

A SWOT Analysis for Utilizing Second-Use Wood as a Resource for Engineered Wood Products

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Abstract

Question: How can the North American lumber and engineered wood product (EWP) industries, specifically oriented strand board (OSB) production, integrate second-use wood to scale circular economy practices?

Purpose: This study is intended to explore opportunities and barriers for the integration of second-use wood into large-scale OSB production to move beyond niche reclaimed wood markets.

Research Method: A three-stage methodology was adopted: 1) business models of North American reclaimed wood manufacturers were analyzed; 2) filings of publicly traded lumber and EWP companies were reviewed; and 3) a SWOT analysis on second-use wood in OSB production was performed.

Findings: The analysis shows that OSB production is a promising avenue for circularity because the process can accommodate second-use wood with minimal modifications. While reclaimed wood currently serves niche markets, OSB is identified as offering the scale needed for significant industrial impact.

Limitations: The study is based on secondary data sources and qualitative analysis; no pilot manufacturing trials or quantitative cost-benefit assessments were conducted.

Implications: The findings indicate that transitioning second-use wood from niche

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applications to mainstream wood manufacturing requires coordinated improvements in material processing, quality control, and standardization, as well as closer alignment between deconstruction supply chains and industrial manufacturers.

Value for authors: A roadmap is provided for practitioners in the EWP and construction sectors regarding the integration of sustainable resources into large-scale manufacturing with minimal operational changes.

Keywords: Circular economy; Deconstruction; Oriented strand board (OSB), SWOT analysis; Lean construction; Reclaimed wood

Paper type: Full paper

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' (United Nations, n.d.). This momentum was reinforced by several international and global initiatives, such as the European Union's "Towards a circular economy: A zero waste programme for Europe" (European Commission, 2014). Since then, the adoption of circular economy (CE) principles has gained increasing attention within the construction industry.

As a paradigm that requires a fundamental shift away from the traditional linear model of take-make-dispose, the circular economy demands radical changes in how buildings are designed, constructed, and dismantled. This shift has been reflected in growing efforts to promote deconstruction—one of the key enablers of CE in the construction industry—as a means of generating high-quality material outputs that can be reused as resources in subsequent value chains. In this context, several ordinances and by-laws have been issued including 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 (City of Vancouver, 2018).

Over the past decade, research has demonstrated that applying CE principles in the construction industry represents a challenging transition that requires innovative solutions (Allam & Nik-Bakht, 2024). For instance, 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 primary reasons for this disparity is that deconstruction is a labor-intensive process, often perceived as more time-consuming and costly than demolition (Mollaei et al., 2023).

However, recent research suggests, that this cost and time disadvantage is largely rooted in process inefficiencies, fragmented planning, and poor coordination among stakeholders, rather than in the inherent nature of deconstruction itself (Allam & Nik-Bakht, 2023). In this context, Lean construction principles have been increasingly identified as a critical enabler for improving deconstruction performance and supporting circular outcomes. Lean thinking emphasizes waste elimination, value maximization, flow optimization, early stakeholder involvement, and continuous improvement, principles that directly align with circular economy objectives.

Lean construction has been investigated as a complementary approach to the circular economy in the construction industry, with research consistently highlighting its potential

to improve process efficiency, coordination, and value generation across circular strategies. Within this body of literature, Lean principles have been applied to support circular practices such as deconstruction, design for reuse, and material recovery, addressing organizational, operational, and market-related barriers. For instance, (Marzouk et al., 2019) analyzed the interaction between Lean principles and Building Information Modeling (BIM) functionalities in deconstruction processes and identified predominantly constructive synergies. Their findings indicate that Lean concepts such as pull planning, flow reliability, and continuous improvement, when supported by BIM-based visualization and information management, can reduce uncertainty, improve sequencing, and enhance the recoverability of building components. Similarly, the integration of Lean principles into design for deconstruction approaches has been shown to facilitate early decision-making, improve coordination among project participants, and enable selective dismantling based on anticipated market demand for salvaged elements (Marzouk & Elmaraghy, 2021).

Furthermore, a recent systematic review examining the joint implementation of Lean construction and circular economy principles highlights that Lean practices provide the operational backbone necessary to implement circular strategies at scale (El Hafiane et al., 2025). However, persistent barriers, including supply chain fragmentation, lack of standardized indicators, and limited market coordination, continue to hinder widespread adoption. Empirical evidence from deconstruction projects further reinforces the role of Lean thinking in enabling circularity. A Canadian case study by (Boukherroub et al., 2024) demonstrated that Lean-inspired process restructuring can significantly increase material reuse rates by addressing inefficiencies related to logistics, skills availability, and stakeholder communication. This line of research underlines that material reuse is not only a technical challenge but also an organizational and market coordination problem, which Lean methodologies are well-suited to address.

While Lean-supported deconstruction has the potential to reduce costs and improve material recovery, the economic viability of deconstruction ultimately depends on the existence of robust markets for second-use products. Although revenues from salvaged materials could offset the higher upfront costs of deconstruction, such benefits remain largely unrealized due to weak and fragmented demand for second-use products (Allam & Nik-Bakht, 2023). This lack of market demand, combined with stakeholder resistance to change and limited information flow across the value chain, makes the large-scale mining of the built environment appear economically uncertain. Consequently, there is a pressing need to investigate market opportunities for resources extracted from existing buildings and to understand how process efficiency improvements, enabled by Lean principles, can support the formation of stable secondary markets (Orenga Panizza & 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). Establishing a market around wood-based products extracted from the built environment could unlock significant business opportunities, potentially requiring existing industry players to restructure their operations or encouraging the entry of new market actors. In either case, strategic investments will be necessary to enable scaling, logistics optimization, and quality assurance. From an investor's perspective, the scalability of such operations is a decisive factor in determining their long-term viability.

Accordingly, it is essential to explore the opportunities for integrating second-use wood into large, established markets such as the lumber and wood industries, where Lean principles may play a critical role in aligning supply, demand, and operational efficiency. 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?

Methodology

A three-stage research methodology was adopted to examine the feasibility of utilizing second-use wood as a resource for manufacturing wood products: (i) analysis of the second-hand market (ii) assessment of the lumber and wood industries; and (iii) SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis. In the first stage, the business models of existing reclaimed wood manufacturers were investigated through a systematic three-step approach: (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 & 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 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).

Results and Discussion

The results are divided into three main subsections: (i) Reclaimed Wood Business; (ii) Lumber and Wood Industries; and (iii) SWOT Analysis; and (iv) System-Level Implications for Circular Economy Implementation: The Role of Lean Construction. Together, these analyses provide a multi-scalar perspective on the feasibility of integrating second-use wood into large-scale wood manufacturing, moving from niche reclaimed wood markets to dominant industrial actors and, ultimately, to system-level enablers and constraints. Beyond presenting descriptive findings, this section interprets the results in relation to circular economy implementation challenges, industrial scalability, market coordination requirements, and the operational role of Lean construction in enabling reuse-oriented material pathways.

Reclaimed Wood Business

Nine second-use wood manufacturers were identified through the conducted Google search; seven operate in the United States, and the other two are based in Canada. Osterwalder's Business Model Canvas (BMC) (Osterwalder & Pigneur, 2010) was used to identify the business model of each manufacturer. Table 1 summarizes the nine BMC blocks and 44 unified subsections identified across the studied manufacturers.

Overall, the results show that these reclaimed wood manufacturers predominantly operate within niche markets, offering a wide portfolio of high-value, design-oriented reclaimed wood products, including flooring, siding, and millwork (i.e., decorative elements). Their value propositions emphasize craftsmanship, customization, aesthetic uniqueness, and sustainability, often supported by the sourcing of rare materials such as old-growth or hand-sawn lumber. Whether through in-house deconstruction teams or partnerships with third-party contractors, these firms carefully select buildings for material recovery to ensure consistency with customer preferences and quality requirements. Consequently, their primary customer segments include architects, interior designers, and high-end residential clients, rather than mass-market construction.

Table 1: Business Model Canvas for Second-Use Wood Manufacturers

		C1	C2	C3	C4	C5	C6	C7	C8	C9
Value Proposition	Quality Craftsmanship & Customization									
	Niche Appeal									
	Reclaimed Product Certification									
	Superior Durability									
	Sustainability									
Key Activities	Building Deconstruction Services									
	Salvage Material									

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		C1	C2	C3	C4	C5	C6	C7	C8	C9
	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									
	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									

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		C1	C2	C3	C4	C5	C6	C7	C8	C9
	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 reclaimed wood manufacturers play a valuable role in promoting sustainable practices within their niche, yet, their impact on the overall wood waste problem remains limited. Their specialized business models, though effective for serving design-oriented customers, do not substantially reduce the volume of wood sent to landfills. This highlights a key limitation of niche business models: without integration into dominant material supply chains, their capacity to influence sector-wide material flows is inherently restricted. These findings reinforce the need for collaboration with large-scale manufacturers, whose standardized processes, production volume, stable demand, and logistics infrastructures offer significantly greater potential for large-scale material diversion.

Lumber and Wood Industries

To assess the potential for integrating reclaimed wood into existing industrial processes, the structure of the North American lumber and wood manufacturing industries was examined. 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 \$33 billion (as of January 2026). 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).

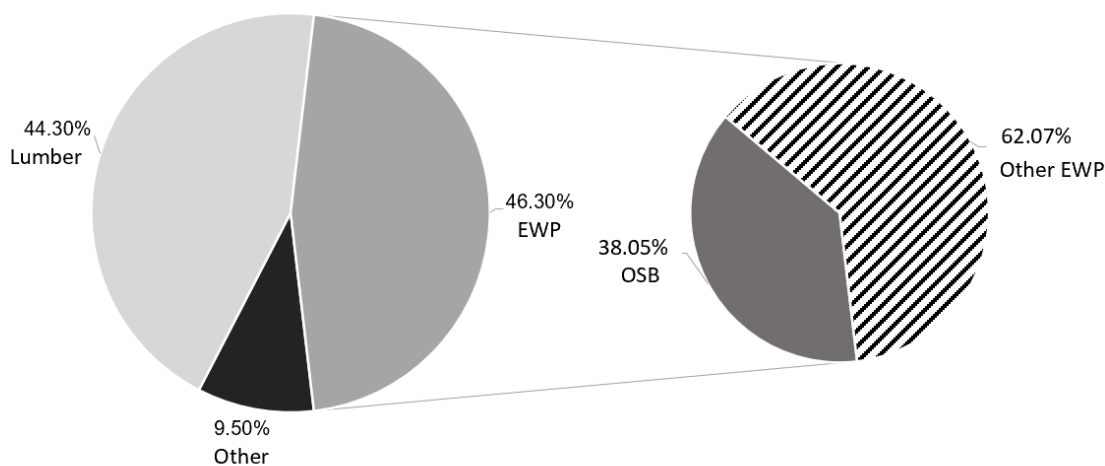


Figure 1. Market Share Breakdown of Lumber and EWPs in North America

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 cyclicity 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.

SWOT Analysis

Building on the previous analyses, a SWOT assessment was conducted to evaluate the external factors influencing the adoption of reclaimed wood in OSB production. 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.

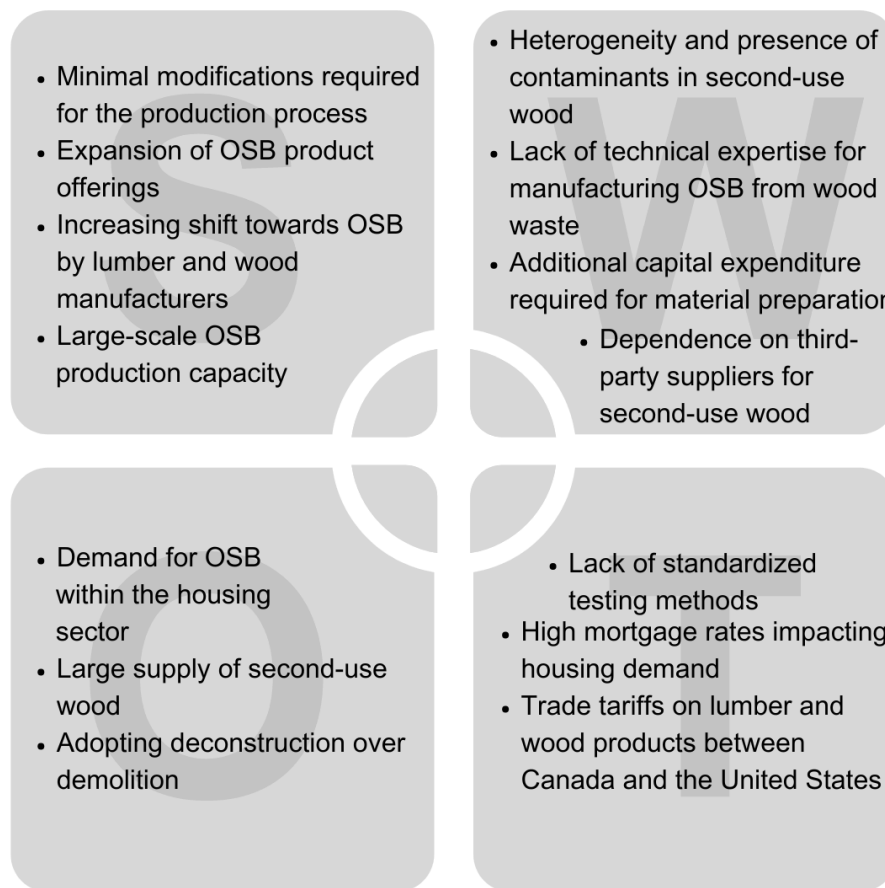


Figure 3. Summary of strengths (S), weaknesses (W), opportunities (O), and threats (T) for utilizing second-use wood as input for OSB production

The findings highlight several inherent strengths that position OSB manufacturing as a strong candidate for large-scale integration of 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, OSB's versatility across structural and non-structural applications, together with a market shift toward OSB due to its profitability and price stability relative to traditional lumber, further strengthens its suitability. 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). From a production perspective, the ability to integrate reclaimed inputs without disrupting continuous flow or requiring fundamental system redesign supports efficient material utilization and waste reduction within existing production systems (Benachio et al., 2021).

Nevertheless, the analysis also reveals critical weaknesses. 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, there is a lack of technical expertise for manufacturing OSB from second-hand wood. This was manifested in of the limited research on OSB production with second-use wood (Amarasinghe et al., 2024). Furthermore, the preparation process, including sorting, de-nailing, and contaminant detection, requires capital investment that may 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. These limitations are operational rather than material-intrinsic, arising from inconsistent input streams, limited standardization in material preparation, and insufficient transparency in sorting and handling processes (Hartini et al., 2021; Johns et al., 2023).

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. (NAHB, 2025). North America is expected to have a large supply of second-use wood, driven by aging infrastructure and the increasing trend of retrofitting buildings to reduce carbon emissions. The growing emphasis on deconstruction over demolition is another key opportunity, as up to 45% of the deconstructed wood can be repurposed for panel production, reducing CO₂ emissions and preserving natural resources (Amarasinghe et al., 2024; Zhu & Feng, 2024). From a circular economy perspective, OSB represents a form of cascading, in which wood extracted from the built environment is reintroduced into industrial production at a lower but still functionally valuable level. While this does not preserve component-level value, it enables significantly higher material retention than disposal or low-grade recycling, thereby contributing to material circularity at scale.

Despite these opportunities, several threats could hinder this transition. 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 6.09% for a 30-year fixed mortgage (as of January 2026), could dampen new housing starts and renovation projects, reducing OSB demand. Furthermore, tariffs, anti-dumping and countervailing duty rates 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.

System-Level Implications for Circular Economy Implementation: The Role of Lean Construction

The findings of this study indicate that integrating second-use wood into OSB production represents a scalable circular economy strategy; however, its successful implementation is contingent upon significant operational restructuring across the construction and demolition value chain. In this context, Lean construction principles emerge as a critical enabling mechanism for transforming second-use wood from a heterogeneous and unreliable waste stream into a predictable industrial feedstock.

Lean construction emphasizes waste elimination, flow reliability, early stakeholder engagement, and continuous improvement, principles that directly address several of the

key weaknesses identified in the SWOT analysis. Specifically, Lean-supported deconstruction can improve the consistency and quality of recovered wood by enabling standardized work processes that minimize the reliance on a highly skilled workforce. These practices can help reduce contamination, limit unnecessary handling, and increase recovery yields, thereby mitigating the quality and variability challenges that currently constrain large-scale adoption of second-use wood.

From a supply chain perspective, Lean principles facilitate tighter coordination between deconstruction contractors, material processors, and OSB manufacturers. The establishment of stable material flows can reduce inventory uncertainty and dependence on third-party suppliers, which were identified as major risks in the integration of second-use wood. This coordination can be further enhanced by applying Lean-inspired Just-in-Time principles to reverse logistics systems, using “supermarket” buffers as decoupling points to manage the mismatch between the irregular supply of second-hand wood and the continuous demand of OSB manufacturing. Such decoupling mechanisms, widely discussed in Lean supply chain literature, enable variability to be absorbed without excessive on-site inventory (Hines et al., 2004). In this sense, Lean construction does not merely improve deconstruction efficiency; it enables the alignment of upstream recovery processes with downstream manufacturing requirements, a prerequisite for scaling circular material pathways.

Importantly, the application of Lean construction reframes material reuse as an organizational and coordination challenge rather than a purely technical one. While the OSB manufacturing process is technically capable of incorporating second-use wood, the realization of its circular potential depends on the reliability of upstream processes. Lean methodologies provide a structured pathway for addressing this challenge by integrating deconstruction planning, logistics optimization, and performance measurement into a coherent system.

Overall, this study positions Lean construction not as a complementary tool but as a central mechanism for enabling large-scale circularity in wood-based construction materials. By stabilizing material flows, reducing uncertainty, and aligning stakeholder incentives, Lean principles can bridge the gap between niche reuse practices and industrial-scale manufacturing, thereby unlocking the full circular potential of second-use wood in OSB production.

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, a comprehensive overview of the reclaimed wood business landscape was presented. Second, major lumber and wood manufacturing companies were analyzed. Finally, a SWOT analysis was conducted to systematically evaluate the enablers and barriers to incorporating 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. Importantly, these characteristics align with Lean manufacturing principles, as reclaimed inputs can be introduced without disrupting production flow, increasing process complexity, or requiring fundamental system redesign.

This study contributes to the circularity in the 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 these contributions, this study has certain limitations: The analysis of reclaimed wood businesses relied on publicly available data, which may not fully capture operational constraints and process-level challenges. 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 and production aspects to assess the mechanical performance, quality consistency, and production impacts of OSB panels incorporating reclaimed wood and any potential quality assurance concerns that may arise.

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