БУДІВНИЦТВО ТА ЦИВІЛЬНА ІНЖЕНЕРІЯ

УДК 539.3 https://doi.org/10.31713/vt420255

Homon S. S. [1; ORCID ID: 0000-0001-9818-1804],
Doctor of Engineering, Professor,
Yakubets V. R. [1; ORCID ID: 0009-0001-4111-7147],
Post-graduate Student,
Suvorov O. M. [2; ORCID ID: 0009-0009-7077-3600],
Post-graduate Student,
Kratiuk O. M. [2; ORCID ID: 0009-0007-8265-9544],
Post-graduate Student

[1]National University of Water and Environmental Engineering, Rivne
[2]Lutsk National Technical University, Lutsk, Ukraine

PERSPECTIVES FOR THE USE OF WOOD IN VARIOUS INDUSTRIES OF UKRAINE

The article investigates the use of wood in the primary industrial sectors of Ukraine and analyzes the structure of its consumption. Wood is an important renewable natural resource, utilized in construction, wood-processing, furniture manufacturing, pulp and paper, and chemical industries, as well as in the energy sector. It has been established that the highest consumption of wood occurs in the wood-processing and construction industries, while furniture manufacturing plays a significant role, and a smaller share is used in the pulp and paper and chemical industries. In construction, wood is actively applied in residential, industrial, public, and agricultural buildings, predominantly in load-bearing, roofing, and auxiliary structural elements. As load-bearing structures: beams, columns, trusses, arches, purlins, decks, shells and others. Such structures are made of solid, glued and modified wood at woodworking enterprises. Mainly coniferous wood species are used: pine, spruce, larch, spruce, fir and others. The results indicate a substantial potential for the development of wood-processing sectors and highlight the need to enhance the efficiency of wood utilization through the implementation of modern technologies and the rational management of forest resources.

In the future, we will investigate the physical and mechanical properties of solid, glued and modified wood, which are operated in aggressive environments. In particular, we will conduct experimental studies of defect-free samples under axial compression along the fibers and analyze their behavior in the subcritical and postcritical stages of the material's operation. Based on the experiments conducted, construct

 ISSN 2306-5478

complete deformation diagrams and determine the main characteristics of strength and deformability.

***Keywords*:** wood; industry; construction; strength; deformation; stress-strain state; diagram.

Introduction. Wood is one of the oldest and most important natural materials, widely utilized in the national economy [1–6]. Due to its unique physico-mechanical properties [7–12], availability, renewability, and environmental sustainability, wood has historically played a crucial role in the development of various economic sectors. Its use supports the provision of construction materials, energy resources, consumer products, and industrial goods to meet societal needs.

At present, wood is utilized across numerous sectors of the national economy. It has found its most widespread application in construction, where it is used for the production of load-bearing and enclosing structural elements of buildings and facilities, as well as in the manufacture of joinery, furniture, flooring, and engineered or composite wood products. Additionally, wood serves as a key raw material for the pulp and paper, wood-processing, and chemical industries, where it is processed into paper, cardboard, plywood, particleboards, fiberboards, biofuel, and other derivative products. A major advantage of wood is its renewability and relatively low environmental impact compared to many conventional construction materials. In the context of contemporary trends toward sustainable development and energy-efficient construction, the interest in wood utilization continues to grow. Modern processing and modification technologies significantly enhance its strength, durability, and resistance to environmental effects, thereby expanding its potential applications across various sectors of the national economy.

Thus, the use of wood holds significant economic, environmental, and technological importance. The rational utilization of this natural resource contributes to the development of industry, enhances construction efficiency, and supports the sustainable growth of the economy.

Analysis of recent publications. Wood is an important natural resource widely used in various sectors of Ukraine's national economy, including construction, woodworking industry, furniture manufacturing, energy, and the pulp and paper sector. Due to its mechanical properties, renewability, and relatively low environmental impact, wood remains one of the key materials in shaping the modern economy. The issues of efficient wood utilization, development of the woodworking industry,

and rational use of forest resources are widely addressed in scientific publications. Studies devoted to the development of the woodworking industry pay significant attention to the analysis of Ukraine's forest resource base. Research on the development of the woodworking sector indicates that it is an important component of the forest industry complex and has significant export potential [13]. These studies note that wood is used as the primary raw material for the production of lumber, plywood, veneer, particleboard, and fiberboard. Research on trends in the development of Ukraine's forest complex also emphasizes the important role of deep wood processing in increasing the efficiency of natural resource use. In particular, an analysis of the production structure in the woodworking sector shows growth in the production of panel materials, furniture, and paper products [14]. At the same time, the need to shift from exporting unprocessed wood to producing higher value-added products is highlighted. A separate research direction is the use of wood in construction. Scientific studies indicate that wood is widely used in the manufacture of building structures, including beams, columns, trusses, roof systems, and other elements of buildings and structures [15]. Moreover, modern technologies allow the use of glued and modified wood, which significantly increases its strength and durability. An important focus of scientific research is the rational use of wood resources and the processing of woodworking industry waste. In the works of S. V. Haida, the potential use of secondary wood generated after the service life of wooden products is studied [16]. The author notes that a significant portion of such wood can be reused or processed for the production of panel materials or energy resources. According to researchers, the potential of secondary wood in Ukraine is substantial and can constitute a significant share of overall wood consumption.

Another direction of wood utilization is the production of composite materials. Studies have demonstrated the possibility of using logging residues to manufacture new wood-composite materials, which, in terms of their physico-mechanical properties, can be similar to oriented strand boards (OSB) [17]. Such materials allow for the efficient use of wood waste and reduce losses during production. Significant attention is also given to the use of wood as an energy source. Research indicates that woody biomass is one of the most important types of renewable energy resources in Ukraine [18]. It can be used in the form of firewood, pellets, briquettes, and other types of biofuel. The use of

ISSN 2306-5478

woody biomass helps reduce dependence on fossil fuels and enhances the country's energy security.

The ecological aspects of wood utilization are also widely studied in modern scientific works. In particular, research on the ecological footprint of wood-processing industry products shows that using wood as a construction material can significantly reduce carbon dioxide emissions compared to other materials [19]. This is because wood is a renewable resource and is capable of storing carbon throughout the entire growth period of trees. Scientific studies also consider the economic aspects of wood use in the national economy. Research on the development of wooden architecture indicates that the use of wood in construction has significant economic potential, as it allows for reduced costs of transportation, assembly, and processing of structural elements. Moreover, wood has high thermal insulation properties, which contribute to increased energy efficiency of buildings.

Thus, the analysis of scientific publications indicates that wood is a crucial resource for the development of Ukraine's national economy. The primary areas of its utilization include construction, the wood-processing industry, furniture and paper production, energy, and the processing of wood residues. Further research is focused on improving the efficiency of wood use, implementing modern processing technologies, and ensuring the sustainable management of forest resources.

Results of the analysis and recommendations. Wood is an important raw material for many industrial sectors in Ukraine. Its distribution across various industries is shown in Figure 1. Wood is used as a structural material, a raw material for the production of diverse products, and as an energy resource. Ukraine possesses significant forest resource potential: the total forest area is approximately 10.4 million hectares, with total timber reserves exceeding 2.3 billion cubic meters, providing a basis for the development of wood-utilizing industries. The annual timber increment is around 35 million cubic meters, while the annual harvest is approximately 15 million cubic meters, indicating substantial potential for further development of processing industries.

An analysis of wood utilization in the construction sector has shown that wood is widely used in residential and low-rise construction, where it is applied in frame structures, floor systems, and roofing. Following the reconstruction of Ukraine's housing stock, a substantial increase in demand for wood and wood-based construction materials is

expected. According to market studies, the construction sector consumes approximately 25–35% of total industrial wood.

The wood-processing industry consumes a comparable amount of wood. This sector comprises over 26,000 enterprises, reflecting its significant economic potential. Wood-processing companies account for the majority of Ukraine's wood product exports. The share of wood consumption in this industry is estimated at 35–40% of total industrial wood use. The wood-processing industry is the primary consumer of wood in Ukraine, as it provides both primary and secondary processing. Key products include various types of sawn timber, plywood, veneer, particleboards (PB), fiberboards (FB), and oriented strand boards (OSB).

Wood is also extensively used in the furniture industry. In Ukraine, there are over 11,800 enterprises operating in the furniture sector, with an annual production volume of approximately UAH 35 billion. The significant export of furniture products makes this sector one of the leading export-oriented industries within the wood-processing complex. The share of wood consumption in this sector is estimated at 15–20%.

The distribution of wood use in industrial sector2 is shown in Figure 1.

The pulp and paper industry uses wood as the primary raw material for the production of paper, cardboard, pulp, and packaging materials. The share of wood consumption in this sector is estimated at 10–15%. The industry comprises numerous enterprises producing approximately 50 types of paper and over 20 types of cardboard. Despite the significant resource potential, Ukraine remains largely dependent on imported paper products, indicating an underdeveloped level of advanced wood processing.

Chemical and forest chemical industries. In the chemical industry, wood is used for the production of charcoal, resins, acetic acid, methanol, bioethanol, and various cellulose-based chemical products. Additionally, wood processing products are applied in the pharmaceutical, food, and textile industries. The share of wood consumption in this sector is estimated at 5–8%.

 ISSN 2306-5478

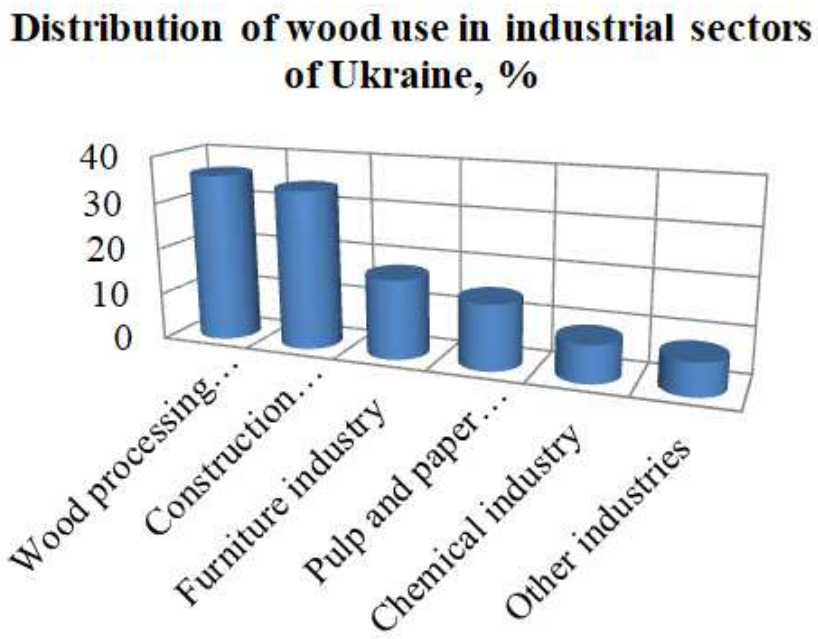

Fig. 1. Distribution of wood use in industrial sectors of Ukraine

Other sectors of wood utilization. Other areas of wood use include energy (firewood, pellets, briquettes); transport and logistics (wooden packaging, pallets); agriculture (construction of farm buildings); and the production of musical instruments and sports equipment. These sectors consume approximately 5–10% of wood.

Analysis of wood utilization in various construction sectors. he use of wood in construction depends on the functional purpose of buildings, their structural design, and the type of structures. Wood is employed in both load-bearing elements as well as in enclosing and finishing components of buildings. The distribution of wood use in the construction sector is shown in Figure 2.

1. Civil buildings. Civil buildings is the primary sector for wood utilization. In European and North American countries, wood is widely used for house frames, floor systems, roof trusses, and interior finishes (Fig. 3). In many countries, approximately 90% of individual residential houses are constructed with wooden structures. In the overall wood consumption in construction, the residential sector accounts for about 45–50%. Key applications include house frame structures, roof truss systems, floor structures, and interior finishing elements.

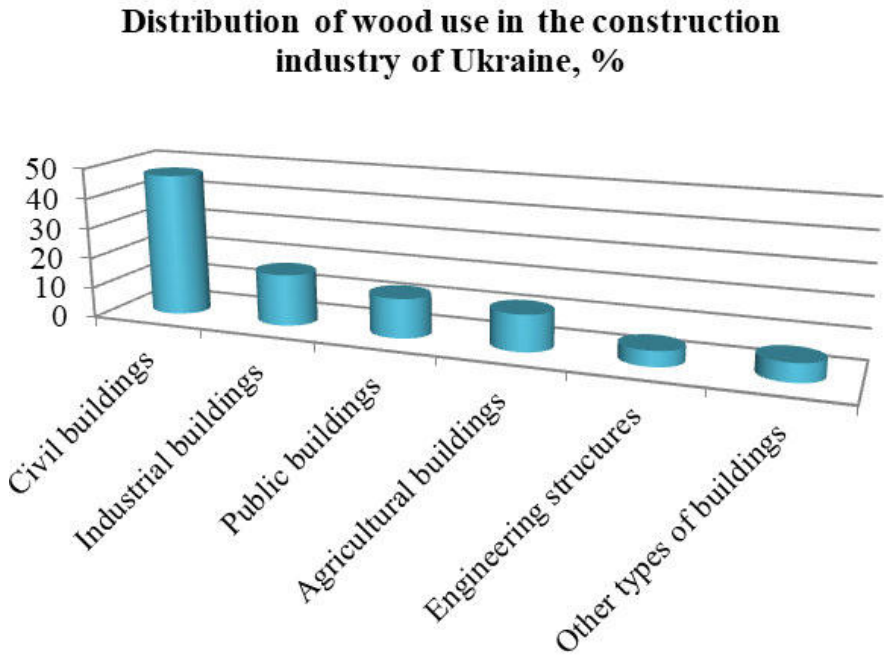

Fig. 2. Distribution of wood use in the construction industry of Ukraine

Fig. 3. Examples of civil buildings constructed with wood

2. Industrial buildings. In industrial buildings, wood is primarily used in roof structures, large-span trusses, and enclosing elements (Fig. 4). The share of wood consumption in industrial construction is estimated at 15–20%. In modern industrial buildings, a significant portion of structures is made of steel or reinforced concrete; however, wood is actively used in warehouses, hangars, logistics centers, and large-span roof systems.

 ISSN 2306-5478

3. Public buildings. This group includes schools, hospitals, offices, commercial, and sports facilities. In many countries, the use of wood in such buildings is increasing due to the development of engineered and laminated wood products (CLT, LVL, glulam). The share of wood consumption in this sector is estimated at 10–15%. Wood is used in structural building frames, floor systems, facade systems, and interior finishes.

4. Agricultural buildings. Wood is traditionally widely used in agricultural structures due to its availability and low cost. The share of wood consumption in this sector is estimated at 10–15%. Applications include farms and cattle sheds, grain storage facilities, greenhouses, and auxiliary structures.

Fig. 4. Examples wooden industrial buildings

5. Engineering structures and transport infrastructure. Wood is used much less frequently in bridges (Fig. 5), viaducts, and other engineering structures; however, modern glued-laminated constructions allow for increased utilization. The share of wood consumption in this sector is estimated at 3–5%. Applications include wooden bridges, supports and decks, and temporary structures.

In some countries, approximately 20% of new bridges are constructed using wood.

In the future, we will investigate the physical and mechanical properties of solid, glued and modified wood, which are operated in aggressive environments. In particular, we will conduct experimental studies of defect-free samples under axial compression along the fibers and analyze their behavior in the subcritical and postcritical stages of

the material's operation. Based on the experiments conducted, construct complete deformation diagrams and determine the main characteristics of strength and deformability.

Fig. 5. Timber bridges of different functions

Conclusions

1. The analysis shows that the largest consumers of wood in Ukraine are the woodworking and construction sectors. The furniture industry also plays a significant role, being actively developing and export-oriented. A smaller share of wood is used in the pulp and paper and chemical industries. A promising direction for development is the deep processing of wood and the production of high value-added products.

2. The analysis indicates that the largest share of wood use is in residential construction, where it is applied in structural elements, roofing, and interior components. In industrial, public, and agricultural buildings, wood is primarily used in roof systems and auxiliary structures. A significantly smaller share of wood is applied in transport infrastructure and engineering structures.

3. In the future, we will investigate the physical and mechanical properties of solid, glued and modified wood, which are operated in aggressive environments. In particular, we will conduct experimental studies of defect-free samples under axial compression along the fibers and analyze their behavior in the subcritical and postcritical stages of the material's operation. Based on the experiments conducted,

ISSN 2306-5478

construct complete deformation diagrams and determine the main characteristics of strength and deformability.

1. Antczak A., Skręta A., Kamińska-Dwórznicka A., Rząd, K. Matwijczuk A. Study on the Structure of Lignin Isolated from Wood Under Acidic Conditions. *Molecules*. 2025. Vol. 30(24). P. 4705. **2.** Green D. W., Kretschmann D. E. Properties and grading of Southern Pine Woods. *Forest Products Journal*. 1992. Vol. 47 (9). P. 78–85. **3.** Cragg S. M. Timber in the marine environment. *Timber Trades Journal*. 1996. Vol. 376. P. 26–28. **4.** Гомон Св. Св., Матвіюк О. В., Савчук С. М., Верешко О. В., Кулаковський Л. Я. Вплив агресивного середовища на міцнісні та деформівні показники суцільної деревини хвойних порід. *Вісник Національного університету водного господарства та природокористування. Сер. Технічні науки*. Рівне : НУВГП, 2021. Вип. 2(94). С. 69–80. **5.** Гомон Св. Св., Гомон С. С., Матвіюк О. В., Верешко О. В., Чорномаз Н. Ю. Застосування деревини в умовах агресивних середовищ. *Сучасні технології та методи розрахунків у будівництві.* Луцьк : ЛНТУ, 2022. Вип. 17. С. 15–22. **6.** Довбенко Т. О., Гомон Св. Св., Матвіюк О. В., Павлюк А. П. Модифікація деревини екологічно чистими матеріалами. *Вісник Національного університету водного господарства та природокористування. Сер. Технічні науки.* Рівне : НУВГП, 2023. Вип. 1(101). С. 134–142. **7.** Landis E. N., Vasic S., Davids W. G., Parrod P. Coupled experiments and simulations of microstructural damage in wood. *Experimental Mechanics*. 2002. Vol. 42. P. 389–394. **8.** Moya L., Bano V. Elastic behavior of east-growth uruguayan pine determined from compression and bending tests. BioResources. 2017. Vol. 12(3). P. 5896–5912. **9.** Roman K., Leszczyński M., Pycka S., Wardal W. J. The Effects of Seawater Treatment on Selected Coniferous Wood Types. *Materials.* 2023. Vol. 16(17). P. 5831. **10.** Gomon S. S., Gomon S., Karavan V., Gomon P., Sobczak-Piastka J. Investigation of solid and glued wood on the effect of variables of low-cycle repeated loads. *AIP Conference Proceedings*. 2019. Vol. 2077. P. 020020. **11.** Gomon S. S., Gomon S., Karavan V., Gomon P., Sobczak-Piastka J. Calculated cross-sectional model and stages of the stressstrain state of the wood element for transverse bending. *AIP Conference Proceedings*. 2019. Vol. 2077. P. 020019. **12.** Gomon S. S., Gomon S., Gomon P., Pavluk A., Podhorecki A. Complete deflections of glued beams in the conditions of oblique bend for the effects of low cycle loads. *AIP Conference Proceedings*. 2019. Vol. 2077. P. 020021. **13.** Nevar O. V. Osoblyvosti rozvytku derevoobrobnoi promyslovosti Ukrainy ta yii rehioniv. *Naukovyi visnyk Lvivskoho universytetu vetsynarnoi medytsyny ta biotekhnolohii. Ser. Ekonomichni nauky*. 2022. T. 24. № 100. S. 35–40. **14.** Khvesyk M., Shubalyi O. Trends and prospects of processing industries of the forest complex of Ukraine. *Journal Scientific and Applied Research*. 2022. Vol. 1. Pp. 122–132. **15.** Danchak I., Dykalo V. Economic potential of wooden architecture. *Space & Architecture*. 2025. Vol. 4. P. 95–106. **16.** Gayda S. Potential of post-consumer recovered wood and possible ways of its using in Ukraine. *Forestry, Forest, Paper and Woodworking Industry*. 2024. Vol. 35. P. 63–83. **17.** Oliinyk R., Yeroshenko A. Designing a new wood-composite material made from logging waste. *Eastern-European Journal of Enterprise Technologies*. 2020. Vol. 5. P. 14–21. **18.** Soloviy I., Kaflyk M., Dubnevych P. Fuel wood usage in a focus of bioenergy policy of Ukraine. *Naukovi pratsi Lisivnychoi akademii nauk Ukrainy*. 2019. Vol. 19. P. 171–177. **19.** Soloviy I., Kiyko O., Ilkiv M. Assessment of the furniture board ecological footprint: case study of a woodworking enterprise in Ukraine. *Bulletin of the Transilvania University of Brasov*. 2024. Vol. 17(66). P. 103–122.

REFERENCES:

1. Antczak A., Skręta A., Kamińska-Dwórznicka A., Rząd, K. Matwijczuk A. Study on the Structure of Lignin Isolated from Wood Under Acidic Conditions. *Molecules*. 2025. Vol. 30(24). P. 4705. **2.** Green D. W., Kretschmann D. E. Properties and grading of Southern Pine Woods. *Forest Products Journal*. 1992. Vol. 47 (9). P. 78–85. **3.** Cragg S. M. Timber in the marine environment. *Timber Trades Journal*. 1996. Vol. 376. P. 26–28. **4.** Homon Sv. Sv., Matviiuk O. V., Savchuk S. M., Vereshko O. V., Kulakovskyi L. Ya. Vplyv ahresyvnoho seredovyshcha na mitsnisni ta deformivni pokaznyky sutsilnoi derevyny khvoinykh porid. *Visnyk Natsionalnoho universytetu vodnoho hospodarstva ta pryrodokorystuvannia. Ser. Tekhnichni nauky*. Rivne : NUVHP, 2021. Vyp. 2(94). S. 69–80. **5.** Homon Sv. Sv., Homon S. S., Matviiuk O. V., Vereshko O. V., Chornomaz N. Yu. Zastosuvannia derevyny v umovakh ahresyvnykh seredovyshch. *Suchasni tekhnolohii ta metody rozrakhunkiv u budivnytstvi*. Lutsk : LNTU, 2022. Vyp. 17. S. 15–22. **6.** Dovbenko T. O., Homon Sv. Sv., Matviiuk O. V., Pavliuk A. P. Modyfikatsiia derevyny ekolohichno chystymy materialamy. *Visnyk Natsionalnoho universytetu vodnoho hospodarstva ta pryrodokorystuvannia. Ser. Tekhnichni nauky*. Rivne : NUVHP, 2023. Vyp. 1(101). S. 134–142. **7.** Landis E. N., Vasic S., Davids W. G., Parrod P. Coupled experiments and simulations of microstructural damage in wood. *Experimental Mechanics*. 2002. Vol. 42. P. 389–394. **8.** Moya L., Bano V. Elastic behavior of east-growth uruguayan pine determined from compression and bending tests. BioResources. 2017. Vol. 12(3). P. 5896–5912. **9.** Roman K., Leszczyński M., Pycka S., Wardal W. J. The Effects of Seawater Treatment on Selected Coniferous Wood Types. *Materials.* 2023. Vol. 16(17). P. 5831. **10.** Gomon S. S., Gomon S., Karavan V., Gomon P., Sobczak-Piastka J. Investigation of solid and glued wood on the effect of variables of low-cycle repeated loads. *AIP Conference Proceedings*. 2019. Vol. 2077. P. 020020. **11.** Gomon S. S., Gomon S., Karavan V., Gomon P., Sobczak-Piastka J. Calculated cross-sectional model and stages of the stressstrain state of the wood element for transverse bending. *AIP Conference Proceedings*. 2019. Vol. 2077. P. 020019. **12.** Gomon S. S., Gomon S., Gomon P., Pavluk A., Podhorecki A. Complete deflections of glued beams in the conditions of oblique bend for the effects of low cycle loads. *AIP Conference Proceedings*. 2019. Vol. 2077. P. 020021. **13.** Nevar O. V. Osoblyvosti rozvytku derevoobrobnoi promyslovosti Ukrainy ta yii rehioniv. *Naukovyi visnyk Lvivskoho universytetu vetsynarnoi medytsyny ta biotekhnolohii. Ser. Ekonomichni nauky*. 2022. T. 24. № 100. S. 35–40. **14.** Khvesyk M., Shubalyi O. Trends and prospects of processing industries of the forest complex of Ukraine. *Journal Scientific and Applied Research*. 2022. Vol. 1. Pp. 122–132. **15.** Danchak I., Dykalo V. Economic potential of wooden architecture. *Space & Architecture*. 2025. Vol. 4. P. 95–106. **16.** Gayda S. Potential of post-consumer recovered wood and possible ways of its using in Ukraine. *Forestry, Forest, Paper and Woodworking Industry*. 2024. Vol. 35. P. 63–83. **17.** Oliinyk R., Yeroshenko A. Designing a new wood-composite material made from logging waste. *Eastern-European Journal of Enterprise Technologies*. 2020. Vol. 5. P. 14–21. **18.** Soloviy I., Kaflyk M., Dubnevych P. Fuel wood usage in a focus of bioenergy policy of Ukraine. *Naukovi pratsi Lisivnychoi akademii nauk Ukrainy*. 2019. Vol. 19. P. 171–177. **19.** Soloviy I., Kiyko O., Ilkiv M. Assessment of the furniture board ecological footprint: case study of a woodworking enterprise in Ukraine. *Bulletin of the Transilvania University of Brasov*. 2024. Vol. 17(66). P. 103–122.

ISSN 2306-5478

Гомон Св. Св. [1; ORCID ID: 0000-0001-9818-1804],
д.т.н., професор,
Якубець В. Р. [1; ORCID ID: 0009-0001-4111-7147],
аспірант,
Суворов О. М. [2; ORCID ID: 0009-0009-7077-3600],
аспірант,
Кратюк О. М. [2; ORCID ID: 0009-0007-8265-9544],
аспірант

[1]Національний університет водного господарства та природокористування, Рівне
[2]Луцький національний технічний університет, Луцьк, Україна

ПЕРСПЕКТИВИ ВИКОРИСТАННЯ ДЕРЕВИНИ В НАРОДНОМУ ГОСПОДАРСТВІ УКРАЇНИ

У статті досліджується використання деревини в основних галузях промисловості України та аналізується структура її споживання з урахуванням сучасних тенденцій розвитку економіки та будівельних технологій. Деревина є важливим відновлюваним природним ресурсом, який широко застосовується у будівництві, деревообробній, меблевій, целюлозно-паперовій та хімічній промисловості, а також у виробництві енергетичних ресурсів і біопалива. У роботі визначено, що найбільше деревини споживають деревообробна та будівельна галузі, при цьому значну роль відіграє меблева промисловість, а менша частка припадає на целюлозно-паперову та хімічну промисловість. У будівництві деревина активно використовується у житлових, промислових, громадських та сільськогосподарських спорудах, переважно у несучих конструкціях, покрівельних системах та допоміжних елементах. Проведений аналіз також показує перспективи застосування деревини у виробництві композитних та інженерних матеріалів, що підвищує ефективність використання відходів і сприяє розвитку енергоефективних технологій. Отримані результати свідчать про значний потенціал розвитку галузей переробки деревини та підкреслюють необхідність впровадження сучасних технологій, оптимізації використання лісових ресурсів і забезпечення сталого розвитку економіки на основі раціонального використання цього природного матеріалу.

***Ключові слова*:** деревина; промисловість; будівництво; міцність; деформативність; напружено-деформований стан; діаграма.

Отримано: 08 жовтня 2025 року
Прорецензовано: 10 жовтня 2025 року
Прийнято до друку: 18 грудня 2025 року