

WoodEMA 2025

**WOOD FOR THE FUTURE:
INTEGRATING SUSTAINABILITY
ACROSS INDUSTRIES**

Ohrid, North Macedonia
September 17th-19th 2025





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



Faculty of Design and Technology of Furniture and Interior



**INTERNATIONAL
BALKAN
UNIVERSITY**

EXCELLENCE FOR THE FUTURE!

International Balkan University



Mebel Vi Branko DOOEL



КИ-ПАР

www.ki-par.com.mk

KI-PAR DOO

WOOD FOR THE FUTURE: INTEGRATING SUSTAINABILITY ACROSS INDUSTRIES

Proceedings of Scientific Papers

Ohrid, September 17th-19th 2025

WOOD FOR THE FUTURE: INTEGRATING SUSTAINABILITY ACROSS INDUSTRIES
Proceedings of Scientific Papers

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

Editors-in-chief: **Prof. Živka Meloska, PhD.**
Assoc. Prof. Marija Miloshevska Janakieska, PhD.

Cover: **Assoc. Prof. Marija Miloshevska Janakieska, PhD.**

Scientific Board and Reviews:

Assoc. Prof. Andreja Pirc Barčič, PhD. – Zagreb (CRO)
Assoc. Prof. Roman Dudík, PhD. – Prague (CZE)
Assoc. Prof. Daniela V. Georgieva, PhD. – Sofia (BUL)
Prof. Branko Glavonjić, PhD. – Beograd (SRB)
Assist. Prof. Matej Jošt, PhD. – Ljubljana (SLO)
Assist. Prof. Vladislav Kaputa, PhD. – Zvolen (SVK)
Prof. Zivka Meloska, PhD. – Skopje (MAC)
Prof. Darko Motik, PhD. – Zagreb (CRO)
Prof. Leon Oblak, PhD. – Ljubljana (SLO)
Assist. Prof. Petra Palátová, PhD. – Prague (CZE)
Assoc. Prof. Huber Paluš, PhD. – Zvolen (SVK)
Assoc. Prof. Jan Parobek, PhD. – Zvolen (SVK)
Assis.Prof. Slavica Petrović, PhD. - Beograd (SRB)
Prof. Richard Vlosky, PhD. – Baton Rouge (USA)
Prof. Dick Sandberg, PhD. – Gjøvik (NOR)
Assist. Prof. Leszek Wanat, PhD. – Poznan (POL)

Organization Committee:

Prof. Zivka Meloska, PhD., Chairperson – Skopje (MAC)
Asst. Prof. Marija Miloshevska Janakieska, PhD. – Skopje (MAC)
Prof. Denis Jelacic, PhD. – Zagreb (CRO)
Prof. Gjorgji Gruevski, PhD. – Skopje (MAC)
Prof. Goran Zlateski, PhD. – Skopje (MAC)

Edition: **100 copies**

ISBN: **978-953-8446-04-7**

PREFACE

Dear colleagues, experts, and friends of the WoodEMA international association,

We are pleased to present the book of proceedings from the 18th WoodEMA international scientific conference „*Wood For The Future: Integrating Sustainability Across Industries*“, held in Ohrid, North Macedonia, from September 17 to 19, 2025.

The conference aimed to transfer knowledge and good practices from the field of economics and management of the forest-based sector. Topics under consideration and discussion are sustainability and circular economy in forest and wood-based sectors, economic, financial, and logistics perspectives. management, investment, and innovation, artificial intelligence and digital innovation, market trends, marketing, and customer engagement, policy, legal framework, and esg reporting, technological innovations in production and construction.

This year WoodEMA i.a. partnered with Faculty of Design and Technology of Furniture and Interior, Skopje, North Macedonia, International Balkan University, Skopje, North Macedonia, KI-PAR d.o.o., Strumica, North Macedonia and Mebel VI d.o.o.e.l. Vinica, North Macedonia to organize the conference event. We would like to thank them all for their cooperation and the opportunity to see good practices from the Bulgarian furniture industry.

After the review process, the conference book of proceedings includes 82 scientific articles authored by 138 scientists and experts representing 11 European countries. This book includes five main axes of scientific papers which introduce readers to interdisciplinary and various debates about conceptual ideas and approaches towards sustainable, innovative and productive forestry-based sector.

WoodEMA 2025 international conference was conceived as a space for debate and networking among academics, experts and professionals in the forestry and wood-based industries. We are grateful to all authors and conference participants who presented their analysis and points of view regarding important topics of the current market demands and competitiveness, sustainability, as well as new perspectives, innovative ideas and new approaches towards the successful and sustainable forest and wood-based sector.

We believe that the outcomes of the 18th International Scientific Conference WoodEMA 2025 and the book of proceedings will be valuable in future work to all scientists, teachers, experts, professional, and enthusiasts in the forest and wood-based sector.

Editors-in-chief,
Prof. Živka Meloska, PhD.
Assoc. Prof. Marija Miloshevska Janakieska, PhD.

LIST OF AUTHORS

- Lior **AGAI** (BUL)
Desislava **ALEXOVA** (BUL)
Antoaneta **ANGELOVA-STANIMIROVA** (BUL)
Nadica **ANGOVA KOLEVSKA** (MAC)
Katya **ANTONOVA** (BUL)
Ivana **ANTOVSKA** (MAC)
Atanas **ATANASOV** (BUL)
Stela **BALTOVA** (BUL)
Daniel **BEBEJ** (SVK)
Šimon **BELIANSKY** (SVK)
Karlo **BELJAN** (CRO)
Dimitar **BLAGOEV** (BUL)
Lalka **BORISOVA** (BUL)
Dragan **BOROTA** (SRB)
Dominika **BÚRYOVÁ** (SVK)
Ibrahim **BUSULADZIC** (BiH)
Tsvetan **DAVIDKOV** (BUL)
Boryana **DELIYSKA** (BUL)
Rumen **DOMBASHOV** (BUL)
Danijela **DOMLJAN** (CRO)
Roman **DUDÍK** (CZE)
Michal **DZIAN** (SVK)
Jozef **FEKIAČ** (SVK)
Amina **GAČO JEŽ** (SLO)
Miloš **GEJDOŠ** (SVK)
Pavol **GEJDOŠ** (SVK)
Tanya **GEORGIEVA** (BUL)
Nina **GERGOVA** (BUL)
Luka **GOROPEČNIK** (SLO)
Jasna **GRUJOSKA-KUNESKA** (MAC)
Eva **HABIŇÁKOVÁ** (SVK)
Seid **HAJDAREVIC** (BiH)
Martin **HALÁSZ** (SVK)
Martin **HIRTŁ** (SVK)
Henrieta **HRABLIK CHOVANOVÁ** (SVK)
Arbresha **IBRAHIMI** (MAC)
Alen **IBRISEVIC** (BiH)
Boris **ILIEV** (MAC)
Ivaylo **ILIEV** (BUL)
Tsvetan **ILIEV** (BUL)
Gloria **ILIEVA** (BUL)
Ani **ISTATKOVA** (BUL)
Josip **IŠTVANIĆ** (CRO)
Ivana **IVANIŠ** (CRO)
Adelina **IVANOVA** (BUL)
Maya **IVANOVA** (BUL)
Andrea **JANÁKOVÁ SUJOVÁ** (SVK)
Denis **JELAČIĆ** (CRO)
Matej **JOŠT** (SLO)
Faton **KALISI** (MAC)
Dimitar **KANEV** (BUL)
Martina **KÁNOVÁ** (SVK)
Vladislav **KAPUTA** (SVK)
Damyan **KIRECHEV** (BUL)
Marek **KIRNER** (SVK)
Manja **KITEK KUZMAN** (SLO)
Jan **KLIMEK** (POL)
Kaloyan **KOLEV** (BUL)
Daniela **KOLLÁROVÁ** (SVK)
Milena **KRACHANOVA** (BUL)
Neviana **KRASTEVA** (BUL)
Jože **KROPIVŠEK** (SLO)
Władysław **KUSIAK** (POL)
Nadežda **LANGOVÁ** (SVK)
Petra **LESNÍKOVÁ** (SVK)
Denisa **LIZOŇOVÁ** (SVK)

Sanin **HASANIC** (BiH)
Ana Marija **STAMENKOSKA** (MAC)
Petar **MARINOV** (BUL)
Velichka **MARINOVA** (BUL)
Teodora **MARINOVA GEORGIEVA** (BUL)
Svetla **MARKOVA** (BUL)
Sandra **MARTINOVIC** (BiH)
Hana **MAŤOVÁ** (SVK)
Angelina **MELOSKA** (MAC)
Živka **MELOSKA** (MAC)
Mihaela **MIHAILOVA** (BUL)
Goran **MIHULJA** (CRO)
Sonia **MILEVA** (BUL)
Marija **MILOSHEVSKA JANAKIESKA** (MAC)
Darko **MOTIK** (CRO)
Nedialko **NESTOROV** (BUL)
Nikolay **NEYKOV** (BUL)
Martina **NOSÁL'OVÁ** (SVK)
Renata **NOVÁKOVÁ** (CZE)
Leon **OBLAK** (SLO)
Jelena **OBRANKOVIĆ** (CRO)
Murco **OBUCINA** (BiH)
Miriam **OLŠIAKOVÁ** (SVK)
Mária **OSVALDOVÁ** (SVK)
Petra **PALÁTOVÁ** (CZE)
Ján **PAROBEK** (SVK)
Alena **PAULIKOVÁ** (SVK)
Ivana **PERIĆ** (CRO)
Simeonka **PETROVA** (BUL)
Slavica **PETROVIĆ** (SRB)
Ilijana **PETROVSKA** (MAC)
Andreja **PIRC BARČIĆ** (CRO)
Olena **PLAKSIUK** (UKR)
Nikola **LUKEŽ** (CRO)
Radostina **POPOVA-TERZIYSKA** (BUL)
Stjepan **POSAVEC** (CRO)
Aleksy **POTEBNYA** (BUL)
Marek **POTKÁNY** (SVK)
Gergana **RASHKOVA** (BUL)
Katarina **REMIC** (SLO)
Patrik **RICHNÁK** (SVK)
Dick **SANDBERG** (NOR)
Łukasz **SARNIAK** (POL)
Pavol **SEDLÁK** (SVK)
Ľubica **SIMANOVÁ** (SVK)
Gergana **SLAVOVA** (BUL)
Yavor **STANEV** (BUL)
Marieta **STEFANOVA** (BUL)
Patrik **ŠTOMPF** (SVK)
Antoaneta **STOYANOVA** (BUL)
Janka **TÁBORECKÁ** (SVK)
Azra **TAFRO** (CRO)
Anastasija **TEMELKOVA** (MAC)
Daniela **TODOROVA** (BUL)
Lyubomira **TODOROVA** (BUL)
Irina **TSAKOVA** (BUL)
Volodymyr **TSAP** (UKR)
Oksana **TULAI** (UKR)
Magdaléna **UNGEROVÁ** (SVK)
Rozália **VAŇOVÁ** (SVK)
Lyubcho **VARAMEZOV** (BUL)
Daniela **VENTSISLAVOVA GEORGIEVA** (BUL)
Anna **VILHANOVÁ** (SVK)
Zoran **VLAOVIĆ** (CRO)
Karla **VUKMAN** (CRO)
Leszek **WANAT** (POL)

CONTENTS

A. INVITED PAPERS

- Ventsislavova Georgieva, D., Tsakova, I.
REGULATORY SANDBOXES IN THE FURNITURE INDUSTRY: CHALLENGES AND OPPORTUNITIES.....3
- Kropivšek, J., Oblak, L., Jošt. M., Goropečnik, L., Remic K., Gačo Jež, A., Zupančič, A.
TRENDS AND MAIN CHALLENGES IN THE WOOD INDUSTRY IN SLOVENIA.....13
- Kaputa, V., Maťová, H., Táborecká, J., Olšiaková, M.
WOOD-BASED CIRCULAR BIOECONOMY AND ITS PROMOTION IN EUROPE.....21

B. SUSTAINABILITY AND CIRCULAR ECONOMY IN FOREST AND WOOD-BASED SECTORS

- Blagoev, D.
CIRCULAR ECONOMY AND SUSTAINABILITY IN WOOD PRODUCTION SECTOR BASED ON RECYCLING (THE BULGARIAN EXPERIENCE).....31
- Antonova, K.
THE ROLE OF SUSTAINABLE FOREST MANAGEMENT IN THE TRANSITION TO A CIRCULAR ECONOMY.....37
- Miloshevska Janakieska, M., Kitek Kuzman, M.
ARCHITECTURAL PERSPECTIVES ON WOOD REUSE WITHIN CIRCULAR CONSTRUCTION IN NORTH MACEDONIA.....45
- Perić, I., Vukman, K., Posavec, S., Beljan, K., Ištvanić, J.
EXPLORING THE POTENTIAL OF DIGITIZATION IN ADVANCING THE CIRCULAR ECONOMY IN THE WOOD-BASED SECTOR.....51
- Osvaldová, M., Potkány, M., Lesníková, P.
A MODEL FOR QUANTIFYING POTENTIAL COST SAVINGS IN THE WOOD INDUSTRY FOR PRODUCTS UTILIZING RECYCLED MATERIALS.....59

Slavova, G., Georgieva, T. CONCEPTUAL MODELS FOR ENHANCING SUSTAINABLE MANAGEMENT IN FORESTRY AND AGRICULTURAL SECTORS.....	67
Angova Kolevska, N. DEVELOPMENT OF LOCAL EXPOSURE MODEL OF TIMBER STRUCTURES IN THE CITY OF STRUMICA.....	75
Grujoska-Kuneska, J. THE ROLE OF WOOD IN SUSTAINABLE ARCHITECTURAL DESIGN.....	81
Mihailova, M., Marinov, P. SMALL FOREST FARMS A PATH TO SUSTAINABILITY IN BULGARIA.....	87
Miloshevska Janakieska, M. SUSTAINABLE FAÇADE REDESIGN WITH ENGINEERED WOOD PRODUCTS: A CASE STUDY OF HOTEL MONTANA.....	95
Ibrahimi, A., Kitek Kuzman, M., Sandberg, D. THE ROLE OF WOOD IN ALBANIAN TRADITIONAL RESIDENTIAL TOWERS: STRUCTURAL AND CULTURAL SIGNIFICANCE.....	101
Atanasov, A. INTEGRATING SUSTAINABILITY INFORMATION THROUGH VALUE CHAIN DISCLOSURES: INSIGHTS FROM THE WOOD-BASED INDUSTRIES.....	105
Todorova, D., Gergova, N. IMPACT OF TRANSPORT ON FORESTS - A CONCEPT FOR SUSTAINABLE DEVELOPMENT.....	111

C. ECONOMIC, FINANCIAL, AND LOGISTICS PERSPECTIVES

Gejdoš, M., Potkány, M. ECONOMIC CALCULATION OF HEALTH RISKS IN LONG-TERM STORAGE AND USE OF BIOMASS.....	119
---	------------

Iliev, I. SUSTAINABLE PRACTICES IN THE FURNITURE MANUFACTURING PROCESS FOR MSMES.....	127
Stefanova, M., Kanev, D., Agai, L. FORESTRY LOGISTICS AND SUSTAINABILITY – ADAPTATION TO PRICE CHALLENGES.....	133
Stefanova, M., Stoyanova, A., Kirechev, D., Marinova, V. FORESTRY, LOGISTICS AND ARTIFICIAL INTELLIGENCE IN THE CONTEXT OF NEW REGULATIONS.....	139
Tsap, V., Tulai, O., Yatsuh, R. ENSURING THE EXPORT POTENTIAL OF UKRAINE'S FORESTRY SECTOR UNDER CONDITIONS OF SUSTAINABLE DEVELOPMENT.....	145
Yatsukh, O., Zhuravlova, I., Tsap, V. DIGITAL PLATFORMS FOR THE FINANCIAL AND ECONOMIC SUPPORT OF FORESTRY ENTERPRISES: THE EXPERIENCE OF UKRAINE.....	151
Parobek, J., Dzian, M., Nosáľová, M. COMPARATIVE ADVANTAGES OF SLOVAK FOREST PRODUCTS IN THE EU MARKET.....	157
Ventsislavova Georgieva, D., Marinova Georgieva, T. CLUSTER ANALYSIS OF THE FURNITURE INDUSTRY AND AGRIBUSINESS IN BULGARIA: INNOVATION POTENTIAL, CHALLENGES, AND DEVELOPMENT OPPORTUNITIES.....	163
Marinova Georgieva, T., Ventsislavova Georgieva, D. INNOVATION POTENTIAL OF LOW-TECHNOLOGY SECTORS: THE CASE STUDY OF THE FORESTRY SECTOR AND AGRIBUSINESS IN BULGARIA.....	169
Nestorov, N., Ventsislavova Georgieva, D. GEOGRAPHICAL CONCENTRATION AND STABILITY OF FURNITURE EXPORTS FROM BULGARIA.....	175

Neykov, N., Ivanova, A., Popova-Terziyska, R., Deliyska, B. EFFICIENCY ANALYSIS OF PELLET PRODUCING ENTERPRISES: A DATA ENVELOPMENT ANALYSIS (DEA) APPROACH TO BULGARIAN WOOD PROCESSING	181
Stamenkoska, A., Meloska, Ž., Meloska, A., Petrovska, I., Antovska I., Temelkova, A. THE STATE OF EXPORT AND IMPORT OF WOOD PRODUCTS AND FURNITURE IN THE REPUBLIC OF NORTH MACEDONIA: TRENDS AND STRATEGIES FOR GROWTH	187
Iliev, T., Borisova, L., Rashkova, G. ASSESSMENT OF THE COMPETITIVENESS OF COMMERCIAL FACILITIES OF COMPANIES FROM THE FURNITURE INDUSTRY OF BULGARIA (FOLLOWING THE EXAMPLE OF "MEBELI VIDENOV" AND IKEA)	193
Wanat, L., Kusiak, W., Sarniak, Ł., Wieruszewski, M. SELECTED ASPECTS OF THE TREE STANDS ECONOMIC USE DAMAGED BY HURRICANE (WINDFALLS) - THE REGIONAL FORESTRY CASE OF POLAND	199
Wieruszewski, M., Wanat, L., Kusiak, W., Sarniak, Ł. VARIATION OF CONIFEROUS SAWNWOOD MATERIAL EFFICIENCY ON THE CASE OF THE QUANTITY-DIMENSIONAL STRUCTURE OF ROOF TRUSSES: SELECTED ECONOMIC AND ECOLOGICAL ASPECTS	205
Wieruszewski, M., Sarniak, Ł., Kusiak, W., Wanat, L. ECONOMIC DILEMMAS OF QUANTITATIVE CHANGES IN THE PARTITION OF WOODY BIOMASS IN PELLET PRODUCTION - THE CASE OF POLAND	211
Wanat, L., Kusiak, W., Sarniak, Ł. OPTIMIZATION OR INTEGRATION AND UNIFICATION? SPACE-FILLING PROGRAMMING CHALLENGES FOR TRANSPORT VEHICLES IN ROUNDWOOD LOGISTICS	217
Kolev, K. MULTINATIONL ENTERPRISES AND THE TIMBER VALUE CHAIN: INTEGRATING SUSTAINABILITY INTO GLOBAL BUSINESS STRATEGIES	223

D. MANAGEMENT, INVESTMENT, AND INNOVATION

Nováková, R., Plaksiuk, O., Habiňáková, E.

ENVIRONMENTAL TAXES AS A MEANS OF SUPPORTING SUSTAINABLE DEVELOPMENT OF THE COUNTRY WITH A FOCUS ON THE FORESTRY INDUSTRY.....231

Pauliková, A., Nováková, R.

SUPPORT FOR SUSTAINABILITY IN AUDITING INTEGRATED MANAGEMENT SYSTEMS IN THE WOODEN INTERIOR DESIGN INDUSTRY.....237

Pirc Barcic, A. Ivanis, I., Motik, D., Tafro, A., Obrankovic, J., Jelacic, D.

INNOVATION ACTIVITY IN WOOD-BASED INDUSTRY – EUROPEAN UNION AND CROATIAN PERSPECTIVE.....243

Richnák, P.

ELECTROMOBILITY AS KEY FACTOR IN THE SUSTAINABLE MODERNIZATION OF WOOD PROCESSING ENTERPRISES.....251

Kánová, M., Lesníková, P., Janáková Sujová, A.

THE ROLE OF AGILITY IN ACHIEVING THE SUSTAINABILITY AND INVESTMENT CAPABILITY OF WOOD PROCESSING COMPANIES.....257

Gejdoš, P.

INCREASING THE PERFORMANCE OF SLOVAK WOOD PROCESSING COMPANIES ON THE PLATFORM OF QUALITY MANAGEMENT SYSTEMS.....265

Angelova-Stanimirova, A.

MAIN INDICATORS FOR EVALUATING THE SOCIAL IMPACT OF RESEARCH PROJECTS IN THE FORESTRY-BASED SECTOR.....273

Angelova-Stanimirova, A.

ESSENTIAL COMPONENTS OF MANAGEMENT CONTROL SYSTEMS IN THE FORESTRY-BASED SECTOR.....279

Palátová P., Dudík, R.

HUMAN RESOURCES IN CZECHIA: INTEGRATING THE GENDER-DIMENSION FOR THE SUSTAINABILITY OF THE FOREST-BASED SECTOR.....285

Varamezov, L., Petrova, S., Todorova, L., Stanev, Y.
**INNOVATION AND SUSTAINABLE DEVELOPMENT OF EUROPEAN SMALL AND
MEDIUM-SIZED ENTERPRISES IN THE WOOD PROCESSING INDUSTRY.....293**

Janáková Sujová, A., Halász, M.
**AGILITY PERCEPTION AND AWARENESS IN SLOVAK WOODPROCESSING AND
FURNITURE COMPANIES.....301**

Wanat, L., Klimek, J., Kusiak, W., Sarniak, Ł.
**PEOPLE - FOREST - WOOD: INCLUSIVE INTEGRATION MODELS. THE CASE OF THE
KOBIERZYN URBAN FOREST PARK IN THE KRAKÓW METROPOLITAN AREA IN
POLAND.....307**

Janáková Sujová, A., Simanová, Ľ.
**CRISIS AS THE CHALLENGE THROUGH AGILE APPROACH IN SLOVAK
WOODPROCESSING
COMPANIES.....313**

Baltova, S.
**FURNITURE-AS-A-SERVICE: BENEFITS AND BARRIERS ON THE PATHWAY TO
SUSTAINABILITY.....319**

Wanat, L.
**INTEGRATED DEVELOPMENT OF FOREST AND WOOD-BASED SCIENCES ON THE
BACKGROUND OF THE UNIVERSITY IDEA.....325**

E. ARTIFICIAL INTELIGENCE AND DIGITAL INNOVATION

Dombashov, R.
**CHALLENGES AND OPPORTUNITIES IN MANAGING FORESTRY INDUSTRY
ENTERPRISES WITH ARTIFICIAL INTELLIGENCE.....333**

Hirtl, M., Pauliková, A., Hrablík Chovanová, H.
**AI-DRIVEN QUALITY MANAGEMENT IN THE WOOD INDUSTRY: ENHANCING
STANDARDS THROUGH AUTOMATION AND DATA-DRIVEN INSIGHTS.....339**

Kollárová, D., Ungerová, M.
THE ROLE OF VIRTUAL AND AUGMENTED REALITY IN COMMUNICATING AND SELLING FURNITURE.....345

Slavova, G.
FEASIBILITY OF APPLYING ARTIFICIAL INTELLIGENCE IN THE DESIGN AND RENEWAL OF FOREST BUFFER ZONES IN BULGARIA.....351

Antonova, K.
DIGITAL TRANSFORMATION OF THE FORESTRY SECTOR IN THE CONTEXT OF INDUSTRY 5.0.....359

Markova, S.
PRECISION FARMING TECHNOLOGIES AS A FACTOR FOR ADDRESSING THE SCARCITY OF AGRONOMY EXPERTISE IN TREE PLANTING: A REVIEW.....367

F. MARKET TRENDS, MARKETING, AND CUSTOMER ENGAGEMENT

Krasteva, N., Mileva, S., Potebnya, A.
GAMIFIED MARKETING IN E-COMMERCE FOR FURNITURE RETAIL IN BULGARIA.....357

Mileva, S., Krasteva, N., Alexova, D.
GAMIFICATION OF TRADITIONAL BULGARIAN WOODCARVING AS A CULTURAL HERITAGE TOURISM PRODUCT.....383

Ilieva, G.
SUSTAINABILITY PREFERENCES OF CUSTOMERS AND THEIR IMPACT ON PURCHASING FURNITURE.....389

Davidkov, T., Krasteva, N., Potebnya, A.
COMMUNICATION BETWEEN SALESPERSONS AND CUSTOMERS IN THE FURNITURE MARKET – DOES GAMIFICATION IMPROVE INTERACTION OUTCOMES?.....395

Ivanova, M. FOREST-BASED BUSINESS MODELS IN CULTURAL AND CREATIVE TOURISM IN RURAL AND REMOTE AREAS: A BUSINESS MODEL CANVAS APPROACH.....	401
Domljan, D., Iliev, B., Lukež, N., Vlaović, Z. CULTURAL HERITAGE OF ISTRIA AS INSPIRATION FOR FURNITURE DESIGN IN TOURIST ACCOMMODATION.....	407
Mileva, S., Istatkova A., Krachanova, M. BEYOND FUNCTIONALITY: WOODEN INTERIOR ELEMENTS AS CARRIERS OF CULTURAL IDENTITY AND SUSTAINABILITY IN THE EDUCATIONAL ENVIRONMENT.....	413
Petrović, S., Borota, D. CORK FLOORING MARKET IN SELECTED NON-EU COUNTRIES WITH AN ANALYSIS OF BARRIERS TO ITS DEVELOPMENT.....	421
 <u>G. POLICY, LEGAL FRAMEWORK, AND ESG REPORTING</u>	
Pozharevska, R., Bacheva, S. INTELLECTUAL PROPERTY AND "GREEN" ACCOUNTING – LEVERS FOR SUSTAINABLE DEVELOPMENT OF THE FORESTRY SECTOR AND ITS DERIVATIVE INDUSTRIES.....	431
Glavonjić, B., Lazarević, A., Kalem, M. INVENTORY OF WOOD ENERGY CONSUMPTION AND GHG EMISSIONS FROM WOOD FUEL COMBUSTION: A CASE STUDY OF CENTRAL SERBIA.....	439
Kostyakova, A. TRANSPARENCY IN ACCOUNTING AND AUDITING OF UKRAINIAN TIMBER: EITI REPORTING AS A FACTOR OF SUSTAINABLE DEVELOPMENT.....	445
Zhelyazkova, V. FROM POLICY TO PRACTICE: CIRCULAR ECONOMY TRANSITIONS IN THE EU AND THEIR IMPACT ON THE FOREST-BASED INDUSTRY.....	451

Zhelev, Z. GREEN TAXES AS A TOOL FOR SUSTAINABLE DEVELOPMENT IN THE FOREST INDUSTRY: APPROACHES AND IMPACTS.....	457
Šatanová, A. WOOD INDUSTRY IN THE SLOVAK REPUBLIC.....	463
Dzianová, L., Paluš, H., Loučanová, E. ESG AND THE FOREST-BASED INDUSTRIES IN SLOVAKIA: THEORETICAL BACKGROUND AND IMPLEMENTATION CHALLENGES.....	471
Kostova, S. KEY INDICATORS FOR ASSESSING DUAL MATERIALITY IN THE WOOD INDUSTRY.....	477
Filipova, F., Atanasov, A., Marinova, R., Zapryanova, T. INFORMATION FROM CASH FLOW STATEMENTS AND SUSTAINABLE BANK LENDING: INSIGHTS FROM THE WOOD-BASED SECTOR.....	483
Petrović, S EUROPEAN STANDARDS FOR THE QUALITY OF CORK FLOORS AND REGULATIONS FOR THEIR PLACING ON THE EU MARKET.....	489
Mitova, R., Grigorov, B., Todorov, L., Assenova, M. GIS-BASED INDICATORS FOR MONITORING THE IMPACT OF RECREATIONAL TRAILS ON FOREST HABITATS.....	497

H. TECHNOLOGICAL INNOVATIONS IN PRODUCTION AND CONSTRUCTION

Hajdarevic, S., Obucina, M., Busuladzic, I., Ibrisevic, A., Martinovic, S. STRENGTH ANALYSIS OF THE END-TO-END GRAIN PUZZLE JOINT.....	505
Busuladzic, I., Hajdarevic, S., Obucina, M., Ibrisevic, A., Martinovic, S. ANALYSIS OF WOOD CUTTING USING DIFFERENT CIRCULAR SAWS AT DIFFERENT PROCESSING PARAMETERS.....	511

Langová, N., Beliansky, Š., Fekiač, J., Lizoňová, D. FROM DESIGN TO IMPLEMENTATION: DEVELOPMENT OF 3D-PRINTED FASTENING SYSTEMS FOR MODERN FURNITURE CONSTRUCTIONS.....	517
Vilhanová, A., Langová, N., Zigová, K. EFFECT OF THE FINENESS OF THE SEWING THREAD AND STITCH LENGTH ON THE STRENGTH OF THE SEWN JOINT: IMPLICATIONS FOR SUSTAINABLE UPHOLSTERED FURNITURE MANUFACTURING.....	523
Sedlák, P., Kirner, M., Búryová, D., Bebej, D., Štompf, P., Vaňová, R. LOG HOUSES – AIR TIGHTNESS IN RELATION TO VARIOUS LOG JOINT ARRANGEMENTS.....	529
Búryová, D., Vaňová, R., Sedlák, P., Bebej, D. SUSTAINABLE BUILDING: ASSESSING THE ENVIRONMENTAL IMPACT OF CONSTRUCTION MATERIALS.....	535
Kalisi, F. IMPACT OF WOOD TREATMENTS ON INDOOR AIR QUALITY: A COMPARATIVE REVIEW OF CHEMICAL AND SUSTAINABLE COATINGS.....	541
Ibrisevic, A., Obucina, M., Hajdarevic, S., Hasanic, S., Mihulja, G. MECHANICAL PROPERTIES OF FINGER JOINTS EXPOSED TO DIFFERENT ENVIRONMENTAL CONDITIONS.....	547

INVITED PAPERS

WOOD-BASED CIRCULAR BIOECONOMY AND ITS PROMOTION IN EUROPE

Vladislav Kaputa, Hana Mařová, Janka Táborecká, Miriam Olřiaková

Abstract: This paper focuses on the role of the bioeconomy and the wood sector in particular as a driver of competitiveness in the construction sector in the light of the EU's ambitious environmental and social goals. The paper highlights the need for greater recognition and support of this sector by EU countries and institutions. It presents carbon balance related knowledge in the field of building design and identifies ways in which the public sector can promote more construction based on bio-based/renewable materials. The aim is to assess the supporting tools and the (still untapped) potential of using wood in building construction from the perspective of implementing pro-environmental initiatives and strategies.

Keywords: wood sector, constructions, buildings, promotion, bioeconomy

1. INTRODUCTION

The *ability* of each generation of people to *sustain* the environment for life in a "certain" state is a subject of interest across the entire (not only) academic community. The initiatives we are working on are conceptually based on efforts to achieve sustainability. We understand the term sustainability as a concept of human endeavour leading society towards a paradigm based on prosperity of humankind that thrives socially and environmentally. Achieving sustainability is clearly an issue that the forest-based sector not only touches on, but is holistically involved in (Kaputa et al., 2024). The home domain of the forest-based industry is the bioeconomy – and as quoted by (Moravčik, Dzian, Paluš, & Parobek, 2024) this is essential to achieving a balance between society, the environment, and economic development processes. The bioeconomy comprises those parts of the economy that use renewable biological resources from land and sea, suggests crops, forests, fish, animals and microorganism to produce food, materials and energy (European Commission, 2018). (Global Bioeconomy Summit, 2015) defined the term as the knowledge-based production and utilization of biological resources, innovative biological processes and principles to *sustainably* provide goods and services across all economic sectors.

Global trends in the bioeconomy reflect a fundamental transformation of economic models – fossil capital being replaced by natural renewable capital in connection with the paradigm shift from a linear to a circular economy. The practical application of bioeconomics lies not only in the use of biomass as a source of energy or raw material for industry, but also in the creation of systems that support the regeneration of natural resources, reduce greenhouse gas emissions, and promote sustainable economic models. This approach has particularly significant potential in the construction industry, where it can lead to innovations in materials processing, improvements in the energy efficiency of buildings, the achievement of climate neutrality (Pánik and Jantová, 2019) and social responsibility, thereby linking the three fundamental dimensions of the bioeconomy into a single comprehensive framework (Goldhahn, Cabane, & Chanana, 2021). Regional strategies vary depending on the economic,

geographical, and political characteristics of individual regions. In countries with a developed bioeconomy, emphasis is placed on creating local value by supporting small and medium-sized enterprises that use locally available biomass. In other regions where natural resources are limited, attention is focused on importing technology and know-how, which also stimulates regional development and increases competitiveness. These differences require the adaptation of political and financial instruments to the specific needs of individual regions in order to effectively implement the principles of sustainable development (Gallo, 2022). An integral part of regional trends is the interconnection of the bioeconomy with digital transformation. Technological digitization and the rise of analytical tools enable the optimization of production chains and improved management of natural resources. This supports more effective planning and monitoring of environmental indicators, which is critical for evaluating the success of bioeconomy strategies. Digitization enables the creation of coordinated strategies between stakeholders at both the regional and global levels (Moravčik et al., 2019).

This article focuses on promoting the use of wooden buildings in selected countries of the European Union (EU). This market within the wood processing sector was chosen based on its importance in terms of added value, not only economic but also social and environmental. Regulations affecting the market for wood products are clearly outlined, for example, in the document "Taking a bird's eye view of EU wood-based policy" (Aggestam, Weiss, Elomina, & Pülzl, 2025). Various related policies may not be explicitly focused on wood, but the instruments introduced have an impact on wood production in forests and the use of wood in the processing chain. Ultimately, they also have an impact on the consumer market.

The construction industry produces more than a third of CO₂ emissions in the EU (Sharmina, Pappas, Scott, & Gallego-Schmid, 2023). EU documents suggest that increasing the use of wood as a building material contributes to meeting its carbon emission reduction targets. The drive to reduce these emissions within the single European market (area), as well as pressure on trading partners worldwide (e.g. through the CBAM instrument), reflect the targets set. The prioritization of carbon reduction has also been reflected in the marketing (and political) strategy of the wood-based sector. Wooden buildings store CO₂ and use less CO₂-intensive materials than concrete or steel, underscoring their contribution to the transition to a circular bioeconomy. Traditional wood-based construction is making a successful comeback in the world (Eriksson et al., 2018), not only in the construction of single-family homes, but also in non-residential buildings. This is true for many EU countries, but in Slovakia the potential of timber buildings is far from being fully exploited (Švajlenka & Pošiváková, 2023). These facts, together with a number of social and environmental benefits, makes the issue very topical.

2. ANALYSIS OF SUPPORTIVE POLICIES TO PROMOTE THE USE OF WOOD IN CONSTRUCTION

As part of ongoing efforts to decarbonise the construction sector, develop a circular economy and strengthen the regional bio-economy, policies and instruments aimed at promoting the use of wood as a sustainable building material are increasingly being implemented in European countries. In this context, wood is presented not only as an environmentally friendly alternative to traditional materials, but also as a strategic element for economic development, employment promotion and technological innovation.

By analysing selected examples from countries such as Austria, Germany, Slovenia, the Czech Republic, Spain, Switzerland, Finland and Sweden, it is possible to identify a variety of

public policy approaches that support the increased use of wood in public and private construction projects. These initiatives include legislative measures, public-private partnerships, public procurement programmes, supportive financing, training, as well as technological innovations including CLT (cross-laminated timber) or hybrid wood systems.

2.1. Austria

Aenean vel nisl at metus mattis iaculis id a ante. Morbi lorem nunc, adipiscing a convallis non, scelerisque quis lorem. Aliquam blandit justo in purus sollicitudin at cursus dolor aliquam. Nunc quam nulla, tempor ut bibendum at, sagittis quis eros. Nam rhoncus, magna vel faucibus luctus, mi nibh sollicitudin nisl, et ullamcorper dolor ligula ac felis. Aliquam erat volutpat.

Thanks to its systematic approach, it can be considered a European leader in the field of timber construction. The 33% share of timber construction in social housing is the result of a combination of supportive legislation, public procurement favouring timber construction, and technological innovations (such as the development of CLT). The education system, which ensures the qualification of specialists, also plays a role.

In 2021, the CO₂ Bonus was launched – a specialized subsidy mechanism aimed at supporting environmentally friendly construction methods using renewable materials as part of a package of measures under the Waldfonds administered by the Ministry of Agriculture, Regions and Tourism (Kommunalkredit Public Consulting, 2024). The program provides transparent and measurable support through subsidies linked to the amount of wood used in construction – residential buildings and public buildings (such as schools, community centres, and administrative buildings):

- in its basic form, €1 for every kilogram of wood used.
- when using insulation materials from renewable raw materials, the increase is to €1.10/kg.

The maximum amount of support is €200,000 for businesses and €500,000 for public or non-profit entities outside the competitive market (municipalities, schools), but no more than 50% of eligible construction costs in total. Projects must not use fossil fuels for heating

2.2. Czech Republic

In response to the unsustainable trend of high raw timber exports, the Czech Republic adopted a National Wood Policy, which aims to increase domestic wood processing while supporting the development of higher added value in the wood processing industry. One of the goals in the field of sustainable construction is to increase the share of wooden buildings in individual housing from the current 15% to 25%. The next step is to reach 20 % share of wood in the public procurement for buildings and their reconstructions for the Ministry of Agriculture and its subordinate organizations (gov.cz, 2024). In 2023, an initiative known as the Platform for Sustainable Wooden Buildings was established in the Czech Republic, bringing together key players from the fields of development, architecture, and construction with the aim of promoting the construction of multi-story wooden buildings. The platform is overseen by the Czech Green Building Council (CZGBC). The aim is also to amend fire safety standards so that wooden buildings can reach a height of up to 22.5 meters without the need for special permits or exemptions (CZGBC, 2025).

2.3. Finland

The Finnish government's Wood Building Programme (2016–2023), coordinated by the Finnish Ministry of the Environment, focused on increasing the use of wood in various areas of construction, particularly in urban development, public buildings, and large structures such as bridges and halls, but also on strengthening regional skills and promoting exports

2.4. Germany

Germany introduces amendment to climate protection law (Klimaschutzgesetz) in 2021. The law introduces annual emission budgets for individual sectors, which are required to contribute to the overall emission reduction target. Each sector is allocated a specific limit on the amount of CO₂ it can produce in a year. In addition to climate protection, there is also the dimension of fair distribution of responsibility between the current and future generations (The Federal Government of Germany, 2021). The „Charter for Wood 2.0“ has been established to increase contributions of sustainable forestry and wood use to climate change mitigation, value creation and resource efficiency (Purkus & Lüdtko, 2020).

Table 1. Overview of subsidies to promote the use of structural timber in German regions

Region/city	Subsidy (€/kg)	Note
Bavaria (BayFHolz)	cca 0.50	Calculation based on €500 per tonne of carbon sequestered in structural timber.
Berlin	0.30 – 0.80	The official municipal subsidy programme "Berlin baut mit Holz", aimed at promoting wood construction.
Munich	2.00	Part of a large urban project - Prinz-Eugen-Park - the largest wooden housing estate in Germany.
Freiburg	1.00 – 1.20	The amount of the subsidy depends on the distance of origin of the material (up to 400 km = the highest subsidy).
Hamburg	0.80	The subsidy applies to non-residential buildings; the material must be from sustainable sources.

Sources: Bayerisches Staatsministerium, 2021; Berlin.de, 2019; Optoppen, 2024)

Several German states and cities have introduced specific subsidy schemes to promote timber construction. Unlike traditional subsidies linked to the total investment volume or built-up area, these programmes encourage green construction based on the precisely quantifiable amount of timber used or carbon sequestered (Table 1). Simply, the subsidy presents an amounts in Euro per kilogram of renewable carbon-storing building material used in the building over the long term.

Bavaria, one of the most active German regions in this area, is implementing a strategy based on public-private partnerships. The aim of these projects is not only to promote timber construction, but also to verify its technical and environmental advantages in practice.

2.5. Slovenia

Slovenia emphasises education and the development of professional skills as a tool for promoting timber construction. The system of environmentally preferred public procurement is widely used. This approach, known as 'Green Public Procurement' (GPP), means that when

purchasing goods, services and construction works, preference is given to solutions with a lower environmental impact throughout their entire life cycle (gov.si, 2022). GPP is mandatory in Slovenia for procurement in more than 20 categories of public contracts, including the design and construction of buildings.

2.6. Spain

In the Galicia region of Spain, legislation requires that at least 20% of the materials used in public buildings be wood, which, in addition to the environmental dimension, also has a regional economic dimension, as it supports the local forest/wood-based sector.

The key initiator of decarbonisation in the construction sector is the Mass Madera network, coordinated by the Institute for Advanced Architecture of Catalonia and financially supported by the Built by Nature foundation in 2023. The aim is to strengthen: i) the building of a network of experts and institutions; ii) the advocacy of policies in the field of timber construction; and iii) the development of knowledge and solutions in the field of sustainable architecture. The network focuses on removing barriers that hinder the adoption of solid wood in construction processes (IAAC, 2025). The initiative does not introduce direct financial subsidies linked to the weight of wood used, but is a tool for long-term influence on the regulatory environment and the speed of adoption of wood as the main building material in Spain

2.7. Sweden

In 2020, the Swedish government allocated approx. EUR 200 million to support projects focused on energy-efficient and sustainable buildings. These funds were provided through the European Investment Bank to Vasakronan, Sweden's largest real estate developer, to finance the construction and renovation of five properties with low energy consumption and minimal climate impact (buildings have obtained LEED Platinum or LEED Gold environmental certification) (EIB.org, 2020).

Among private projects, Stockholm Wood City stands out – described as the largest urban district in the world built mainly from wood (2,000 new apartments and 7,000 office spaces).

Table 2 Overview of support policies and initiatives to promote the use of wood in construction in selected countries

Country	Initiative / Policy	Tools and measures
Austria	CO ₂ Bonus (Waldfonds)	- Subsidy of €1–1.10/kg of wood - Max. €200,000–500,000 - Conditions for CO ₂ and energy
Czech Republic	National Wood Policy (2023)	- SWOT analysis of the sector - Interdepartmental cooperation - Integrated approach
Finland	Wood Building Programme (2016–2023)	- Target: 45% share of wood (2025) - Handbooks, databases, networking
Germany	BayFHolz + regional projects (e.g. Munich)	- Support of up to €2/kg (Munich), €0.5/kg (BayFHolz) - Pilot constructions, training
Slovenia	Green Public Procurement + education	- Mandatory GPP in 20+ categories - Material certification, training

Spain	Mass Madera + Galician legislation	- Financial support €180,000 - Legislation, public procurement, network of actors
Sweden	Strategic plan for timber construction	- SEK 2 billion from government, - Stockholm Wood City – financed by private sector
Switzerland	Wood Resources Policy, Think Earth Project	Research, legislation, public campaigns - Think Earth project, ETH Zurich

Source: own elaboration (based on the previous text sources)

3. CONCLUSIONS

An analysis of measures in European countries identified several recurring tools and principles. Among the most common are national or regional policies specifically aimed at promoting timber construction, whether in the form of a legislative framework (Spain/Galicia), technological support (Austria, Switzerland). One of the most effective and transparent tools for promoting sustainable construction is the introduction of financial support directly linked to the volume of environmentally friendly materials actually used in construction, based on the Austrian and German models. In the case of timber buildings, this specifically refers to the amount of structural timber incorporated into the building, which not only represents environmental value (bound carbon) but also provides an economic stimulus for the entire supply chain – from harvesting and processing to construction. Several EU countries still lack a mechanism that would specifically support timber construction in this way. In this context, the Austrian CO₂ Bonus, which is part of the state Waldfonds program, can be considered a model. This instrument provides a direct subsidy of €1 to €1.10 for each kilogram of renewable building material used, with the amount of the subsidy linked to the environmental value of the material – i.e. the amount of carbon sequestered. The common denominator is the integration of environmental and economic policy objectives, as well as the linking of innovation with industry and academia. Communication and raising awareness among the public and professionals about the benefits of timber construction is also an important element.

Acknowledgements: The authors would like to thank the Scientific Grant Agency of the Ministry of Education, Science, Research and Youth of the Slovak Republic, grant No. 1/0494/22 ‘Comparative Advantages of the Wood Based Sector under the Growing Influence of the Green Economy Principles’ and grant No. 1/0513/25 ‘Business model of innovations based on the principle of sustainability’.

REFERENCES

1. Aggestam, F., Weiss, G., Elomina, J., & Pütz, H. (2025). *Taking a bird’s eye view of EU wood-based policy: Untangling policy, institutional, and actor frameworks affecting the wood-based sectors*. European Forest Institute. <https://doi.org/10.36333/K2A07>

2. Bayerisches Staatsministerium. (2021). Bayerisches Holzbauförderprogramm – BayFHolz. Retrieved 24 July 2025, from Bayerisches Staatsministerium für Wohnen, Bau und Verkehr website:
<https://www.stmb.bayern.de/buw/bauthemen/gebaeudeundenergie/foerderprogramme/bayfholz/index.php>
3. Berlin.de. (2019). Bauen mit Holz. Retrieved 24 July 2025, from Berlin.de - Berlin baut mit Holz website: <https://www.berlin.de/nachhaltige-beschaffung/umweltaanforderungen/spezifische-beschaffungshinweise/bauen-mit-holz/>
4. CZGBC. (2025). CZGBC.org. Retrieved 25 July 2025, from CZECH GREEN BUILDING COUNCIL website: <https://www.czgbc.org/>
5. EIB.org. (2020, June 24). Vasakronan signs a SEK 2 billion green energy loan agreement with the EIB. Retrieved 25 July 2025, from European Investment Bank website: <https://www.eib.org/en/press/all/2020-159-vasakronan-signs-a-sek-2-billion-green-energy-loan-agreement-with-the-eib>
6. Eriksson, M., Samuelson, L., Jägrud, L., Mattsson, E., Celander, T., Malmer, A., ... Tengberg, A. (2018). Water, Forests, People: The Swedish Experience in Building Resilient Landscapes. *Environmental Management*, 62(1), 45–57. <https://doi.org/10.1007/S00267-018-1066-X/TABLES/2>
7. European Commission. (2018). Bioeconomy. Retrieved 24 July 2025, from European Commission website: https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy_en
8. Gallo, M. E. (2022). *The Bioeconomy: A Primer*. Retrieved from <https://www.congress.gov/crs-product/R46881>
9. Global Bioeconomy Summit. (2015). *Making Bioeconomy Work for Sustainable Development*. Berlin. Retrieved from https://gbs2020.net/wp-content/uploads/2021/10/Communique_final_neu.pdf
10. Goldhahn, C., Cabane, E., & Chanana, M. (2021). Sustainability in wood materials science: an opinion about current material development techniques and the end of lifetime perspectives. *Philosophical Transactions of the Royal Society A*, 379(2206). <https://doi.org/10.1098/RSTA.2020.0339>
11. gov.cz. (2024). *Surovinová politika pro dřevo 2024*. Retrieved from https://mpo.gov.cz/assets/cz/prumysl/zpracovatelsky-prumysl/prumysl-na-bazi-dreva/2024/7/SUR-POL_DREVO_.pdf
12. gov.si. (2022). Green public procurement. Retrieved 25 July 2025, from <https://www.gov.si/en/topics/green-public-procurement/>
13. IAAC. (2025). Mass Madera. Retrieved 24 July 2025, from IAAC - Institute for Advanced Architecture of Catalonia website: <https://iaac.net/projects/mass-madera/>
14. Kaputa V., Maťová H., Rácz A., & Wanat L. (2024). Achieving sustainability - with the consumer or the citizen? In Jelačić D. (Ed.), *Achieving Sustainability In Forest-Based Industry* (pp. 1–18). Zagreb: WoodEMA, i.a. Retrieved from https://www.woodema.org/book_2024.html
15. Kommunalkredit Public Consulting. (2024, August). Waldfonds-Gebäude in Holzbauweise Detailinformationen. *WALDFONDS Republik Österreich*. Kommunalkredit Public Consulting. Retrieved from https://www.umweltfoerderung.at/fileadmin/user_upload/umweltfoerderung/betriebe/Waldfonds/Waldfonds_Detailinformationen.pdf

16. Moravčík, M., Dzian, M., Paluš, H., & Parobek, J. (2024). Sustainable development: Evaluation and forecasting of Norway spruce production and growing stock in Slovakia in the context of bioeconomy. *Central European Forestry Journal*, 70(1), 11–18. <https://doi.org/10.2478/FORJ-2023-0023>
17. Moravčík, M., Kovalčík, M., Paluš, H., Parobek, J., Murgaš, V., & Kulla, L. (2019). *Využívanie dreva ako obnoviteľnej suroviny v kontexte bioekonomiky* (Lesnícke štúdie). Národné lesnícke centrum. Retrieved from https://www.library.sk/arl-sldk/sk/detail-sldk_un_epca-0022355-Vyuzivanie-dreva-ako-obnovitelnej-suroviny-v-kontexte-bioekonomiky/
18. Optoppen. (2024). Optoppen - Germany Country Policies. Retrieved 24 July 2025, from Urban Densification & Sustainable Development website: <https://www.optoppen.org/country-policies/germany>
19. Pánik Miroslav, & Jantová Soňa. (2019). *Bioekonomika*. STU Bratislava. Retrieved from <https://www.vydavatelstvo.stuba.sk/obchod/bioekonomika>
20. Purkus, A., & Lüdtke, J. (2020). A systemic evaluation framework for a multi-actor, forest-based bioeconomy governance process: The German Charter for Wood 2.0 as a case study. *Forest Policy and Economics*, 113, 102113. <https://doi.org/10.1016/J.FORPOL.2020.102113>
21. Sharmina, M., Pappas, D., Scott, K., & Gallego-Schmid, A. (2023). Impact of Circular Economy Measures in the European Union Built Environment on a Net-Zero Target. *Circular Economy and Sustainability*, 3(4), 1989–2008. <https://doi.org/10.1007/S43615-023-00257-2/FIGURES/8>
22. Švajlenka, J., & Pošiváková, T. (2023). Innovation potential of wood constructions in the context of sustainability and efficiency of the construction industry. *Journal of Cleaner Production*, 411, 137209. <https://doi.org/10.1016/J.JCLEPRO.2023.137209>
23. The Federal Government of Germany. (2021). Climate Change Act - climate neutrality by 2045. Retrieved 24 July 2025, from The Federal Government of Germany website: <https://www.bundesregierung.de/breg-en/service/archive/climate-change-act-2021-1913970>

Authors address:

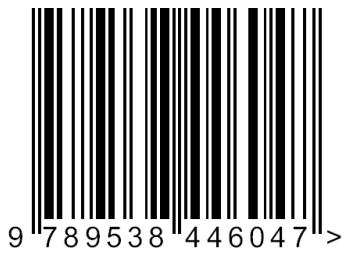
Kaputa, V.^{1*}; Maťová, H.²; Táborecká, J.³; Olšiaková, M.⁴

^{1,2,4}Department of Marketing, Trade and World Forestry, Technical University in Zvolen, Slovakia

³Department of Corporate Economics and Management, Faculty of Economics, Matej Bell University in Banská Bystrica

*Corresponding author: kaputa@tuzvo.sk

ISBN 978-953-8446-04-7



9 789538 446047 >