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Title of the paper:

ARCHITECTURAL PERSPECTIVES ON WOOD REUSE WITHIN CIRCULAR CONSTRUCTION IN NORTH MACEDONIA

Name of the authors:

Marija Miloshevska Janakieska[1], Manja Kitek Kuzman[2]

Affiliation:

[1] Department of Architecture, Faculty of Engineering, International Balkan University, Skopje, Macedonia

[2] Department of Wood Science and Technology, Biotechnical Faculty, University of Ljubljana, Slovenia

Application of Reclaimed Wooden Elements in North Macedonia

The application of reclaimed wooden elements in architecture and construction has become popular, especially because of its sustainable advantages. This practice is following the principles of circular economy such as efficient use of resources, decreasing the waste and carbon emissions [Nußholz et al., 2020]. Although reusing wood has some disadvantages, such as structural restrictions, health safety, and maintenance needs, the advantages are numerous.

A large part of the carbon emissions comes from the embodied energy in the building materials [Pomponi et al., 2016; Cabeza et al., 2014]. The circularity in the construction aims to close the material loops through recycling, reusing, and repurposing of the materials. Wood with its renewable nature, carbon storage potential and low embodied energy is especially valuable in this process.

The building sector in North Macedonia is revitalizing following a period of political and economic instability. Although almost 40% of the country is forested [Worldbank.org, 2020], the potential of using wood in sustainable building practices is still being explored.

The main aim of this study was to research the feasibility of recycling wood products in North Macedonia based on collected data and identify the possible directions for future development.

WPC panel used as a wall decoration [https://ironwood.mk/]

Re-designed furniture in Macedonia [https://urbanold.com//]

Objectives of the Study

- To evaluate the perception and trends of wood reuse by architects in Macedonia;
- To characterize information sources and their perceived value used by architects;
- To identify information on wood reuse needed by architects.



The specific goals of the study were:

(1) to identify the reuse of wood in a process of architectural designing,

(2) to assess architect's knowledge on reused wood and their advantages.

The study provides an updated overview of the perception of reused wood products among architects.

Methodology

The methodology of this research is based on a survey questionnaire that was distributed among practicing architects through the Chamber of Certified Architects and Certified Engineers of the Republic of North Macedonia. The aim was to gather insights on the reuse of wood in building construction. The survey was conducted online, using 1KA—free web survey software developed by the Centre for Social Informatics at the Faculty of Social Sciences, University of Ljubljana. A total of 101 valid responses were received. Considering undeliverable emails caused by outdated addresses or inactive firms, the response rate for the country was calculated accordingly. While specific reasons for lower participation are not fully known, common factors include limited interest in the survey topic or the perceived length of the questionnaire [Fan et al., 2010].

Public structures with reclaimed wood [https://archello.com/news/10-public-structures-that-make-use-of-salvaged-wood]

Samples and Data

A total of 101 valid responses were received.

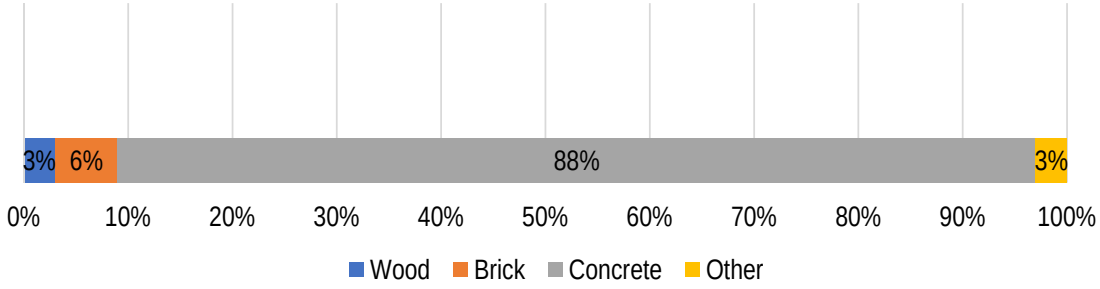
According to the survey, the gender distribution among respondents was roughly equal. More than 80% of them were aged between 25 and 44 years. All respondents were certified architects, holding either a professional master's degree or a university degree.




Public structures with reclaimed wood [https://archello.com/news/10-public-structures-that-make-use-of-salvaged-wood]

Results

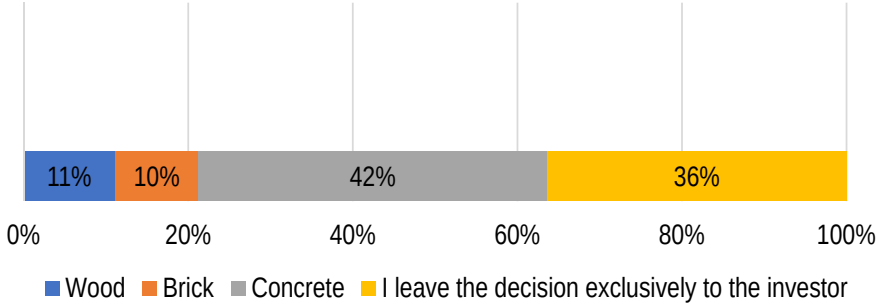
88% of the architects reported that the investors typically use concrete for building construction. Brick is not so commonly used, which is understandable, since it doesn't have a horizontal load bearing capacity, and it is not recommended in seismic active regions. Wood and other materials are rarely selected as primary building materials.



Investors' Choice of Material in Construction (Question: Which material for building construction do investors most often choose?)

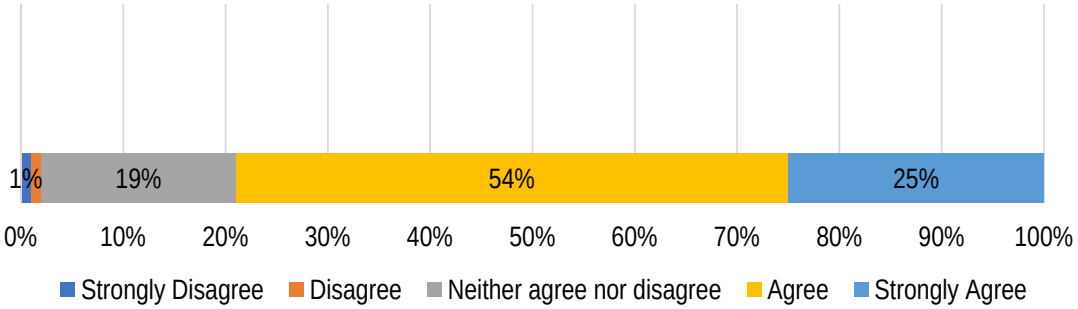
Results

The situation is different when it comes to architects' recommendation regarding the building materials. According to the answers, architects in North Macedonia are recommending concrete (42%), but also other materials (36%).



Construction Materials that are Recommended by Architects (Question: Which construction material do you recommend to investors?)

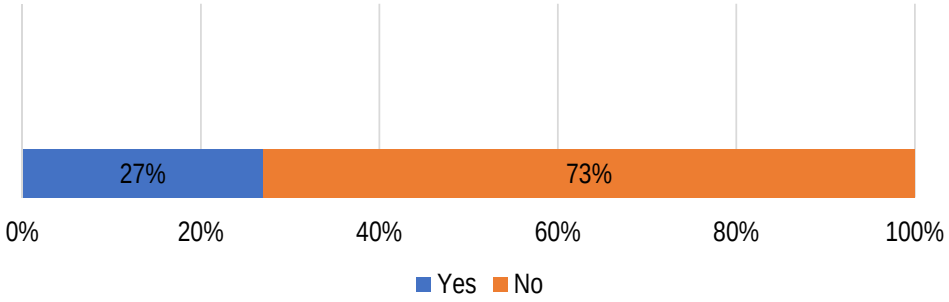
In North Macedonia, architects show a high level of confidence in wood as a building material, but various factors influence their percpetions, such as limited exposure or familiarity with contemporary wood technolgies, misconseptions about the structural performance and durability, as well as regulatory limitations. A majority of the architects agree or strongly agree (79%) that the ecological materials and construction methods applications are important for the investors.



Perceived Importance of Ecological Materials and Construction Methods for Investors (Question: To what extent do you believe that the selection of ecological materials or sustainable construction methods is a significant factor for investors?)

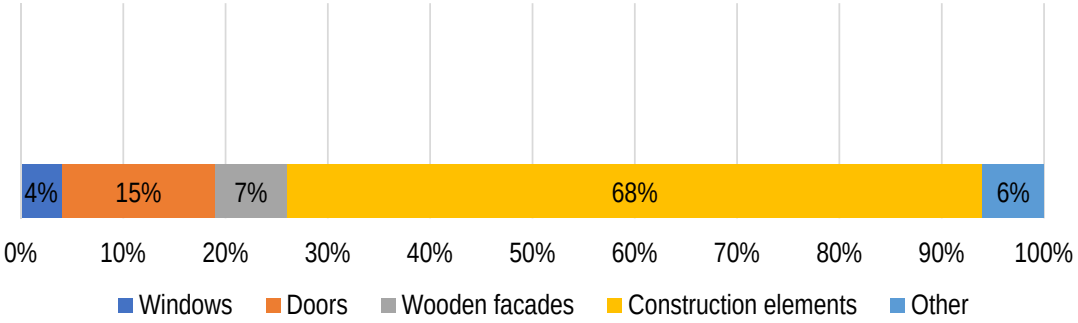
Results

Unfortunately, low percentage of the architects have experience with use of reclaimed wood.



Architects' Experience with the Use of Reclaimed Wood (Question: In your architectural practice, have you encountered instances where an investor opted to reuse previously installed wooden elements, such as reclaimed wood?)

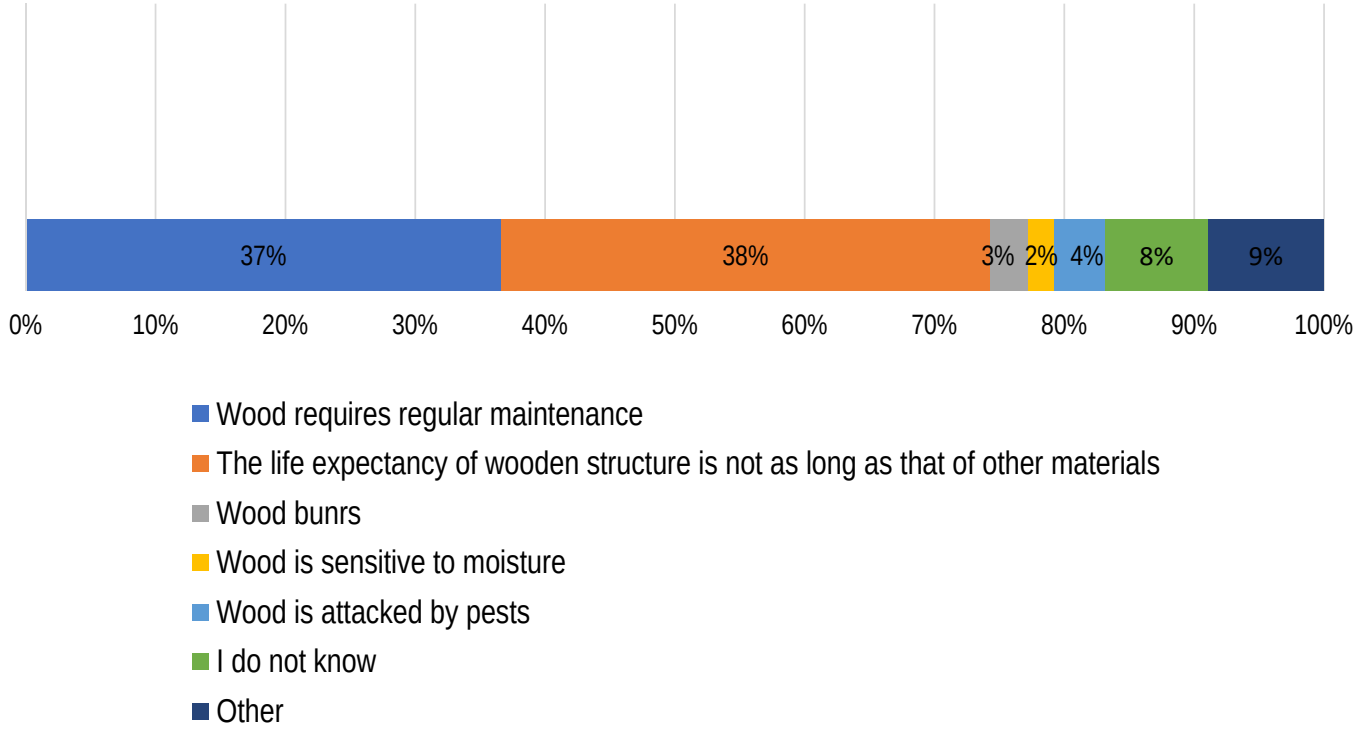
Among those surveyed, 68% of architects identified structural elements—such as beams and columns—as having the greatest potential for reuse, followed by doors with only 15%.



Perceived Reuse Potential of Various Wood Products (Question: In your opinion, which types of wood products possess the greatest potential for reuse?)

Results

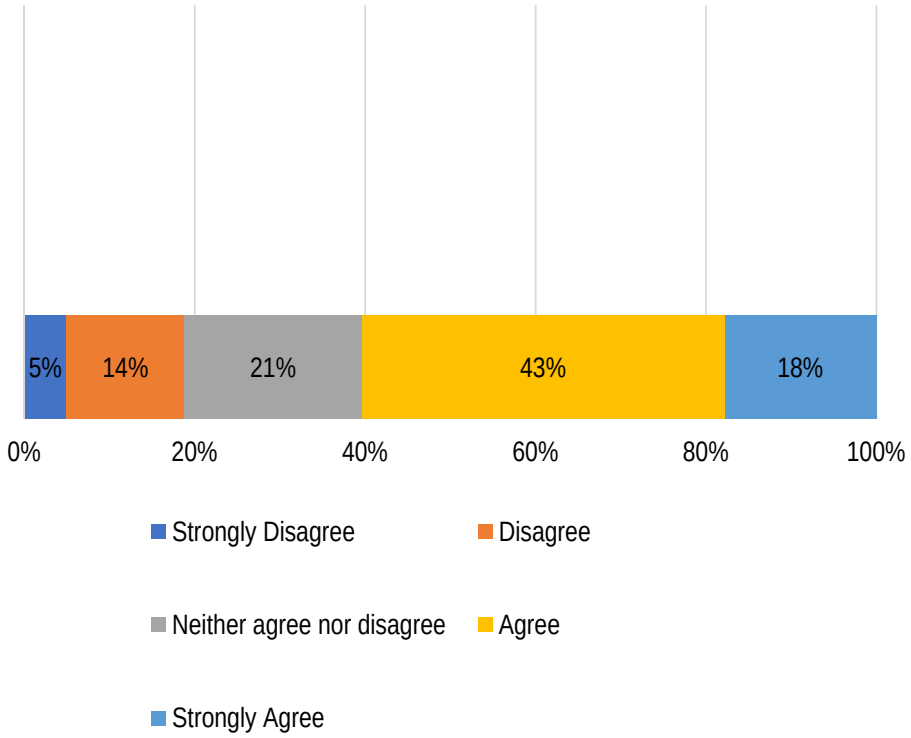
The concerns about the long-term quality of wood products are primarily due to the need for regular maintenance and the life expectancy of wooden structure.



Doubts about the long-term quality of wood products (Question: What, in your opinion, discourages investors from choosing a wooden house?)

Results

Most of the respondents either agree or strongly agree that reclaimed wood has a lower value compared to other construction and demolition wastes, such as metals and plastics. They noted that reclaimed wood is reused less frequently than materials such as metal or plastic due to several factors. Reclaimed wood offers many benefits, from environmental characteristic to beautiful aesthetics, but it is not always easy to source, and the usage can be both labor-intensive and not affordable. Processing challenges, such as irregular sizes, embedded hardware, or degradation, further complicate its reuse. Moreover, the quality and durability of reclaimed wood vary depending on its previous use and condition, often requiring thorough inspection or testing. Regulatory constraints, including building codes and certification standards, may also restrict its application. Finally, regional availability, market demand, industry practices, and cultural attitudes can significantly influence the extent to which reclaimed wood is reused in construction and design.



Reclaimed wood has a lower value compared to other construction and demolition waste (Question: Do you agree that reclaimed wood has a lower value compared to other construction and demolition waste?)

Conclusions

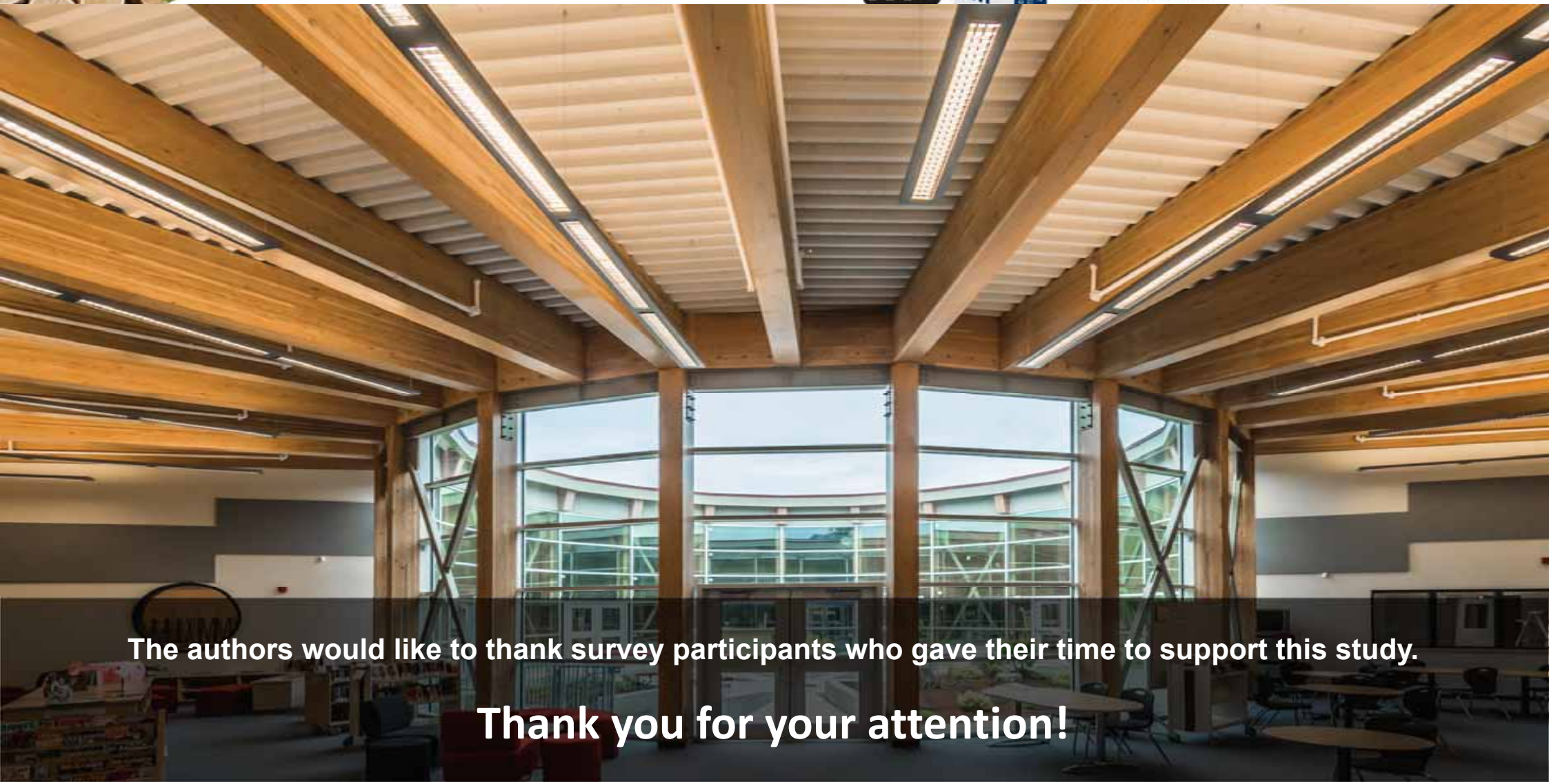
This study highlights architects' perceptions on wood reuse in the construction sector in North Macedonia, emphasizing its potential within circular economy practices.

Architects reported limited support from both professional and governmental institutions for reusing wood. Key challenges include limited availability, high costs, processing complexity, durability concerns, and regulatory limitations.

In North Macedonia, concrete is a dominant construction material, most often chosen by the investors for the structural elements in the buildings. Despite this fact, 79% of the architects agree that ecological material selection is important to investors—one of the highest rates among the surveyed countries.

Most architects reject the idea that reclaimed wood is of lower value. They are emphasizing the positive features of the reused wood, such as its sustainability, aesthetics, historic value, and craftsmanship appeal. The primary concerns include the need for regular maintenance and perceived shorter lifespan of wooden structures compared to other structures from concrete and steel.

This study highlights the need for stronger institutional support, targeted strategies to overcome common challenges, and greater awareness of the ecological and economic benefits of using reclaimed wood in construction. These actions could promote wider adoption of reclaimed wood within circular construction practices in North Macedonia. Furthermore, the research offers valuable insights into the country's potential to advance circular construction within the broader framework of the circular economy.



The authors would like to thank survey participants who gave their time to support this study.

Thank you for your attention!