

A SWOT ANALYSIS FOR UTILIZING SECOND-USE WOOD AS A RESOURCE FOR ENGINEERED WOOD PRODUCTS

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ABSTRACT: The construction industry's extensive resource consumption and waste generation highlight the urgency of adopting circular economy practices, particularly through deconstruction and material reuse. Despite efforts to promote circularity, second-use wood remains underutilized due to economic and logistical barriers. This study explores opportunities for integrating second-use wood into North America's lumber and engineered wood product (EWP) industries, with a focus on oriented strand board (OSB) production. A three-stage methodology was adopted. First, the business models of reclaimed wood manufacturers in North America were analyzed using Osterwalder's Business Model Canvas to assess current market dynamics. Second, publicly traded companies in the lumber and EWP industries were examined through financial reports to identify major players, market trends, and potential points of integration. Finally, a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was conducted to evaluate the internal and external factors influencing the adoption of second-use wood in OSB production. Findings reveal that while reclaimed wood manufacturers primarily cater to niche markets, OSB presents a promising avenue for scaling up circularity in the industry. OSB's production process can accommodate second-use wood with minimal modifications, and the demand for sustainable building materials is rising. However, challenges such as quality inconsistencies, contamination risks, and supply chain dependencies must be addressed. Strengthening market demand, improving material processing, and establishing industry standards are crucial for making second-use wood a viable resource in large-scale wood production.

1. INTRODUCTION

The tremendous amount of resources consumed and waste produced by the construction industry has placed it in the crosshairs of the United Nations through Sustainable Development Goal (SDG) 12 'Responsible Consumption and Production' ("SDG12" 2023). This momentum was backed up by several international and global initiatives, such as the European Union's "A zero waste programme for Europe" (European Commission 2014). Since then, more ordinances and by-laws have been issued such as the implementation of deconstruction ordinances in four cities in the United States (Augustine-Marceil 2023), and the expansion of Vancouver, Canada's green demolition by-law to include homes constructed before 1950 (COV 2018). On the scholarly side, the research community primarily focuses on the design and end-of-life (EoL) phases, as decisions during these phases significantly affect deconstruction adoption (Guerra and Leite 2021).

While these efforts are essential, the application of circular economy in the construction industry is still in its infancy stage (Allam and Nik-Bakht 2024). Deconstruction, a key enabler of circularity in construction, continues to be outperformed by demolition practices, which leave behind significant amounts of waste that

ultimately end up in landfills. One of the main reasons for this is that deconstruction, being a labor-intensive task, costs more and takes more time than demolition (Mollaei et al. 2023). However, when looking beyond the deconstruction phase, the economic benefits gained from selling second-use products could make deconstruction a more economically viable solution than demolition.

To achieve this goal, an established market for second-use products is essential. However, there is currently a lack of market demand for these products (Allam and Nik-Bakht 2023). This, combined with stakeholder resistance to change and poor communication, makes the economic viability of mining the built environment to supply a second-hand market seem like a far-fetched prospect. Therefore, there is a dire need to investigate market opportunities for the potential resources that could be extracted from the built environment (Orenga Panizza and Nik-Bakht 2024).

Wood, as a renewable resource, is the most prevalent construction material in North America. Its ease of assembly and disassembly makes wood-based products an ideal fit for responsible consumption and production (Natural Resources Canada 2025). In this context, establishing a market around wood-based products from the built environment could reveal numerous business opportunities. This may require existing players in the market to restructure their operations or new players to enter. In either case, strategic investments will be necessary to establish the market.

The potential for scaling up operations is a key factor for investors when deciding whether an idea is worth pursuing. Therefore, it is essential to explore the opportunities for integrating second-use wood into large markets such as the lumber and wood industries. To this end, the present study aims to evaluate the strengths, weaknesses, opportunities, and threats (SWOT) of utilizing second-use wood as a resource for producing lumber and Engineered Wood Products (EWPs). To fulfill this aim, we addressed three main questions: (i) What does the existing reclaimed wood business landscape look like? (ii) What is the current status of the wood and lumber industries? (iii) What are the possible synergies between second-use wood and the lumber and wood industries?

2. METHODOLOGY

A three-stage research methodology was adopted to examine the feasibility of utilizing second-use wood as a resource for manufacturing wood products. In the first stage, the business models of existing reclaimed wood manufacturers were investigated. This process involved three key steps: (i) conducting a Google search using "reclaimed wood" as a search query while limiting the location to North America (i.e., Canada and the United States); (ii) reviewing the websites and social media accounts of the identified manufacturers; and (iii) analyzing each manufacturer's business model using Osterwalder's Business Model Canvas (BMC) (Osterwalder and Pigneur 2010). Osterwalder's BMC consists of nine blocks: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure. A systematic approach was taken to complete each block by answering specific questions. For instance, under the "channels" block, questions such as "How do customers purchase reclaimed wood?" and "How is it delivered to them?" were addressed. Osterwalder's BMC is widely used as a strategic tool to systematically analyze and compare business models, providing insights into how companies create, deliver, and capture value.

In the second stage, the status quo of the lumber and wood production industry in North America was analyzed. The authors identified major players in the lumber and wood manufacturing industry by focusing on companies listed on the New York Stock Exchange (NYSE) and the Toronto Stock Exchange (TSX) to ensure comprehensive market coverage. After selecting the relevant manufacturing companies, publicly available filings were examined, including 10-K reports for U.S.-based businesses from the U.S. Securities and Exchange Commission (SEC) and annual reports and financial statements for Canadian businesses from SEDAR+.

In the final stage, the feasibility of using second-use wood as a resource for producing wood products was assessed. This evaluation was based on findings from the first two stages, along with additional factors such as housing starts and repair and remodeling projects. A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was conducted to analyze the internal and external factors influencing

the implementation of secondary wood utilization. SWOT analysis has previously been applied in studies on circularity in construction and waste management to assess the competitive position of municipalities and countries in waste management practices (Allam et al. 2023)

3. RESULTS AND DISCUSSION

The results are divided into three main subsections: (i) Reclaimed Wood Business; (ii) Lumber and Wood Industries; and (iii) SWOT Analysis. The first explores the characteristics, challenges, and market positioning of companies specializing in reclaimed wood. Followed by a virgin wood industry perspective, examining major players, and their products. The section ends with an assessment of the feasibility of using second-use wood as a resource for producing wood-based products.

3.1 Reclaimed Wood Business

Nine second-use wood manufacturers were identified from the conducted Google search, seven operate in the United States and the other two are based in Canada. Osterwalder's Business Model Canvas (Osterwalder and Pigneur 2010) was used to identify the business model of each manufacturer. Table 1 presents the nine blocks (sections) and 44 unified subsections identified by the authors. The studied manufacturers offer a wide range of wood-based products, including flooring, siding, millwork (i.e., decorative elements), and, to a lesser extent, dimensional lumber. Given this decor-focused product portfolio, the primary customers of the second-hand wood manufacturers were architects, interior designers, and do-it-yourself (DIY) enthusiasts. To meet their customers' needs, the manufacturers offered not only craftsmanship and customized products but also sourced rare materials from the built environment, such as hand-sawn and old-growth lumber. Whether they had their own deconstruction team or partnered with a third party, these manufacturers carefully selected facilities for harvesting wood to ensure their products met customer demands.

Table 1: Business Model Canvas for second-use wood manufacturers

		C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	C ₉
Value Proposition	Quality Craftsmanship & Customization									
	Niche Appeal									
	Reclaimed Product Certification									
	Superior Durability									
	Sustainability									
Key Activities	Building Deconstruction Services									
	Salvage Material									
	Procurement									
	Processing & Refinement									
	Installation Services									
	Delivery Services									
Key Partners	Material suppliers & salvage partners									
	Logistics & transportation services									
Key Resources	Material Resources & Inventory									
	Processing Equipment & Facilities									
	Skilled Workforce									
	Industry Partnerships									
Customer Segments	Architects & Interior Designers									
	Builders & Contractors									

		C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	C ₉
	Other Manufacturers									
	Individuals									
	High-End Clients									
	Non-Local Customers									
	Local Customers									
Customer Relationships	Personalized Consultations									
	Ongoing Support									
	Collaboration with Industry Professionals									
Channel	In-store Sales									
	Online & Phone Sales									
	Outside Retailers									
	Local Pickup & Delivery									
	Nationwide Shipping									
	International Delivery									
Cost Structure	Material Sourcing & Transportation									
	Manufacturing & Labor									
	Marketing & Business Operations									
Revenue Streams	Direct Sales & Custom Orders									
	Deconstruction Services									
	Retail Partnerships									

The reclamation, processing, and redistribution of second-use wood pose logistical challenges when scaling up, making localized operations more viable both economically and environmentally. While these manufacturers play a valuable role in promoting sustainable practices within their niche, their impact on the overall wood waste problem remains limited. Their specialized approach, though effective for their niche customer base, does not significantly reduce the volume of wood sent to landfills. Overcoming these challenges requires collaboration with major manufacturers of virgin lumber and wood products, leveraging their dominant market share in the construction materials sector. The following subsection provides a detailed examination of the key players in the lumber and wood industries.

3.2 Lumber and Wood Industries

To assess the potential for integrating reclaimed wood into existing industrial processes, we first examined the structure of the North American lumber and wood manufacturing industries. This analysis focused on the primary product categories, key industry players, financial and market trends, and potential areas for reclaimed wood incorporation. Six publicly traded companies in the lumber and wood industries were identified: three listed on the NYSE, two on the TSX, and one on both stock exchanges. In general, most of the companies based in Canada have manufacturing facilities and distribution networks in the United States. The combined market capitalization of these companies is approximately \$45 billion. These firms control a significant share of North American wood production and have vertically integrated supply chains that encompass timber harvesting, processing, and distribution.

These companies primarily manufacture two broad categories of products: lumber and engineered wood products (EWPs). Lumber, typically sold as dimensional pieces of various wood species, is primarily used for load-bearing structural elements such as studs, beams, joists, and rafters. It undergoes processing that includes debarking the harvested logs from forests, sawing them into rough lumber, kiln drying to reduce moisture content, and finally, planning and grading them ensuring compliance with strength and durability requirements. Given its role in structural applications, lumber must undergo certification as part of its

manufacturing process. We analyzed the income statements of the identified companies, which revealed that lumber production dominates the North American market, accounting for over 44% of total wood manufacturer sales.

Unlike traditional lumber, EWPs are composite materials made by bonding wood fibers, strands, veneers, or particles together with adhesives under heat and pressure. The production process varies depending on the specific product. Common EWPs include plywood panels, oriented strand board (OSB), Medium-density fiberboard (MDF), Laminated veneer lumber (LVL), Glue-laminated timber (glulam), I-joists and laminated beams. In North America, EWPs represent over 46% of total wood manufacturer sales, with OSB alone generating approximately 38% of total EWP revenues. OSB's widespread use, particularly in structural applications such as subflooring, wall sheathing, and roofing, makes it a dominant segment within the EWP market (Figure 1).

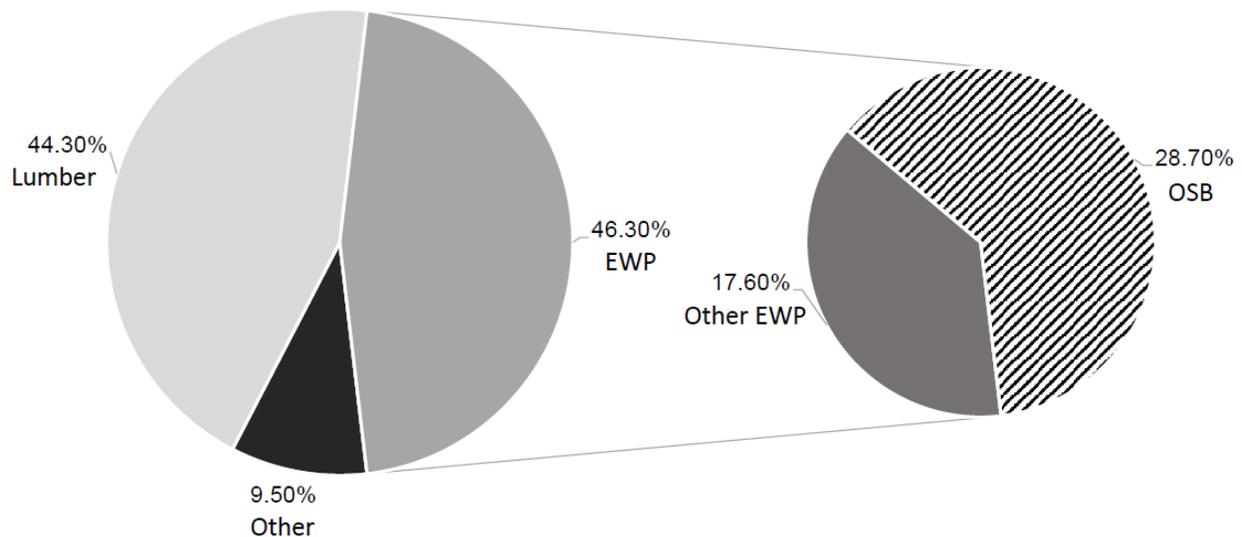


Figure 1: Market Share Breakdown of Lumber and EWPs in North America

We analyzed 10-K reports from the U.S. SEC and annual reports from SEDAR+ (Canada), which indicated that these companies are continually expanding their EWP production capacity. This penetration of the EWP market was driven by two key factors: (i) reducing the cyclical nature of their business by expanding their product offerings; and (ii) recent advancements in EWP technology, which have enabled wood-based construction to extend beyond low-rise residential buildings to include high-rise and commercial structures. Notably, OSB has seen consistent revenue growth due to its widespread application in residential construction, particularly in sheathing and subflooring. Additionally, OSB is a key component in the production of other engineered wood products (EWP), such as I-joists, where it is used as the web. However, several key factors significantly influence the lumber and EWP industries, including fluctuations in raw material costs, housing starts, and renovation trends. These dynamic elements play a crucial role in shaping production strategies and market demand.

Given OSB's manufacturing process, where wood strands are bonded under heat and pressure, and its substantial market demand, we identify OSB as the product with the greatest potential for incorporating second-use materials from the built environment. OSB production could accommodate reclaimed wood fibers and strands, reducing reliance on virgin materials while aligning with industry trends toward sustainability. In the following subsection, the strengths, weaknesses, opportunities, and threats of using reclaimed wood as a resource for OSB production will be further discussed.

3.3 SWOT Analysis

Identifying the major trends in lumber and wood industries as well as the status quo of second-use wood manufacturers showed how far or close the North American market is from adopting second-use wood in manufacturing wood-based products. As OSB has the potential to utilize second-use wood as an input for its production process, we investigated the internal (strengths and weaknesses) and external factors (opportunities and threats) that may boost/ hinder this transition. A summary of these findings is presented in Figure 2, offering a comprehensive overview of the key enablers and barriers to adopting second-use wood in OSB manufacturing.

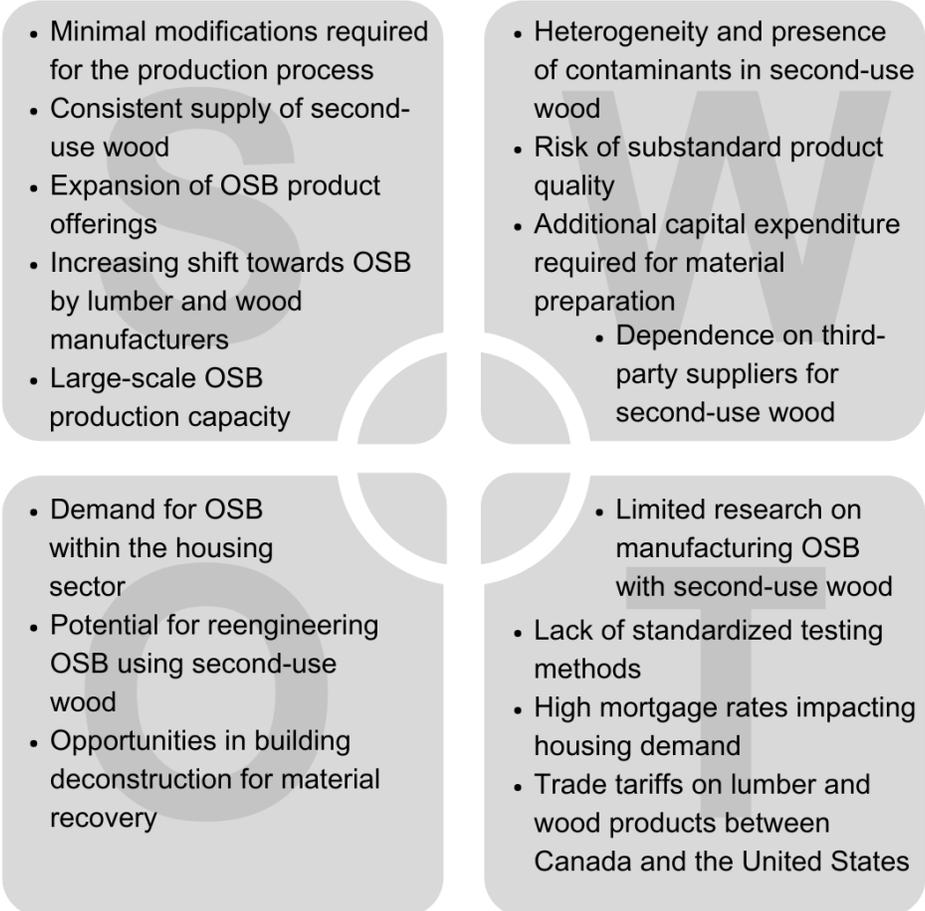


Figure 2: Summary of strengths (S), weaknesses (W), opportunities (O), and threats (T) for utilizing second-use wood as input for OSB production

The findings highlight several internal factors that position OSB manufacturing as a strong candidate for integrating second-use wood. A major advantage is that the existing OSB production process requires minimal modifications to accommodate waste wood, making adoption relatively seamless (Amarasinghe et al. 2024). Additionally, North America has a consistent supply of second-use wood, driven by aging infrastructure and the increasing trend of retrofitting buildings to reduce carbon emissions. OSB also benefits from a diverse product offering, serving both structural and non-structural applications, and a market shift in favor of OSB due to its higher profitability and stability compared to traditional lumber. Furthermore, North America’s large-scale OSB production capacity (26 billion square feet annually) presents a significant opportunity to divert over 50% of the 22.4 million tonnes of wood waste generated each year from landfills, reinforcing OSB’s potential role in closing the circularity gap (Environment and Climate Change Canada 2020; Forisk Consulting 2023; U.S. Environmental Protection Agency 2024). However, key weaknesses present challenges to this transition. The heterogeneity and presence of contaminants in second-use wood create inconsistencies in quality, which may impact OSB performance

(Faraca et al. 2019; Nguyen et al. 2023; Schild et al. 2021). Additionally, using second-use wood introduces risks of substandard product quality, particularly in terms of bending strength and stiffness (Taskhiri et al. 2019). The preparation process, including sorting, de-nailing, and contaminant detection requires additional capital investment, which could reduce profit margins. Lastly, the dependence on third-party suppliers for high-quality second-use wood adds uncertainty, as specialized deconstruction contractors are needed to carefully extract and process reusable materials.

Several external factors create a favorable market landscape for incorporating second-use wood into OSB production. The housing sector's strong demand presents a substantial opportunity, with each new single-family home requiring approximately 6,800 square feet of OSB, and over 1.6 million housing starts recorded in Canada and the United States in 2024 (Bureau 2024; Canada Mortgage and Housing Corporation 2024; NAHB 2025). Additionally, reengineering OSB to incorporate second-use wood has shown promising results, with the potential to replace up to 100% of core layer strands, thereby lowering raw material costs and advancing circular economy initiatives (Schild et al. 2021). The growing emphasis on deconstruction over demolition is another key opportunity, as up to 45% of recovered wood can be repurposed for panel production, reducing CO₂ emissions and preserving natural resources (Amarasinghe et al. 2024; Zhu and Feng 2024). However, several threats could hinder this transition. The lack of research on OSB production with second-use wood creates uncertainty in market adoption and slows industry progress (Amarasinghe et al. 2024). Additionally, the absence of standardized testing methods raises concerns about product strength, durability, and regulatory compliance, potentially limiting its acceptance (Amarasinghe et al. 2024). Broader economic and policy challenges also pose risks: high mortgage rates, currently at 6.87% for a 30-year fixed mortgage, could dampen new housing starts and renovation projects, reducing OSB demand. Furthermore, tariffs on lumber and wood products between Canada and the United States may disrupt supply chains, potentially leading to production curtailments and lower OSB output from Canadian facilities.

4. CONCLUSION

This study assessed the feasibility of integrating second-use wood into North America's lumber and EWP industries, with a focus on OSB production. First, we presented a comprehensive overview of the reclaimed wood business landscape. Second, we analyzed major lumber and wood manufacturing companies. Finally, we conducted a SWOT analysis to provide a systematic evaluation of the enablers and barriers to integrating second-use wood into OSB production. The findings highlight a contrast between the limited scalability of second-use wood, currently constrained to niche markets, and the emerging opportunity for integration through the growing interest in EWP production by major lumber and wood manufacturers. The consistent demand for OSB, its large-scale manufacturing capacity, and its ability to incorporate reclaimed wood strands with minimal modifications position it as the most promising candidate for circular economy implementation in the sector.

This study contributes to the circularity in construction body of knowledge by identifying practical pathways for integrating second-use wood into large-scale manufacturing, advancing the broader goal of reducing construction waste and promoting sustainable material use. Despite its contribution, this study has certain limitations: The analysis of reclaimed wood businesses relied on publicly available data, which may not fully capture the operational challenges faced by these firms. Additionally, our examination of the wood and lumber industries focused solely on publicly traded companies. While these firms provide detailed disclosures, the exclusion of private companies represents a limitation. Lastly, while the SWOT analysis provides a strategic perspective, future research should further investigate the experimental aspects to assess the mechanical performance of OSB panels incorporating reclaimed wood.

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