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# Why Not Wood? Benefits and Barriers of Wood as a Multistory Construction Material: Perceptions of Municipal Civil Servants from Finland

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**Abstract:** As the construction sector continues to be associated with highly energy-intensive practices leading to excessive carbon emissions, governments in many countries are promoting a shift towards greener building practices, like the use of wood in multistory construction (WMC). Meanwhile, local-government actors (e.g., municipalities) often act as important gatekeepers of urban development given their authority to oversee or approve zoning and land-use plans. Despite this fact, they are not much focused on in existing WMC research. This qualitative interview study serves to fill a gap by studying municipal civil servant perceptions regarding WMC, using Finland as a case study. Civil servants were asked to elicit their personal opinions on WMC, and what they perceived as favorable or unfavorable about using wood as a multistory construction material. Results show increasing support for WMC, and that this is due to key benefits made possible by the technical qualities of engineered wood products in emerging WMC projects. These products permit both the adoption of rapid construction practices that enhance citizens' quality of living, and also the sourcing of local renewable building materials that support local industries. On the other hand, barriers to the use of wood were identified, such as inadequate information distribution, a limited number of WMC industry actors, and inefficient policy measures.

**Keywords:** wood; multistory construction; path dependency; sustainable built environment; municipal perceptions

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## 1. Introduction

As the construction sector continues to be associated with energy-intensive practices responsible for excessive carbon emissions, the consumption of largely nonrenewable materials, and environmental degradation, numerous governments are shifting towards greener building practices, e.g., References [1–6]. One component of this shift focuses on the materials used in building construction, since material efficiency impacts energy consumption and greenhouse-gas emissions [7]. Lately, attention has been placed on the role of wood, as it is a renewable building material that can contribute to sustainable development goals [8]. In countries like European Union (E.U.) states and Canada, key policies are linked to the rise of wood construction in the building sector [8–10]. In the United States (U.S.), legislative backing for the development of wood construction was seen through the introduction of the Timber Innovation Act of 2017 [11]. Consequently, several of these policy initiatives focus on the development of wooden multistory construction (WMC), that is, buildings of four or more stories whose primary loadbearing frame is made of wood or engineered wood products (EWP).

Despite such sustainability agendas, the diffusion of WMC has been slow due to what is described as a path-dependent construction regime [12–14]. A recent metastudy identified seven regularly cited barriers in WMC: higher building costs, lack of wood construction-industry expertise, challenging or nonexisting standardization of building codes, skepticism regarding wood-material durability, physical and technical challenges of wood, the traditional culture of the construction industry, and a lack of EWP availability [15].

While the metastudy provides a firm literature overview about the development of WMC, it also acknowledges that research attention has been focused predominantly on industrial actors (e.g., architects and engineers). This limits the scope of discussion on potential drivers and barriers of WMC diffusion, as there are other important stakeholder groups influencing urban-housing development (e.g., end users, residents, local-level civil servants and politicians, etc.). The current study attempts to bridge this knowledge gap by providing information from the perspectives of municipal civil servants who work in city planning and development leadership positions.

Finland was chosen as a case study given that the national government has a long history of engaging with wood construction through promotional and developmental campaigns aiming to adopt WMC into the domestic housing market [16,17]. Currently, the national bioeconomy strategy aims to foster the growth of domestic forest industries through value-added products [18,19] and sustainable and renewable material alternatives [20] that lower the impact of greenhouse-gas emissions [21–24]. These objectives are also driving the national agenda for promoting WMC [25]. In 2011, support for WMC culminated with the major legislative change that permitted WMC buildings of up to seven stories for construction. While earlier attempts at integrating WMC into the multistory housing market failed to normalize [13], the current signs are more promising. Yet, one estimate predicts that only 6% of dwellings in the 2018 housing market will be WMC [26]. Another report indicates that between 2018–2020 approximately 183 WMC projects will be initiated—twice as many as were started between 2010–2017 [27].

That government regulations promoting sustainability are the main impetus for the rise of WMC into the Finnish housing market [10] is perhaps not surprising given the top-down approach with which the bioeconomy transition is being realized in Finland [28]. This is noticeably distinct considering that material innovations in the construction sector traditionally stem from either a desire by the end user to change the product or from a desire by the builder to affect cost and material availability [29]. Therefore, information from municipal stakeholders regarding their perceptions or preferences toward WMC would be useful to unraveling its future potential. Unfortunately, such data are very limited, and not only in the international literature [14,30–35], but in the Finnish context as well. Studies from Finland have focused on topical lenses (e.g., technical innovation, the role of sustainability) as opposed to providing a comprehensive view on general stakeholder attitudes, perceptions, or preferences for WMC [10,36–39]. In addition, those studies usually discuss the role of public actors as drivers for WMC diffusion [36], but rarely explore how these actors perceive their own role and engagement in this context.

Framing civil-servant viewpoints is necessary given the responsibility they hold to steer city-planning objectives. According to the Ministry of Environment's Land Use and Building Act, municipalities are authorized to oversee and approve the planning of all zoning maps in Finland [40]. With this authority comes the capacity to force builders to comply with material preferences (like wood) by decreeing zoning regulations. As an example, this power was legitimized by the Supreme Court of Finland in 2015, when the court upheld the decision by the City of Helsinki to zone the Honkasuo neighborhood to be built from wood [41–43]. Yet, regardless of this legal capacity, and the national government push for WMC development, most municipalities rarely enact such regulations.

What cannot be assumed is that the slow diffusion of WMC in Finland directly results from limited municipal support, or from difficulties pushing through WMC zoning plans. Likewise, what drives local government to support WMC diffusion does not likely hinge solely on national-level strategies and aims (e.g., the Bioeconomy Strategy [25]). Instead, it would be beneficial to determine how civil

servants individually perceive residential WMC, and how they comprehend their role and capacity to implement WMC within city development plans. By defining individual perceptions, a broader understanding of what impacts WMC diffusion in residential urban development can be assessed.

## 2. Materials and Methods

A qualitative approach was used to determine the perceptions held by municipal civil servants. Semistructured interviews were chosen as the best method to gather data since the process allows for the interactions and diverse perspectives of the interviewer and participant to foster the creation of new themes apart from those originally being explored [44]. Given the limited number of perceptual studies on WMC, it was anticipated that new themes could arise.

The interview questionnaire was designed using Ajzen's [45] theory of planned behavior (TPB) as a general framework (Table 1). TPB measures a participant's intention to perform a behavior based on three antecedents: personal attitudes, subjective norm, and perceived behavioral control. Here, the behavior component of the TPB framework is the implementation of WMC projects and the attitude component refers to the civil servants favorable or unfavorable appraisal of performing the behavior. Furthermore, the subjective norm component refers to social pressures that motivate a civil servant to engage (or not to engage) in the behavior, and behavioral control refers to the civil servants perceived difficulty to engage in the behavior [44].

**Table 1.** Interview questionnaire theory of planned behavior (TPB) themes and their guiding concepts.

TPB Antecedent	Overview of Thematic Questions
Attitude	<ul style="list-style-type: none"> <li>• Personal opinion on wooden multistory construction (WMC) (advantages/disadvantages)</li> <li>• Municipalities current housing strategy</li> <li>• Municipalities formal criteria for built environment</li> </ul>
Subjective norma	<ul style="list-style-type: none"> <li>• Stakeholders involved in WMC planning decisions</li> <li>• Stakeholder opinion on WMC (advantages/disadvantages)</li> <li>• How end users desires affect WMC planning and project implementation</li> <li>• Methods of communication between stakeholders</li> </ul>
Perceived behavioral control	<ul style="list-style-type: none"> <li>• Process for gathering new information on WMC</li> </ul>

While TPB studies are usually carried out through quantitative analysis, qualitative TPB studies (i.e., elucidation studies) are used to explore commonly held beliefs in a research population prior to implementing a qualitative study [46]. Because the scope of this paper is to report civil-servant perceptions and then distribute a follow-up survey based on the topics discussed by civil servants, this framework was also found most suitable for the research. It should also be noted that the results of this paper include only the analysis of the attitude components [45] from the interviews. Thus, the analysis of the subjective norm and perceived behavioral control components are excluded, but, together with the attitude component investigated in this study, would form the precursor for a more detailed analysis on the subject.

Contact details for civil servants were gathered through professional references or online webpages. Eleven interviews were conducted between May 2017 and January 2018. These participants represent six large-scale municipalities of Finland: Espoo (making up part of the capital-region metropolis and the second fastest-growing municipality in Finland in the last five years); Helsinki (the capital and largest metropolitan city); Seinäjoki (a growing city with a strong wood-industry region); Turku (the country's oldest city that also enjoys a strong industry and service sector); and Uusikaupunki (a small city with a booming industry sector that has resulted in both a 2% increase in population in 2016–2017 and a high demand for residential housing). For the last five years, all these

municipalities, except Rauma, have been experiencing an uptrend in population [47]. Together, these municipalities comprise roughly one-fifth of the population of Finland (Table 2).

**Table 2.** Municipalities represented by interview participants.

Municipality	2017 Population	% of Total Population	% of Population Change 2012–2017
Espoo	279,044	5.06%	7.96%
Helsinki	643,272	11.67%	6.11%
Rauma	39,620	0.72%	−0.56%
Seinäjoki	62,676	1.14%	4.98%
Turku	189,669	3.44%	4.98%
Uusikaupunki	15,752	0.29%	1.61%

<sup>1</sup> Data provided by Statistics Finland (2018) [47].

The professional roles of the civil servants interviewed included high-level strategic planning and development positions or project-management positions (Table 3). For the sake of anonymity, participant administrative titles were not used in conjunction with their corresponding municipality. The semistructured questionnaire was presented to participants prior to the interview. All interviews were held in English at the respondents' office. The average length of the interviews was 60 min. All interviews were audio-recorded then transcribed.

**Table 3.** Interviewees by their professional role.

Interview	Position
1	Project Manager, Architect
2	City Development Director
3	Master Designer, Architect
4	City Mayor
5	Senior City Architect
6	Regional Architect
7	Director of City Planning
8	Senior City Architect
9	Land Use and Development Expert
10	City Development Director
11	Director of City Planning

The interview transcripts were analyzed using Schrier's [48] method for qualitative content analysis (QCA). This method identifies themes within the data and simultaneously accounts for the frequencies with which said themes present themselves across the data [48,49]. Phenomena discussed in the interviews are deductively and inductively grouped and categorized into a "coding framework". The resulting framework is then systematically used across the data to divide the transcripts into units of codes based on the subcategories of the framework. Then, each unit of code is grouped under no more than one subcategory from each main category. This procedure quantifies how often a subcategory appears in the data. As a result, the beliefs commonly mentioned by the civil servants are grouped into categories and the appearance of categories can be counted across the data.

To ensure that the coding framework is reliable at capturing the codes into the appropriate subcategory, a consistency check was performed. A reliable framework should work to ensure that units of code always end up in the same subcategory, regardless of the person using the coding framework, or at what time the coding framework is being used. In this study, a reliability check was performed on 79 units of code, and attitudes were matched with the original category in 83% of codes, which can be deemed as sufficient in level.

### 3. Results and Discussion

#### 3.1. QCA Thematic Coding Framework

When applying QCA to analyze the data for civil-servant attitudes (i.e., favorable or unfavorable appraisals of WMC development), phenomena were split into “Contributing to WMC diffusion” (i.e., favorable attitudes), “Hinders WMC diffusion” (i.e., unfavorable attitudes), or “Neutral opinions”. Between these categories, 36 subcategories (i.e., themes) were elicited from the interview data (Table 4). It is a common practice in QCA to create an “Other” subcategory into the coding framework to capture information that might go undescribed by the coding framework. In addition, neutral opinions were rarely expressed and lacked consensus between civil servants; therefore, no themes could be developed from this data pool and it is excluded from Table 4.

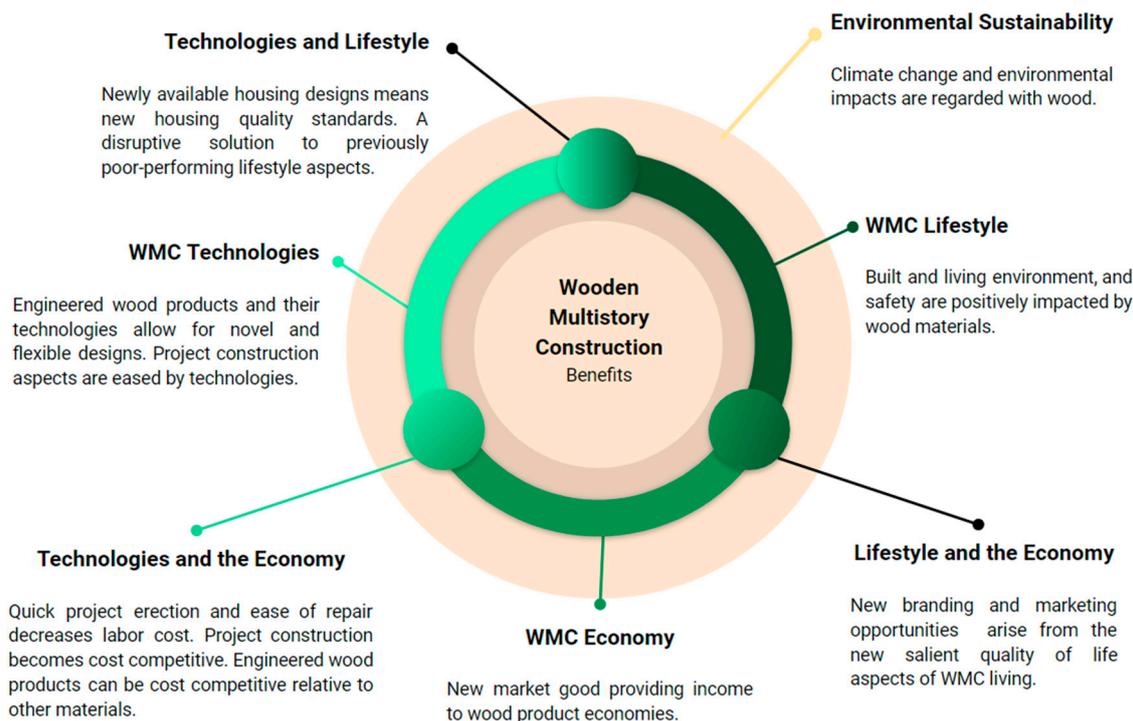
**Table 4.** Qualitative content analysis (QCA) thematic coding framework results for the main category “Attitudes”.

<b>Contributes to WMC Diffusion (Benefits)</b>	
Supports sustainable development	Improved built environment
Climate and environment	Improved living environment
Promotes business innovation	Construction and renovation ease
Supports local industries	Novel and flexible design
Branding and marketing opportunity	Improved housing quality standards
New construction opportunities	Supports the national forest sector
Price competitiveness	Interest in WMC, general support
Improved safety	Other
Prolonged building lifespan	
<b>Hinders WMC Diffusion (Barriers)</b>	
Financial uncertainty	WMC building lifecycles are uncertain
Lack of experienced designers and planners	Safety concerns
Lack of available builders	Lacking project communications
Stagnant wood-industry development	Limited end-user WMC expectations
Policy and regulation challenges	End-user apathy towards WMC
Difficulty accessing WMC information	Limited support from municipalities
Branding and marketing unimportant	Design or planning limitations
Lack of general knowledge about WMC	Limited WMC interest, general opposition
High cost level	Other
Engineered wood product (EWP) material limitations	

#### 3.2. Civil-Servant Attitudes towards WMC—Benefits

##### 3.2.1. Perceived Economic, Technical, and Lifestyle Benefits of WMC

When analyzing the favorable attitudes held by civil servants, it was evident that all the themes constituted benefits associated with choosing to develop WMC. Furthermore, these benefits could be organized into three major groups: economy, lifestyle, or technologies (Figure 1). These groups encapsulate the overarching areas of consideration that civil servants contemplate when engaging in WMC. Furthermore, relevant beneficiary actors can be identified within these groups, as civil servants discussed the stakeholders who are positively affected by these different aspects of WMC.



**Figure 1.** Links between the three major WMC benefit groups (technologies, lifestyle, and economy) are depicted and explained. Please note here that environmental sustainability is an overarching social benefit as opposed to an interconnected theme.

The WMC economy grouping typifies benefits gained through the implementation of WMC projects. This includes the themes “promotes business innovation, supports local industries, and supports the national forest sector”. Two civil servants discussed how supporting WMC “encourages national-forest-sector” actors by creating additional demand for forest products. Discussion on how WMC provides “support for local industries” was explicitly discussed within a singular municipality. These civil servants acknowledged that the opening of a local EWP factory caused them to consider how municipal support for WMC diffusion would provide economic investment for the factory, and one civil servant shared that their interest in WMC was a result of providing support to this local industry. Half of all civil servants discussed how implementing WMC projects “promotes WMC business innovation” by creating demand for projects that allow WMC actors to refine their technologies and practices. Additionally, some civil servants recognized their own personal role in providing these new opportunities, as is illustrated by the following quote: “I’m a city planner and, when I put those regulations to my plan, I hope to encourage the business to develop the production lines or production processes [ . . . ] develop the business” (Architect, 1).

While this architect acknowledged a personal desire to provide an economic benefit to WMC industry actors, they followed up the statement by saying they also hoped that supporting the increment of WMC projects would result in additional WMC actors, and that this would, in turn, lower the overall cost of WMC development.

The WMC lifestyle grouping included benefits that municipal citizens (e.g., resident and end users) are expected to gain from living within, or in proximity to, WMC sites. This includes the themes on improved “safety, built environment and living environment”. More than half of the civil servants believed that WMC improves certain quality-of-living features for municipal citizens. Improvements to end-user “safety” were highlighted by five civil servants, two of whom believed WMC buildings had higher fire-safety levels than other materials, two others believed air-quality standards were better due to the wood being more “breathable”, and one thought WMC was more earthquake-resistant than other materials. The “living environment” was also perceived to be improved by one civil servant

who thought wood made dwellings more aesthetically pleasing, but it should be noted that this is contingent on the exposure of wood material in the home.

Resident “safety” was mentioned once, with an idea that WMC project are less noisy and dusty during assembly phase, thereby impacting the neighborhood in a more positive manner than would be the case with concrete-based building projects. Other benefits to municipal residents were discussed in the context of the “built environment”. These focused on the aesthetic improvements provided by WMC, such as using wood materials to reduce urban stress, using wood materials to create distinct and recognizable districts within a city, and using wood materials to highlight the historic wooden districts within older cities. These conversations indicate that there may be a local-level cultural design preference for the use of wood. This is captured by one civil servant saying:

The area where that [WMC] is built, there [are] old wooden building from the end of the 19th century, these really old buildings. So, it looked really nice. If we think that there are the concrete buildings, let’s say that the whole status of the area would change totally. (Development Director, 10)

The WMC technology grouping exemplifies how WMC building technologies simplify or improve construction processes for builders or developers relative to those technologies used by the concrete dominated, business-as-usual (BAU) regime in Finland. This group includes the themes “new construction opportunities, prolonged building lifecycles, construction and renovation ease”, and “novel and flexible designs”. For example, some civil servants mentioned that the lightness of EWP frames used in WMC allowed previously unfeasible “construction opportunities” on sites that have poor soil (While not clarified in interviews, “poor soil” is understood to mean certain soil characteristics, like texture and composition, that may cause heavy buildings to sink or become unstable): “Of course, they are light, and we have very bad soil in our city for new constructions. The older, good ground is already used, so that’s very good that they are so light” (Architect 3).

Two civil servants believed that the EWP frames help to “increase a WMC building’s lifespan”. One civil servant explained that, because WMC buildings can be consistently repaired with ease, it extends the buildings’ overall durability and use of life by preventing the early demolition associated with difficult-to-repair concrete-frame buildings. The second civil servant pointed out that wood frames can be recycled and used again. Some civil servants mentioned that WMC is “easier to construct or renovate” because projects are faster to mount in the construction phase or because EWP frames are lighter and require less heavy machinery on site. This was thought to make renovation work faster, and to ease the tight construction of new buildings between pre-existing buildings. Moreover, various civil servants discussed aspects of WMC’s “novel and flexible designs” opportunities. Mentioned twice was the potential to change the size of dwellings postconstruction, as WMC projects are not limited by load-bearing walls in the way concrete projects may be. The capacity for WMC to be efficiently assembled as a modular space element in a factory was discussed by two civil servants. Lastly, it was stated that WMC allows for “nice architecture” designs but no elaboration was given on what aspects of WMC made it as such.

### 3.2.2. Interdependent Benefits between Categories

The three major WMC groups, economy, technologies, and lifestyle, are clearly interlinked, as certain aspects of these benefits are contingent to one another. Some civil servants believed that the WMC building technologies (e.g., EWPs) can be economically advantageous and “price competitive” relative to other building materials. Having local EWP factories was thought to reduce the logistical costs of the project’s building materials. WMC’s higher speed of assembly was also linked to reduced labor hours and project cost. Lastly, certain cost considerations associated with the prevention of material damage were thought to be similar between concrete and wood materials. The following quote serves as an example:

On [WMC] site they have this huge tent over the building site, so it will cost more than normal. But in fact, you should have the same tent with concrete because there are many cases where water makes damages on the building site, when it's constructed. (Architect, 1)

The building technologies used in WMC, and particularly their capacity to contribute to “novel and flexible designs”, were perceived to hold potential for disrupting the current standard of living in the residential housing market. Three civil servants described how they perceive WMC could elevate housing quality standards, with one architect specifically referencing cross-laminated timber building systems with whole-space elements as the key in this process: “I think, for example, this CLT system with whole space elements, it can be architecturally interesting and to bring some good quality, [that] we don't have nowadays” (Architect, 3).

With WMC providing end users with new standards of living, civil servants perceived that certain WMC features can be “branded or marketed” to increase consumer awareness. Two civil servants said they personally thought branding and marketing could be used to promote their municipalities' urban-development agendas. For example, promoting a “smart and clean” city was described as a “trendy” experience that makes the city a more desirable place to live. In contrast, one civil servant believed that the promotion of positive WMC features should rest solely on market actors. This is interesting because it was previously argued that municipalities are aware of the marketing potential of WMC [37], but perhaps not all municipal actors see it as part of their role or responsibility to market the benefits of wood to consumers. The conflicting nature of statements is elaborated below:

You can utilize it to create a better brand for your municipality, and I think that's the most important thing for the cities, to insist it in the plan if they are doing that. (Development Director, 10)

If we are thinking marketing, so, I think wood industry and building companies, they should market more those positive things which are connected to the wood as a material. (Architect, 8)

More than half of the interviewed civil servants alluded to personal opinions on how WMC possesses holistic environmental or sustainable aspects, but only one participant expressed robustly what this means to them. The participant explained how wood stores CO<sub>2</sub> and reduces “peak emissions” associated with construction, and then described WMC industries as “smart and clean businesses” that fulfil economic and sustainable development objectives. Furthermore, they explained this to be a personal key reason for promoting WMC. Below is a short excerpt of the discussion:

I think what's relevant in building in wood it's, nowadays because of the climate change, it's very important to have ways to diminish the CO<sub>2</sub> emissions [ . . . ] I think one of the main reasons I want to promote it is that when you build any building, the CO<sub>2</sub> emissions are very high. (Architect, 1)

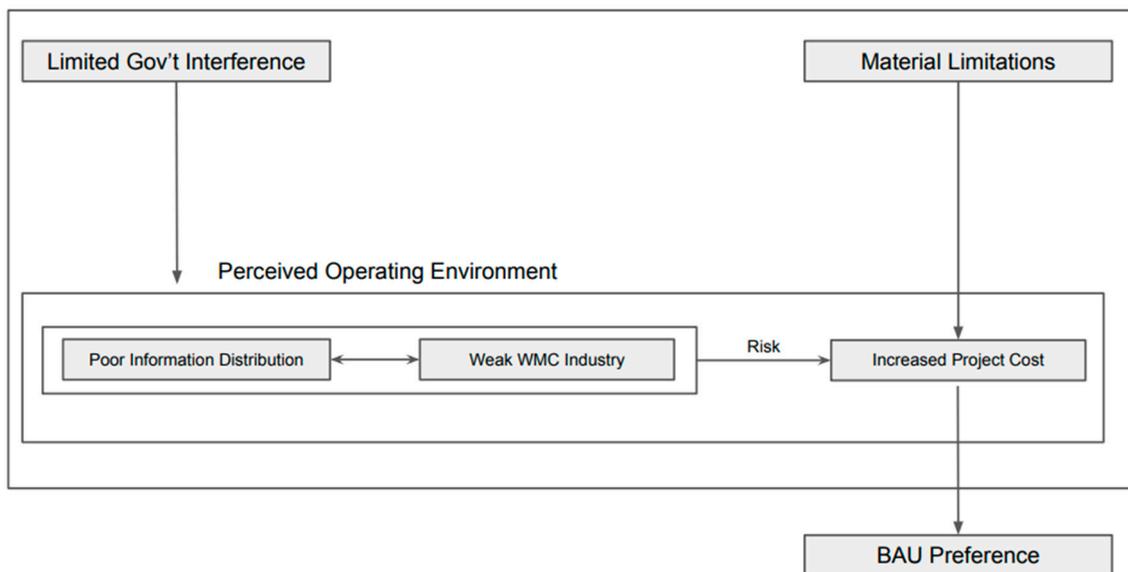
One civil servant did mention that WMC is useful for mitigating climate change effects but did not expand on how or why. As seen below, it was stated in the context of garnering WMC support through the branding of the positively associated benefits of WMC:

And, when [WMC] it's combined also to promoting local economy [like] when you buy from local factory, it's good. When it's combined to climate change it's even better. I don't know but maybe it's better to have WMC buildings from environmental point of view. I don't know. (Development Director, 2)

In all, four civil servants described WMC as an “ecological” material or ideological way of life, but as can be seen by the following quote, no one defined in definite terms what this meant: “You can say it's an ecological way to live” (Mayor, 4).

### 3.3. Civil Servants' Attitudes Towards WMC—Perceived Barriers

When analyzing the range of unfavorable attitudes presented by civil servants, it is apparent that the themes constitute barriers for the diffusion of WMC. These barriers largely stem from market-entry issues, which prevents WMC actors from entering the construction sector. Meanwhile, civil servants are faced with limited access to WMC information, which, when coupled with notions of the higher cost of WMC, limited government support, and strict policy regulations, lead to municipalities preferring BAU projects (Figure 2). As an outcome, there is a vicious circle where the small number of WMC actors results in scarce WMC demand, and low WMC demand prohibits new WMC actors from entering the construction sector.



**Figure 2.** Depiction of relationships between perceived hindrances discussed by civil servants.

#### 3.3.1. A Weak WMC Sector Creates Project Risks

Almost all interviewed civil servants discussed how the WMC industries' slow development has limited WMC diffusion. The primary cause is the long tradition of building with concrete. The concrete industries maintain a well-established position due to their standardized building technologies. This causes what Karakaya [50] dubs a proprietary market-entry barrier to WMC actors attempting to enter, and compete in, the market. The outcome is a path-dependent construction culture, which has also been acknowledged in other studies [13,36,39]. It was also correspondingly discussed, both in this study and in previous research, that active lobbying by the concrete industry further complicates WMC industry development [37]. The following examples indicate the strong path dependency of the Finnish construction industry culture:

In Finland we have about five big companies, and they are very old-fashioned. They build concrete buildings, they have their element factories, and their systems. In fact, the systems are quite common, they have been made together with Finnish, standardization committee in the 1970's and they all use the same systems. (Planning Director, 11)

Whenever we talk about and make some initiatives to promote wooden structures, there's always builders and concrete building constructions lobbying their ideas. (Planning Director, 11)

In the end, the path-dependent nature of the construction industry was cited as causing a shortage of skilled workforce who can implement WMC projects. The limited number of skilled WMC designers and lack of available professional builders are additionally perceived to cause increased riskiness and sometimes higher project cost. In one conversation, it was mentioned that the largest building

developers are less likely to bid on WMC projects solicited in small municipalities when the developer could be building BAU projects in larger municipalities instead. Coupled with the limited number of WMC developers available at national level, it is seen to be a tremendous risk to divert from existing practices. Other civil servants exemplified their concerns as follows: “There’s not enough companies in the business to get the prices down by concurrence” (Architect, 1). “Because there are just very few companies which offer that bit, it’s always risky” (Architect, 3).

These findings are in line with earlier studies showing path dependency and stickiness of both formal and informal institutions in the Finnish construction sector [39]. On the other hand, these perceptions contrast with a previous case study on perceptions showing that WMC quality is thought to be suffering from the limited number of WMC industry actors [36]. Instead, civil servants in our study mention both the motivation and desire to harness the quality of WMC as a disruptive solution to boost the overall quality of the housing market in Finland. While these variances in opinion could be due to the limited inclusion of analysis of public-sector opinions in the literature, it seems more likely that a change in current thinking about WMC quality has occurred because civil servants in this study still acknowledge that there are limited WMC actors in the supply.

### 3.3.2. Poor WMC Information Distribution

Throughout the interviews, about half of the civil servants admitted to personally having a lack of knowledge about certain WMC topics, including technical and financial aspects. These admissions are sensible given the wide variety of functional roles that civil servants hold, but more interesting is that almost all civil servants described difficulties accessing WMC information. Some challenges included a lack of personal time to learn about WMC, scattered sources of information about WMC, or a lack of incentivization from workplace superiors to learn about WMC. The lack of workplace incentivization especially highlights challenges of breaking path dependency, as one civil servant says: “At first, we had to have someone to support this kind of [WMC] development and someone to demand this kind of solutions, so that we as planners have the need to educate ourselves” (Architect, 1).

The relationship between limited WMC information and difficulties accessing WMC information have both been discussed conceptually in a previous WMC study from the Seinäjoki region [37]. Hynynen [37] argued that information is no longer the bottleneck limiting the breakthrough of the WMC industry, and that instead strategic awareness and leadership are needed to guide actors on the path to future WMC development. Based on civil-servant statements from this research, it might be concluded that, while information about WMC does indeed exist, the perception from within the municipalities is that it does not because civil servants have not been guided (or motivated) to discover such information.

Ultimately, this perception of limited information has resulted in a thin understanding of how WMC technologies might function. For example, a few civil servants in this study describe uncertainties about WMC building lifecycles. This includes aspects related to how a WMC building will look aesthetically over time, if the exterior of the building will withstand the test of time, or if the wood materials are superior at inhibiting moisture degradation through improved air circulation. One civil servant touched on how they would like to have such research on how projects age: “I think it’s very important if we’d like to make more wooden construction we should have much more research and knowledge about, what people like, and what is after 10, 20, 30 years” (Mayor, 4).

This quote also outlines another commonly discussed theme, namely, that civil servants have access to limited information about end-user desires regarding WMC. This is especially relevant because many civil servants mentioned that they thought end users possess influence over the housing market through consumer choice: “I think the residents’ opinion is one driving force” (Architect, 1).

Primarily, civil servants mentioned that at this moment there is almost no communication with end users, and that existing communication and engagement occurs largely within the participatory planning process sessions (e.g., local public meetings, online forums, or phone calls). The infrequency

of developers, both private and public, to include end users in the design process of buildings has been highlighted in previous WMC research [36] and continues today.

On the other hand, half of the interviewed civil servants believed that end users are apathetic towards sharing their housing desires. For example, the use of participatory planning process sessions is largely seen as a platform for residents to voice complaints, as opposed to sharing ideas about their desires. A recent study in the Helsinki region between housing consumers and developers also indicates that communication of desires and dissatisfaction is limited between parties, and that perhaps resident choices are not influencing housing market [51]. Civil servants also cited difficulties locating future end users prior to a project being built. Lastly, there may be cultural undertones associated with end users' perceived lack of apathy to share desires, as one civil servant revealed there are unspoken topics surrounding this issue: "I haven't heard any interviews in the newspapers or whatsoever who are living there in this kind of houses, how do they feel. And this is I think more or less a taboo" (Mayor, 4).

### 3.3.3. Material Limitations and Project Costs

Civil servants reported very few technical limitations associated with the EWP used in WMC and mainly focused on those technical aspects that lead to design or planning limitations or higher project cost. For example, WMC frames are perceived as having planning limitations due to their need for nonwood foundations. One civil servant mentioned that the lightness of the EWP frame could pose construction challenges on windy sites but did not specify how. Wood-framed buildings were also said to have a noisy predisposition that resulted in challenging acoustics-management systems, and making the planning phase of locating a quiet site more difficult. While humidity was brought up once, it was in the context of a broader concern for all construction in Finland, not specifically an issue that affects wood materials more than others. Interestingly, one architect believed that WMC is becoming "design-limited" as industries attempt to create standard modular elements for EWP akin to those used in concrete-based building systems: "We have been really disappointed because wood industry is now doing exactly the same kind of elements than concrete [ . . . ] they are not using all the potential which wood have in it as a material" (Architect, 8).

In terms of cost, the mandatory requirement for expensive sprinkler systems due to fire code regulations is seen as a material limitation, even though increased fire risk is not mentioned as a belief held by any of the interviewees. WMC dwellings losing marketable floorspace due to staircases and exterior walls needing to be built thicker with EWP frames was also mentioned.

### 3.3.4. Poor Governance and Support Influences the Operating Environment

All interviewees discussed regulations that either punish WMC industry actors attempting to enter the construction sector or policies that lack the impetus to strengthen the weak WMC market. This perception endures as a major barrier which is closely tied to costs [26,36]. In particular, fire-safety legislation limiting maximum building height and forcing the installation of expensive sprinkler systems were mentioned. The government of Finland was criticized among some interviewees for having limited fiscal policies to support actors who are interested in WMC but are unable to take on the associated financial uncertainty and risk of undertaking a WMC project. The lack of accounting methods for the inclusion of sustainable building materials in energy certification systems was also criticized. Lastly, in the following quote, one civil servant also expressed the government's inability to provide business-development programs for WMC actors: "Why not wood? Because we don't have the companies. And the state is not stressing, at all, to develop these companies [ . . . ] there should be some kind of program, or something" (Development Director, 10).

Criticism of national government was not singular, as reproach for the limited support at city level, was also mentioned by some civil servants. These conversations centered on the lack of high-level political directive pushing for WMC within municipalities, the lack of WMC inclusion within city-development strategies, and the limited use of zoning plans which include WMC. This general

unhappiness with the passive role of local government was captured by the two following quotes: “I think cities should use it [force zoning] more than they are doing at the moment. Because that’s the whole key to help these businesses to grow” (Development Director, 10); and “I think we need the politicians to tell us to do this. It’s more, it’s the most powerful way to get things done” (Architect, 1).

#### 4. Conclusions

This qualitative interview study aimed to increase the scope of WMC research by exploring the perceptions of municipal civil servants regarding ongoing and future WMC development in Finland. According to results, the interviewed civil servants perceive WMC and its building technologies as an interesting and sustainable solution to improve urban citizen lifestyles while supporting local and national businesses and economies. Many of the revealed themes have been previously mentioned in the literature [10,15], while some new considerations were developed. Gosselin et al. [15] had cited sustainability, technical performance, cost reduction, building speed, and aesthetics as the major motivations for using wood in multistory construction, and all those topics were discussed in this study. Markedly, interviewed civil servants were interested in WMC because of certain benefits other municipal stakeholders might gain from WMC diffusion. For example, the motivation to engage in WMC planning might stem from a desire to support the use of locally sourced wood, to support Finnish WMC industries, or to use WMC as a disruptive solution to bolster higher-quality construction and improved quality-of-life aspects for end users. This distinct aspect may be due to the limited inclusion of public-sector opinion in previous WMC research, as Gosselin et al. [15] noted that opinions about WMC vary according to the role of the stakeholder being interviewed.

One surprising nuance from this study was the lack of robust conversation about the sustainable characteristics of wood. In previous research, sustainability has been cited as a driver for WMC diffusion in Finland [10], and today it continues to be referred to as a sustainable building material [39]. In this study, wood was primarily referred to as “ecological”, leaving a lot of room for interpreting exactly what this means. Furthermore, references to sustainability were brief. It could be that civil servants did not expand on the “ecological” qualities of wood because they thought it was self-evident, but future studies should clarify how municipalities view sustainability, both holistically and as a driver for WMC diffusion.

While there are benefits to implementing WMC, interviewed civil servants also perceived multiple barriers inhibiting WMC diffusion. The perception is that there are still too few WMC industry actors and weak regulatory policy to support WMC project implementation. These viewpoints make WMC seem too expensive and risky to undertake. Only one civil servant ended up discussing the necessity for municipalities to force builders to comply with the use of wood materials through municipal zoning plans; instead, civil servants mostly agree that their directive to engage in WMC development should somehow be coming from a higher authority. Furthermore, without instruction to include WMC into city plans, civil servants remain unmotivated to access WMC information and learn more about the topic. This lack of leadership seems to be a persistent topic [37] that needs overcoming. All in all, it could be said that a circular chicken-and-egg scenario has formed: WMC industry actors cannot penetrate the construction market and therefore municipalities will not solicit WMC projects due to perceived riskiness, but the lack of WMC demand is also diminishing the capacity for WMC industry actors to enter the construction market.

One mentioned avenue for overcoming barriers was the prospect of consumer demand being an increasingly strong driver for changing the future housing market. Yet, interviewees also mentioned that they lack information about citizen housing desires, and that existing housing development platforms like the public planning process system have been inadequate in assisting them to gather such information. With this in mind, one might ask how end users can demand WMC given both the limited effort by public actors and developers to bridge low consumer awareness [36,51] and the small number of WMC dwellings on the market to which to expose citizens. It could be that consumer demand cannot materialize in increasing WMC diffusion until such aspects are fully addressed.

Therefore, research into the determinants of consumer demand for WMC, and its capacity to shift residential housing development planning objectives, is needed.

In the end, it can be said that these civil servants did not see WMC buildings as being of poor quality or unsafe products. Instead, they discussed how there are market- and industry-related aspects hindering WMC diffusion. This substantiates a more positive outlook for future evolution in thinking towards the engineered wood products used in WMC, given previous concerns with WMC aspects like quality and fire safety [36]. Of course, it is worth mentioning that, since none of these civil servants admitted to being personally disinterested in WMC, there may also be a bias range of attitudes obtained from this study.

Finally, one should note that the attitudes shared in this study cannot be generalized beyond the scope of these interviewees. The relative weight of importance between favorable or unfavorable attitudes driving or hindering WMC also cannot be ascertained. For example, we cannot say that supporting a local industry is a relatively larger driver for WMC diffusion than using sustainable building material. The creation of a quantitative and well-covering survey can assist in establishing relative significance between the barriers and benefits of WMC while also deepening comprehension on the perceptions and roles of municipal civil servants involved in the development of the WMC market. The principal objective of this study was to outline the attitudes held by civil servants, and the resulting information will be used to build a follow-up quantitative survey study. This survey would enable full-scale analysis of the TPB components (i.e., attitudes, subjective norm, and perceived behavioral control) and how they influence municipal civil-servant behaviors.

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