and caused deficit in the wood market, which affected their expenses. Besides this factor, total liberalization of prices, difficulties in the tax systems, high rates of inflation and termination of important economic relationship, high deficit of fuel resources and other factors caused rapid deterioration of economic situation in forest industry.

In line with the statistics of the United Nations Economic Commission and FAO, the volume of production of sawn wood over the 2009-2012 was about 70 ths. cubic meters, 5.0 ths. cubic meters of wood-based panel and 2 ths. tons of paper and paperboard. In this period the following figures are given: 121 ths. cubic meters of industrial round wood, 21 ths. cubic meters of sawn wood, 94 ths. cubic meters of wood-based panel and 29 ths. cubic meters of paper and paperboard. Total consumption conditionally converted to timber accounts to 299 ths. cubic meters and per person is about- 0.07m³.

The World Bank carried out the survey, in the 30 companies by even distribution of the territory of the country, to study general situation in the private sector: 17% are located in Tbilisi, in east part of Georgia – 3% and in the west part – 50%. Activities of inquired companies include: i) Processing, milling, drying and trading; ii) Export/trade; iii) Furniture; and iv) Flooring, parquet. Companies often carry out activities such as processing, milling, drying and trading. This happened because of small number of organized companies working in sub-industries, shortage of capital, limited investment and distribution according to sub-sectors. High level can be reached by unification of different sub-sectors.

Companies producing products of additional values (doors, windows, parquet etc.) mainly are concentrated in the capital and other big cities, such as Batumi and Kutaisi. There are two reasons: firstly, companies oriented on export are trying to add additional products on local market and the secondly big cities are the main market for high quality products. Beside forest processing, companies are also involved in other sectors, such as transport, trade, etc. Majority of companies are on the market for more than 8 years and only 3% is in the market in the last 4 years. Several companies started working in other sectors but lately have changed their decision because of the better alternatives.

Table 47 Main wood products in Georgia

Main products/ services	Wooden houses	Doors, windows, solid parquet, technological drying of wood, wood coverings, furniture and installation works	lumber and structural materials for construction
Production capacity	Annual 3,400-3,600 m ³	160-200 m ³	11,000 m ³
Key markets	Local	Local	local and international markets like Armenia, Azerbaijan, Turkey, China Iran, and the EU
Process lines	Wood drying/treatment machinery and production of final products	Wood drying/treatment machinery and production of final products	Two different process lines: sawmill and wood drying/treatment machinery plus production of final products

3.3.3 Forest-based sector

Table 48 National forest-based sector of Georgia, 2008-2013

Main parameters	Year	Subindustry			Total national forest sector
		Forestry and wood producing	Wood processing industry	Furniture manufacturing	
1	2	3	4	5	7
Turnover million EU	2008	0.37	12.5	9.82	22.69
Enterprises, units		30	349	193	572
Employees, person		213	1798	885	3,467
Turnover mill EU	2009	0.98	16.52	7.56	25.06
Enterprises, units		110	660	434	1,204
employees, persons		309	1,898	1,166	3373
Turnover mill EU	2010	1.22	11.39	23.52	36.13
Enterprises, units		84	536	418	1,038
Employees, persons		216	1659	1513	3,388
Turnover mill EU	2011	10.44	39.90	38.82	88.16
Enterprises, units					
Employees, persons		1128	2550	2325	6,003
Turnover mill EU	2012	6.91	43.59	42.76	93.26
Enterprises, units		78	213	387	678
Employees, persons		491	1,867	2,650	5,008
Turnover mill EU	2013	6.49	33.65	49.20	89.34
Enterprises, units		-	-	-	-
Number of employs, persons		491	1371	3072	4,934

Key results

1. Georgian forest-based sector in 2008-2013 is characterised by the following parameters: the total turnover since 2008-2013 has increased from 22.69 mln Euro (49.8 mln GEL) to 89.34 mln Euro, (201.44) i.e. increased by four times.
2. Average enterprise of Georgia's forest-based sector in enterprise in 2012 year we can characterize by the following indexes: average turnover- 0.138 mln Euro, average 8 number of employees
3. Turnover in the forest-based sector from 2008-2012 was increased, but in 2013 was decreased. The high number of enterprises reached in 2009 and was about 1204. The number of employment was not constant and in general it increased.
4. In the forestry sector, there is not any joint forest conception, strategy and policy. Forest industry to compare with forestry sector has not state organization.

3.3.4 Main conclusions and recommendations

SWOT ANALYSIS OF THE NATIONAL FOREST-BASED SECTOR

- Strengths: Technical possibilities (77% of inquired companies), marketing and sales (80%) and technical abilities of companies (60%) and marketing and sales companies (63%)
- Weaknesses: the less competitiveness against foreign production and production high values.
- Opportunities: the main ideas are about new products (90%) and the new markets (80%). Number of companies is interested in producing of wood products of additional values
- Threats: 73% of inquired companies consider the main threats - cheap foreign products (73%) and provision of low quality of wood (40%). Competition 75% of inquired companies estimate the competitiveness on high level, while 25% - consider it medium and 5% - small. The low competitiveness takes place in a small and drying companies and the reason is a small number of serious forest companies, the low quality of product etc.
- The right to buy from seller 10% of inquired companies consider that they have the power to define the price (manufacturers of parquet and floor), 60% (mainly milling companies) uses this power by half markets. 30% of inquired companies consider that they have low power to define prices. Representatives of inquired milling companies consider that they have the low power to buyers, because they are buying goods from mediators, requiring a high quality product, the less quality product is sold in very cheap prices or there is not any demand to sell it.
- The right to buy from supplier. In every sector 29% from inquired companies consider that they have relatively small possibility to buy from supplier; the other 29% - medium; the 42% - high. A list of useful factors for the companies: the low quality of logs provided from the most suppliers and the other factors induced suppliers - involving in wood producing activities and having permanent wood producers. 70% of inquired companies (mill companies) stated that they do not feel any competition from the possible substitute production. Substitute products affected carpentries, which need a wide assortment of different substitute goods, which are mainly imported from Turkey. In addition to this, manufacturers of parquet feel a growing demand to the quality of wood floor.
- Barriers to the market. Barriers to the market turned out to be low. 40% of inquired consider that the barriers are low; 33% - middle and 27% - high. The companies consider that barriers are high because of political instability and with a big number of forest companies.
- The most important factors for companies to access the market are the establishment of preferable environment for investment, support of the government and big experience of companies in business.
- The Government of Georgia, with International Organizations, is committed to assist businesses with the skills development projects, in order to increase employment and economic activities. The following steps have been undertaken:
- Vocational Education Training Centres around Georgia provide different types of professional courses in practical subjects. Government of Georgia was financing 80 % of the course's fees and 20% was paid by students.

- IOM (International Organization for Migration) provides businesses with partial financing for staff training.
- The USAID-funded Economic Prosperity Initiative works to assist Georgia's wood sector in the areas of workforce development, technology absorption, market linkages and policy enhancement among others.

RECOMMENDATIONS FOR IMPROVEMENT OF RESOURCE EFFICIENCY

- The current unfavourable status of forest of Georgia is primarily related to non-sustainable forest management practices. The situation can be improved through the introduction of sustainable and ecologically sound management practices. Preconditions for establishing an integrated sustainable forest management system in Georgia are:
 - Optimal institutional set-up of the forestry sector including forest management and ownership forms;
 - Adequate forestry legislation, that takes full account of biodiversity values.
- It is essential to address the problem of poverty (especially in rural areas) and supply affordable alternative energy sources to the population. However, these problems cannot be addressed to the forestry sector alone. They have to be considered within the context of the overall strategic development of the country.
- An effective wood tracking system should be developed and implemented in order to facilitate the identification of the origin of wood, logged on the territory of Georgia. This would help prevent or mitigate illegal logging activities.
- Establishing of sustainable forestry standards, in order to promote voluntary certification of forests.
- Establishing of fast-growing forest plantations in open areas (as opposed to naturally forested areas) would contribute to meet the demand of timber. It is very important to give priority to native species in these plantations (potential areas for forest plantations include the lower forest zones of western Georgia where forests were cleared for tea and citrus plantations during the soviet times—most of the tea plantations are abandoned now).
- In the next few years, net forest clearance should be brought to zero, while the levels of degradation of forest habitats should be substantially reduced. These are realistic targets, because the annual rate of forest clearance is still relatively low. In case of implementation of effective silvicultural interventions, substantial reductions in the rates of forest habitat degradation can be achieved in the observable future. As a first step, a comprehensive assessment of the rates of loss and degradation of natural forest habitats should be conducted to help in identifying adequate measures.
- The issue of excessive livestock grazing in forests requires consistent and coordinated efforts at the national level. The forestry sector alone will be unable to resolve this problem. However, pilot projects could be conducted that would demonstrate practical examples of low-impact, sustainable livestock grazing systems. Close cooperation between the Ministry of Agriculture and livestock farmers is also essential.
- A national-level action plan for combating forest fires should be elaborated and implemented. The roles and responsibilities of the relevant authorities (MoENRP, Ministry of Interior, Emergency Service, local authorities etc.) should be determined more clearly.

The capacities of these agencies should be increased so that forest fires can be more effectively prevented and combated.

- Detailed studies are needed in the forested areas most affected by pests and diseases in order to assess the degree and scale of the problem. After that, a relevant action plan should be elaborated and implemented. Surveys need to be conducted in high-risk areas to assess any potential threats from or actual occurrence of invasive species and their pathways. If necessary, relevant measures should be conducted, to control invasive species and mitigate their negative impacts.
- Sustainable forestry would also contribute to mitigation of climate change and adaptation to its negative impacts. Specifically, forest ecosystem resilience to climate change should be enhanced. Healthy forest ecosystems are able to absorb and store more atmospheric carbon.
- Inventories and assessments should be conducted in the forested areas where the forest cover has been modified, degraded or completely depleted due to infrastructural or mining projects. Based on those findings, adequate measures should be implemented to restore the landscape.
- Sustainable and multipurpose management, including the conservation of biodiversity, requires the implementation of a flexible and optimal forest categorization system. Such system should be introduced and implemented. It should include the identification and mapping of forests under Category V and VI of IUCN (protected landscape and multiple use territory), ecological corridors and forests with High Conservation Values. This would allow (i) the effective protection of most sensitive forest stands (e.g. virgin forests) and (ii) efficient utilization of forests that have significant exploitable timber resources.
- Capacity building of all key players is essential for the conservation of forest biodiversity. Training sessions and extension activities should be conducted for foresters, biodiversity monitoring experts, forest fire fighters and other specialists from related fields.
- It is of vital importance to increase the educational capacity in the forestry discipline and to ensure the training of future specialists with gender aspects taken into account. Modern curricula, incorporating best practices of forest management and biodiversity conservation, should be introduced in the Agricultural University of Georgia (a major education institution preparing professional foresters) and other relevant education institutions. (Notably, one of the objectives of the Environmental Information and Education Centre of MoENRP is to facilitate the professional growth of the employees of the sector. In addition, the National Forest Agency plans to establish a training centre).
- Community forest schemes should be developed that would fully consider the role and rights of local communities—including those of women—in respect of access to non-timber forest products.

3.4 Poland⁶¹

3.4.1 Forest and wood resources

Poland has one of the biggest forest resources and raw material resources in Europe and in the world. The area of forest land amounts to 9.4 million hectares, of which forests are 97.8%. Forest per capita in Poland equals 0.24 hectares. Forests are dominated by public forests (over 81% of forest area), including state forests (77% of forest area) in the stewardship of the State Forests National Forest Holding. The growing stock (gross large timber, in bark) amounts to 2.4 billion m³, and the abundance (measured by the volume of gross large timber per 1 hectare of forest area) is 263 m³/hectare (it is higher in public forests and equals 272 m³/hectare, and lower in private forests – 223 m³/hectare). Woodiness is almost 31%, and if measured by the share of forests within the total area of the country – it is over 29%.

In 2012 more than 37 million m³ of raw wood material was harvested in Poland. It was 8% more than in 2008. More than 96% of wood originated from public forests and 95% from the state forests. The removals were dominated by softwood (74%). More than 86% of wood was intended for production purposes. Sawlogs accounted for almost 39% of harvested raw material. The conversion factor of sawing of sawlogs into sawnwood is estimated to be 63% in the case of softwood and 65% in the case of hardwood (and in recent years it demonstrates a downward trend). In recent years in Poland harvesting has been growing systematically. However, due to the strong orientation of forest management towards sustainability of forests and their non-production functions, exploiting of resources is below the biological capacity of forests (in 2012 in the State Forests National Forest Holding the relation of wood removals to current annual increment was 61.9%, and in 2008 50.5%).

Table 49 Forest resources in Poland, 2012

Index	Parameter	Units	Value
1	Forest land	million ha	9.4
2	Forest area	million ha	9.2
3	Share of forest land in land area	%	30.6
4	Forest cover ^a	%	29.3
5	Growing stock of standing wood (gross grand total timber)	billion m ³	2.4
6	Resources of gross timber	m ³ /ha	263
7	Growing stock of standing wood - annual current increment ^b	m ³ /ha	9.48
		% of total standing	3.74

a The share of forests within the total geographic area of the country.

b W PGL Lasy Państwowe (State Forests National Forest Holding).

Source: Central Statistical Office in Poland.

⁶¹ Main data inputs and coauthorship of this chapter by:

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The sawmilling industry does not exploit its production capacity⁶² in full, which is due to national economic conditions and the conditions specific for this industry. In Poland the main barriers to increasing production capacity are: firstly – the problems concerning supply of raw wood material (inter alia the lack of proper quality raw material, disruptions of supplies resulting from periodical deficits of some raw material assortments, increasing raw wood material prices), and secondly – the ageing of technical equipment and the lack of finance to improve it.

Table 50 Roundwood removals in Poland, 2008-2012 ⁶³

Year	Removals			Production sawnwood ^a
	roundwood	industrial roundwood	sawnlogs	
	ths. m ³			ths. m ³
2008	34,273	30,470	13,854	3,863
2009	34,629	30,475	13,329	3,850
2010	35,467	31,343	14,062	4,220
2011	37,180	32,200	14,462	4,422
2012	37,045	32,001	14,318	4,249

Source: Central Statistical Office in Poland.

Table 51 Roundwood removals in Poland, 2012

Index	Value
	ths. m ³
Roundwood – total removals:	37,045
- industrial roundwood, of which:	32,001
- sawnlogs	14,318
- veneer and plywood logs	256
- pulpwood	16,140
- other	1,287
- wood fuel	5,044

Source: Central Statistical Office in Poland.

⁶² The Wood Technology Institute in Poznan estimates that average exploiting of the potential of the Polish sawmilling industry is within the range 70-75%.

⁶³ . According to the Wood Technology Institute the officially given volume of sawnwood production is understated, for it does not take into account production in small wood companies employing less than 10 people (and in Polish sawmilling industry this is a numerous, but quite unstable group of producers) and part of production of sawnwood intended directly for further processing in the companies which produced it (flooring materials, pallets etc.). It is estimated that in recent years actual production of sawnwood amounted to 8.0-8.3 million m³. Production of sawnwood estimated in the Wood Technology Institute – the volume of timber production resulting from: the amount of coniferous and deciduous sawnlogs (large-size for general purposes) sold on the domestic market by the State Forests National Forest Holding increased by removals of sawnlogs in forests of other ownership, balance of foreign trade in sawnlogs, assumed material efficiency of sawing of softwood and hardwood raw material to timber, assumed percentage of sawnlogs that is not sawn to timber (5%). The volume of sawnwood production does not mean the volume offered on the market. Most of this sawnwood is further processed and offered on the market in the form of less or more processed materials and products of wood (such as: elements of building structures, elements of furnishings, windows, doors, flooring materials).

The structure of harvested wood is dominated by pulpwood (over 43%) and sawnlogs (almost 39%). In 2012 more than 5 million m³ of fuelwood was also harvested. In principle, raw wood material is directly consumed by wood industries, i.e. sawmilling, wood-based panel, and wood pulp industries. In recent years a new player joined the wood market, i.e. the power sector.

It is estimated that of 37.5 million m³ of wood consumed⁶⁴ in 2012 (imports 2.5 million m³, exports 2 million m³):

- 94% was used for production purposes, of which:
- 50% for sawnwood production,
- 28% for wood-based panel production,
- 12% for wood pulp production,
- 4% for the production of other wood products (charcoal, matches etc.),
- 5% was used for energy purposes,
- 1% was used for other purposes (in agriculture, and households).

3.4.2 Market and players

The forest-based sector in Poland is subject to relevant departments of the Ministry of Economy and the Ministry of the Environment. State forests are governed by the General Directorate of the State Forests National Forest Holding. Closer and further environment of the sector is composed of entities which are directly or indirectly connected with the operation based on wood processing.

Economic chambers, associations and producer associations, inter alia:

- The Polish Economic Chamber of Wood Industry,
- Polish Chamber of Commerce of Furniture Manufacturers,
- Wood Based Panels Producers Association of Poland,
- “Polish Parquet Fitters” Association,
- Polish Windows and Doors Association,
- Wooden House Association,
- Association of the Producers of Machines, Machine Tools and Devices for Wood Processing,
- The Polish Chamber of Biomass,
- Renewable Energy Association,
- Polish Technology Platform for the Forestry and Wood Sector, which is a member of the Forest-Based Sector Technology Platform (FTP),
- Centres, committees, and professional associations, such as Wooden Construction Association, Polish National Committee of EPAL, Association of Foresters and Wood Technologists.

⁶⁴ Calculative consumption = removals + imports - exports.

Scientific and R&D institutions, including:

- higher education institutions (mainly forest faculties, wood technology faculties, and faculties of wood industry economics and organisation),
- research institutes (inter alia Wood Technology Institute),
- R&D centres,
- centres of innovation and technology, clusters, and entrepreneurship incubators.

The main aspects that one should bear in mind analysing the forest-based sector in Poland and its role in the economy:

- the necessity of balancing the requirements of ecology, economic reasons, and social expectations both in forestry and the wood and furniture industries, makes it necessary to comprehensively perceive the whole chain of wood processing,
- the basic paradigm of the sector development is eco-development, a drive for the “green” economy, i.e. no-waste economy that keeps the environment clean,
- the main stimulus of the sector development in Poland is construction – potentially the largest segment of the Polish wood market; construction is both a consumer of various wood materials and a creator of the demand for finished wood products.

The forest-based sector plays an important role in the Polish foreign trade, especially export. An excess of exports over imports, which is the case of most high valued-added wood products, is a phenomenon very favourable to the Polish economy characterised by foreign trade deficit. In 2012 in Poland the share of wood and the products of its processing within the value of exports was 6.4% and imports 1.4% (without wood pulp, paper and paperboard, and secondary paper products). The exports of wood products is dominated by furniture, which is beneficial due to the high value added of furniture. Furniture is also one of the main commodity groups in the total Polish exports. In 2012 the share of furniture exports within total Polish exports was 4.5%. Wood exports is of relatively slight significance – its value amounts to approximately 0.1% of the total value of exports. In recent years the trend in the foreign trade in wood has changed, i.e. previously growing imports has been hampered (in the period 2011-2013 it decreased from 3.5 million m³ to 2.3 million m³); whilst raw wood material exports has been increasing (from 1.9 million m³ to 3.1 million m³).

3.4.3 Forest-based sector

In 2012 more than 82 ths. companies⁶⁵ operated in the Polish forest-based sector⁶⁶. These companies employed 271.2 ths. people. Total revenues of forestry, wood industry and furniture industry (in companies employing more than 9 people) amounted to PLN 57.3 billion. Sold production of the wood industry and furniture industry was PLN 58.3 billion.

⁶⁵ Entities of the national economy recorded in the REGON (Official Business Register) register.

⁶⁶ According to the global survey’s methodology the forest-based sector does not encompass Division 17 of NACE – “Manufacture of paper and paper products”. Additionally, the analysis of the Polish forest-based sector does not take into account the following Classes: NACE 43.32 – “Joinery installation”, NACE 43.33 – “Floor and wall covering”, and NACE 43.91 – “Roofing activities” belonging to the Section F – “Construction” (these do not belong to industry, i.e. NACE Sections B+C+D+E).

Table 52 Forest-based sector in Poland, 2008-2012

Main parameters	Year	Revenues from total activity ^b	Sold production	Number of enterprises	Average paid employment
		million PLN	million PLN	units	ths. persons
Forestry and logging (NACE 02)	2008	5,934	-	20,229	39.8
	2009	5,509		19,330	40.0
	2010	6,399		19,805	37.8
	2011	7,903		18,866	38.8
	2012	7,886		19,190	31.1
Manufacture of wood and of products of wood and cork, except furniture; [...] (NACE 16)	2008	19,771	25,472	39,593	123.5
	2009	18,524	23,666	35,437	110.6
	2010	20,447	25,456	36,822	110.5
	2011	22,416	28,141	35,717	107.0
	2012	23,518	29,560	35,957	101.5
Manufacture of furniture (NACE 31)	2008	24,539	26,419	24,980	153.1
	2009	25,112	27,724	24,806	151.0
	2010	23,296	25,728	26,488	144.9
	2011	27,356	30,182	26,434	144.3
	2012	25,888	28,788	27,047	138.6
Total forest-based sector	2008	50,244	51,891	84,802	316.4
	2009	49,145	51,390	79,573	301.6
	2010	50,142	51,184	83,115	293.2
	2011	57,675	58,323	81,017	290.1
	2012	57,292	58,348	82,194	271.2

a NACE Rev. 2 (2008).

b Data regarding the financial management of enterprises include economic entities keeping accounting ledgers employing more than 9 persons.

Source: Central Statistical Office in Poland.

Table 53 Forest-based sector's share of the national economy of Poland, 2012

Main parameters	Gross output	Gross value added	Average paid employment
	Share in the economy in total [%]		
Forestry and logging	0.3	0.3	0.3
Manufacture of wood and of products of wood and cork, except furniture [...]	1.0	0.6	1.0
Manufacture of furniture	0.9	0.7	1.4
Forest-based sector	2.2	1.6	2.7

a NACE: 02 – “Forestry and logging”, 16 - “Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials”, 31 – “Manufacture of furniture”.

Source: Central Statistical Office in Poland.

In the period 2008-2012 the Polish forest-based sector was characterised by the following phenomena:

- the number of entities dropped (by more than 3%),
- average employment decreased (by more than 14%),
- revenues increased (by 14%, in current prices, in entities employing more than 9 people),
- sold production of the wood industry would increase by almost 2% annually and of the furniture industry by more than 1% (in fixed prices).

The forest-based sector is important for the development of the Polish economy in general. Forestry and the wood and furniture industries altogether generate 2.2% of total production in Poland and 1.6% of gross value added, and their share within the average employment in Poland is 2.7% (2012). The great potential of forestry is not directly reflected in macroeconomic indices, which is a specific feature of this sector of economy. Forestry generates approximately 0.3% of each: total production and gross values added. Percentage of the employed in forestry is also approximately 0.3% of the average employment. However, the significance of forestry in Poland is clearly greater in non-economic categories, i.e. social and environmental, which are hard to measure.

3.4.4 Forests and wood resources of the Wielkopolska Region in Poland

Wielkopolska Region is located in the central-western Poland and its capital is Poznan. The Region's geographical location on the European continent is beneficial as it is a natural platform between East and West Europe.

Wielkopolska Region is one of the biggest and most dynamically developing regions in Poland. It ranks the second in the country in terms of land area, the level of employment and the amount of companies operating in industry, and the third in terms of population, the level of industrial production and the amount of gross domestic product per capita.

Wielkopolska covers 9.5% of the country's area, and almost 9% of the population lives in the Region. It concentrates about 12% of the employed and almost 11% of Polish industrial companies producing about 11% of the value of domestic industrial output. It generates 9.3% of the value of Polish GDP. Simultaneously it is the region with the lowest level of unemployment in Poland.

In Wielkopolska Region, similarly to situation across Poland, removals of raw wood material have been growing steadily in recent years. In 2012 approximately 3.3 million m³ of raw wood material (4% more than in 2010), including 3 million m³ of merchantable bole, was harvested in Wielkopolska Region. Removals per capita in the Region amounted to 0.87 m³ merchantable bole. More than 97% of wood originated from public forests, and 96% from the state forests.

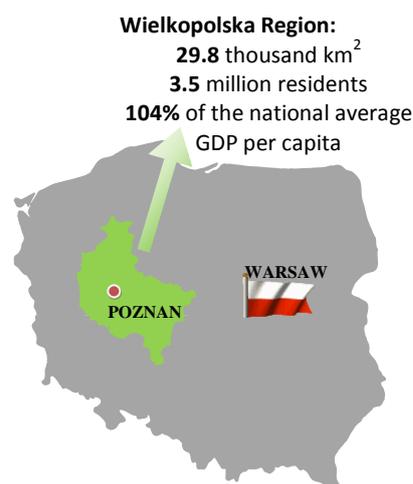


Table 54 Wood resources of Wielkopolska Region in Poland, 2012

Index	Parameter	Units	Value
1	Forest land	ths. ha	787
2	Forest area	ths. ha	766
3	Share of forest land in land area	%	26.8
4	Forest cover ^a	%	25.5
5	Growing stock of standing wood (gross grand total timber)	million m ³	189
6	Resources of gross timber	m ³ /ha	247

a The share of forests within the total geographic area of the country.
Source: Central Statistical Office in Poland.

Table 55 Roundwood removals in Wielkopolska Region in Poland, 2010-2012

Year	Removals			Production sawnwood ^a
	roundwood	industrial roundwood	sawnlogs	
	ths. m ³			ths. m ³
2010	3,147	2,633	983	514
2011	3,231	2,614	952	556
2012	3,270	2,662	961	517

a Data of the Central Statistical Office. According to the Wood Technology Institute the officially given volume of sawnwood production is understated, for it does not take into account production in small wood companies employing less than 10 persons (and in Polish sawmilling industry this is a numerous, but quite unstable group of producers) and part of production of sawnwood intended directly for further processing in the companies which produced it (flooring materials, pallets etc.). It is estimated that in Wielkopolska Region actual production of sawnwood has been approximately two times higher in recent years.
Source: Central Statistical Office in Poland.

Table 56 Roundwood removals in the Wielkopolska Region in Poland, 2012

Parameter	Value ths. m ³
Roundwood – total removals:	3,270
- industrial roundwood, of which:	2,662
- sawnlogs	961
- veneer and plywood logs	4
- pulpwood	1,560
- other	137
- wood fuel	608

Source: Central Statistical Office in Poland.

Forest resources and raw material resources of Wielkopolska Region are amongst the larger in Poland (8.4% of the forest land in the country, 7.9% of domestic wood resources, 8.9% of domestic timber removals). The area of forest land amounts to 0.8 million hectares, of which forests area is 97.4%. Forests are dominated by public forests (89% of forest area), including

state forests (86% of forest area) in the stewardship of the State Forests National Forest Holding. The growing stock (gross large timber, in bark) amounts to 0.2 billion m³, and the abundance (measured by the volume of gross large timber per 1 hectare of forest area) is 247 m³/hectare (it is higher in the state forests and equals 249 m³/hectare, and lower in private forests – 220 m³/hectare). Woodiness is almost 27%, and if measured by the share of forests within the total area of the country – 25.5%.

Softwood dominated removals (78%). More than 81% of wood was intended for production purposes. The structure of roundwood harvested in Wielkopolska Region is dominated by pulpwood (over 48%) and sawnlogs (29%). In 2012 more than 0.6 million m³ of wood fuel was also harvested.

In Wielkopolska Region there are basically two direct consumers of raw wood material: the sawmilling industry and the wood-based panel industry. Wood is also used in agriculture and households. In recent years the demand for wood has been also created by a relatively new consumer, i.e. the power sector.

3.4.5 Forest-based sector of the Wielkopolska Region in Poland

The immediate and remote environment of the forest-based sector in Wielkopolska Region consists of entities directly or indirectly connected with operations based on wood processing. In the region, the sector's environment encompasses the following entities:

- State Forests Regional Directorate in Poznan,
- economic chambers, associations and producer associations (inter alia: The Polish Economic Chamber of Wood Industry, "Polish Parquet Fitters" Association, and the Association of the Producers of Machines, Machine Tools and Devices for Wood Processing),
- Polish Technology Platform for the Forestry and Wood Sector (PPTSL-D), which is a member of the Forest-Based Sector Technology Platform (FTP),
- centres, committees, and professional associations (inter alia the Association of Foresters and Wood Technologists),
- scientific and R&D institutions, including:
 - higher education institutions (mainly forestry faculties, wood technology faculties, and faculties of wood industry economics and organisation),
 - research institutes (inter alia the Wood Technology Institute),
 - R&D centres,
 - centres of innovation and technology, clusters, and entrepreneurship incubators.

Table 57 Forest-based sector of the Wielkopolska Region in Poland, 2012

Main parameters	Sold production ^b	Number of enterprises ^c	Average paid employment
	million PLN	units	ths. persons
Forestry and logging (NACE 02)	-	1,260	3.9
Manufacture of wood and of products of wood and cork, except furniture; (NACE 16)	3,717	3,205	17.6
Manufacture of furniture (NACE 31)	7,594	3,460	35.8
Total forest-based sector	-	7,925	57.3
Total wood sector	11,311	6,665	53.4

a NACE Rev. 2 (2008).

b Data concerns economic entities employing more than 9 persons.

c Entities of the national economy recorded in the REGON register; state of 5.04.2012.

Source: Central Statistical Office in Poland and the Wood Technology Institute.

In 2012 in Wielkopolska Region the forest-based sector⁶⁷ encompassed more than 7.9 ths. active companies⁶⁸ (according to the state of 5.04.2012 it was 11% of entities operating in forestry and the wood and furniture industries in Poland). They employed 57.3 ths. people (approximately 21% of all employed in the forest-based sector in Poland). Sold production of the wood and furniture industries (in the group of companies employing more than 9 persons) amounted to PLN 11.3 billion (which was 21% of its total value created in this group of companies in the wood and furniture industries in Poland).

The forest-based sector is important driver of the development of the economy in Wielkopolska Region, and thus contributes to the increase in wealth of the society and to its development. The social and economic potential of the wood sector in Wielkopolska Region is reflected by 6.7 ths. wood-based companies of different sizes (with the domination of SMEs) and organisational and ownership forms. These companies produce most of wood products. The wood sector in Wielkopolska Region is dominated by the furniture industry (52% of the wood-based companies in the Region, 67% of the employed, and 67% of sold production), followed by the builder's carpentry and joinery and sawmilling.

⁶⁷ According to the global survey's methodology the forest-based sector does not encompass Division 17 of NACE – "Manufacture of paper and paper products". Additionally, the analysis of the Polish forest-based sector does not take into account the following Classes: NACE 43.32 – "Joinery installation", NACE 43.33 – "Floor and wall covering", and NACE 43.91 – "Roofing activities" belonging to the Section F – "Construction" (these do not belong to industry, i.e. NACE Sections B+C+D+E).

⁶⁸ Entities of the national economy recorded in the REGON register (Official Business Register).

3.4.7 Main conclusions and recommendations

SWOT ANALYSIS OF THE NATIONAL FOREST-BASED SECTOR

Strengths

- Rich national raw material base (Poland to a large extent is self-sufficient as regards wood supply) and great potential possibilities of replenishing this base with raw material from other sources (e.g. industrial wood waste, post-consumer wood waste, plantations of fast-growing trees)
- Significant and systematically growing production of wood products (Poland has high positions - often within the first ten countries – in the European Union in terms of production of basic wood products)
- Significant share of high value-added products within production assortment, i.e. products with great possibilities of modification and of importance for foreign trade, mainly for export (which proves their competitiveness on foreign markets, primary on the demanding EU markets; export is one major stimuli of the sector development)
- Domination of small and medium-sized enterprises (especially in sawmilling industry, builder's carpentry and joinery, packaging industry, and furniture industry) characterised by greater flexibility of operation
- Relatively large scale of implementation of innovative technologies of European and/or world standards (wood-based panels industry, furniture industry)
- Fairly good economic and financial standing of the sector (especially the wood-based panel industry and builder's carpentry and joinery)
- Relatively high share of foreign capital (mainly in the wood-based panel industry and furniture industry) stimulating development of the sector
- High activity in the area of creation and implementation of innovation (especially in the wood-based panel industry and furniture industry) and taking up of initiatives to stimulate innovativeness (innovation centres, technology platform, and clusters)
- Relatively high degree of adaptation of the sector and most wood products to European Union standards (inter alia in the area of norms and certificates, reporting systems and statistics)
- High qualifications and competence of managerial staff and employees (especially in big companies, partially also in small and medium-sized enterprises)
- Increasing productivity (average European level) and low production costs (especially labour costs lower than in the EU and than the average for Poland)
- Lack of formal barrier to enter the market and easy access to distribution channels; operation of the wood industries and relations between producers are based on free competition
- Development and implementation of long-term strategies of the sector development (industry strategies, strategy of the Polish Technology Platform for the Forestry and Wood Sector, foresight in wood industry)

Weaknesses

- Domination of one supplier on the wood market and dependence on the quantity and quality structure of wood harvesting
- Much dispersion of production (mainly in the sawmilling industry, packaging industry, and furniture industry), which means less potential in the area of creating the possibilities of the sector development
- Production capacity not used to the full, mainly in sawmilling industry
- Insufficient amount of new, high-performance machines and devices for wood processing in small and medium-sized enterprises
- Generally imitative nature of technical development and investing mainly in technical equipment, while the share of technological and immaterial innovation is low
- Limited possibilities of self-financing of the development of most wood industries; often a lack of sufficient equity capital, the necessity for external financial support (loans, EU aid funds)
- Less possibilities of making use of raw material sources alternative to wood from the forest for the production of “green” energy in the case of small plants (too high costs of devices and technology implementation)
- Relatively unfavourable structure of the staff in terms of age (high percentage of advanced in years employees) and low mobility of staff in the sector
- Insufficient (but diverse in terms of industry) co-operation between entrepreneurs, science and R&D
- Competition over raw material, in case of its deficit, between industries and producers and additionally the new market player – the power sector
- Frequent lack of long-term strategies of operation in small enterprises (and sometimes medium-sized)
- Sale of most Polish wood products abroad not under one’s own brand (no name products)

Opportunities

- Improvement of the economic situation in Europe and in the world (better condition of economies, primarily the economies of the main international trade partners of Poland)
- Good economic situation of Poland, increase in the wealth in the society implying an increase in the demand for wood products
- Stable development of industries connected with allocation of wood materials and products, including mainly construction being one of major creators of the demand for wood products
- Stability of Polish currency; well prepared “paths” for entering the euro zone
- Improvement of the situation on the labour market (decrease in unemployment and increase in vocational activity of society); permanent growth of the qualifications of staff employed in the sector (in the area of electronic, IT, management, command of foreign languages) and greater mobility of employees
- Intensification of pro-export actions, creation of instruments facilitating effective search for new, non-European markets for wood products
- Development of globalisation processes facilitating unlimited access to knowledge and information; intensive knowledge transfer

- Improvement of the mechanisms of operation of the wood market facilitating increase in economic efficiency of the sector; development of the instruments stimulating the inflow foreign capital
- Implementation of effective mechanisms eliminating barriers to co-operation between science and industry
- Development of new, previously unknown applications of wood (nanotechnologies, nanoproducts, wood lamination, thermal and chemical modification of wood), development of techniques and technologies that are raw material-saving, material-saving and energy-saving, implementation of technologies reducing environmental pollution and counteracting climate change, mainly including low CO₂ emission solutions)
- Growing use of alternative energy sources

Threats

- Stagnation on foreign markets, especially on the markets of main trade partners of Poland (resulting in decreasing foreign demand for wood materials and products)
- Slump of a relatively good economic condition in the national economy; a lack of stimulation of the national demand, low level of wealth in society
- Low activity in the main sectors consuming wood (cessation or deceleration of the development of the economy sectors consuming wood products – mainly construction)
- Low effectiveness of pro-export actions in the state policy; increase in the risk connected with international transactions; a lack of stability currency exchange rates; tariff barriers
- Quantitative and structural deficit of labour resources and deepening of negative trends on the labour market
- Incoherent and unstable state policy concerning the sphere of science and research bringing about discrepancy between the science offer and the specific needs of industry
- Competition from foreign concerns in the sphere of research (companies have their own R&D laboratories), especially in wood-based panel industry
- Decrease in the investment attractiveness of the sector – less than desired inflow of foreign capital
- Inflow of competitive wood materials and products from the European Union states, and especially from non-EU states (competition in terms of price and marketing)
- Strong substitution of wood and wood materials by their non-wood equivalents (e.g. plastic, glass, concrete)
- Lack of scenarios of the development of the sector, industries and wood companies or existing scenarios are not implemented (or implemented only in part, which does not guarantee achievement of assumed goals)
- Resulting from international agreements restrictive regulations (especially in the wood-based panel industry) concerning the processes of wood product manufacture and connected with environmental protection (mainly regulations imposing reduction of CO₂ emissions)

RECOMMENDATIONS FOR IMPROVEMENT OF RESOURCE EFFICIENCY

NATIONAL FOREST-BASED SECTOR

- Wood in Poland can and should be treated as a strategic resource in the economy,
- Forests in Poland – necessary actions:
 - change of approach to the balance of forest management (i.e. to the issue of excessive wood accumulation), which makes it possible to increase raw wood material removals,
 - support for system actions conducive to the use of non-forest raw wood material (fast-growing tree plantations, post-consumer wood waste, agricultural biomass) by some wood industries,
 - solution to the problem of combustion of quality wood biomass, increased use of other renew energy sources,
- Forest-based sector in Poland:
 - in the country's policy the sector should be a "Polish intelligent specialization", a priority area taking into account the strengths of Poland and the sector in the sphere of both economic and scientific potential,
 - increase in innovativeness, as a condition for non-price competition, is a basic challenge for the sector development; facing the challenge requires:
 - improvement of the state policy in the area of entrepreneurship, innovativeness and competitiveness, especially as regards the SME sector,
 - increase in outlay on research and implementation,
 - improvement of staff competence in the area of operation in the competitive foreign markets and skilful use of trumps resulting from the specificity of wood industries,
 - the concept of the "green" economy should be an important stimulus to the sector development, including:
 - actions intensifying cascade use of wood and low emissiveness (effective economic-financial and legal instruments supporting cost-intensive eco-innovations and mechanisms facilitating transfer of knowledge and technology),
 - raising awareness of a special role of the sector in finding solutions to socio-economic problems at a local level and allowing for it in regional development strategies,
 - monitoring of the wood market and periodical drawing up of multi-year strategies of the sector development by special analytical-advisory group.

WIELKOPOLSKA REGION OF POLAND

- the economy of Wielkopolska Region should place more emphasis than before on raw wood material as its strategic resource,
- a necessary thing is support for systemic actions conducive to the use of non-forest raw material (especially originating from fast-growing tree plantations, post-consumer wood wastes, and agricultural biomass) by some wood branches in Wielkopolska Region,
- the issues of combustion of valuable wood biomass and increasing the use of other renewable energy sources still have to be solved in Wielkopolska Region,

- the development policy of the Region should treat the forest-based sector as a „regional intelligent specialisation”, i.e. a priority domain taking into account the strengths of the Region and the sector in the sphere of both economic and scientific potential,
- the green economy concept should be an important stimulus of the sector development in Wielkopolska Region, including:
 - actions to intensify cascade use of wood and low emission performance (effective economic-financial and legal instruments supporting cost-intensive eco-innovations and mechanisms streamlining the transfer of knowledge and technology),
 - making a wide audience aware of the special role of the sector in solving social-economic problems at a local level and allowing for this role in regional developments strategies,
 - monitoring of the wood market and periodical preparation of multi-year regional sector development strategies by a special analytic-advisory body.

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