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Circular bioeconomy business ecosystem in Finland: from barriers to solutions for wood reuse in construction

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Introduction

Changing to circular economy requires reconsidering how value is created and captured among the value networks, and what new roles of actors in business ecosystems can be identified (Iurato & Schanz, 2024). Earlier studies found the construction sector is globally a substantial source of waste and blamed for carbon emissions. Hence, ensuring material circularity worldwide and within the European Union (EU) in construction business is crucial. Previous research also found that wood has the greatest reuse capacity when compared to conventional building materials. Although the European Union is emphasizing circularity in wood construction, the current rates of recycling are still at a marginal level (European Parliament and Council, 2015). In Finland, wood is the 2nd largest share of construction and demolition waste (after mineral waste), while most of wood waste from construction is incinerated for energy purposes (Puuinfo, 2024). The reasons for low recirculation rates of wood in construction are manifold, ranging from technological barriers, regulatory rigidity, market inefficiencies and cultural obstacles (Kirchherr et al., 2018). The focus of our study is especially on market and cultural barriers, as well as the potential of addressing them through business ecosystem development. Previous research has shown that further enhancement of business ecosystem is critical for the increase of wood material circularity in the field of both new and renovation construction. Empirically this study explores the characteristics of business ecosystem and need for actors' involvement in different life phase of buildings for material circulation in case of Finland and analyses the rationale behind the identified barriers toward finding solutions for increasing wood material reuse.

Methods

This research relies on a multi-stage explorative approach. Our qualitative research is conducted through 14 semi-structured interviews and dialogue data from two workshops organized with experts involved in different life phases of wood construction. Both stakeholder interviews on barriers data collection and stakeholder workshops on solutions was organized in between November 2022 - June 2024. Based on Braun and Clarke's (2006) step-by-step guide, a thematic analysis of the data was carried out. Coding and theme identification were performed through the qualitative data analysis software ATLAS.ti.

Results

From the business ecosystem for wood material reuse perspective, our study found the diversity of pool of actors and the need for wood-related expertise throughout building life phases. We first mapped the actors and identified architects, building designers and planners, financers, real estate investors, construction companies, developers and contractors to be the core actors of circular business ecosystem. While manufacturers, construction material retailers, waste management companies, real estate maintenance operators, and demolition or deconstruction companies are found to be extended actors. We found many potential actors and intermediaries that are still missing in different life phases of buildings. For instance, there are no recycled product monitoring organizations at any level from EU to city level. Also, physical hub or recycled wood material storage is absent in Finland.
Considering the barriers of wood material circularity, this study found that strong links

between construction operational level actors focusing on reused material market are yet largely missing. Moreover, while used wood from construction is available, one of the key challenges is related to lack of interest from potential end users and industrial destinations. In fact, strong positions of the forest industry and virgin wood products in Finland may serve to weaken the uptake of used wood from construction. These market barriers are linked with the cultural ones, such as perceived high risks of the new practices, wariness towards innovation in a conservative industry, competing goals and lack of coherent vision on sustainability priorities, and the resulting lack of collaboration throughout the value chain. In this regard, our interview findings emphasize the significant role of intermediating actors, such as the management of material hubs, in addressing market and cultural barriers and accelerating the circular economy in wood construction. From two workshops data we dive deeper into practical solutions, including also the use of digital platforms for better circulation of wooden building materials. Moreover, one of the aims of these workshops is to support the emergence of cross-sectorial perspectives by giving a voice to actors that might not be explicitly part of the construction process, yet are critical from the perspective of circularity, such as repair and maintenance service providers.

Conclusions

We Found the cross-sectoral approach and raising awareness among business ecosystem actors on the opportunities related to wood recirculation may help to harmonize wood-related reuse practices to better integrate both circular economy value retention goals and bioeconomy's strive for increased value-added from renewable resources. Moreover, this study found more integrated circular community build up, public-private partnerships, diversification of wood products, change of language of "waste", and harmonization of Construction regulations are the key to established reused wood market in Finland. Additionally, the building construction industry's collaborative demo projects experience beyond internal piloting can be defined as the first opportunity for fostering wood recirculation in construction. Furthermore, reclaimed wood products to be compete in the market, not only have to resolve standardized settings but also consider reputational and cultural appeal, which could generate common understanding about the products qualities among different stakeholders. All in all, we can say the ambition, motivation, and willingness of actors will be instrumental to circulate wood more. Failure to do so will persist in the problem of incineration and energy recovery. Future research is still needed on understanding the end-user inclusion process in the business ecosystem and their acceptance of reused wooden materials. The further development of standards ensuring the safety and quality of circulated materials would be also paramount. Future research could further benefit by identifying how and what novel approaches are required for public–private partnerships to accelerate the circular economy practices in the built environment. Additionally, future research could also progress with how different ongoing Finnish reused woodworking projects are following the EU taxonomy criteria, since they have already committed to produce sustainable and financially profitable business model make out from reclaimed wood (Puuinfo, 2024).

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