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The role of municipalities in transformation towards more sustainable construction: the case of wood construction in Finland

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ABSTRACT

Transformation towards more sustainable construction calls for actions from representatives of different sectors and societal levels. Previous studies have investigated companies and national policies as promoters of change, but neglected municipalities as relevant actors. Municipalities influence construction as they are trailblazers when realizing their own building projects, as well as regulators, whose planning decisions affect local and urban development. We investigate the role of municipalities in driving sustainability transformation in construction, in particular, in relation to wood construction. The empirical study relies on data collected in Finland through a comprehensive survey among municipalities and qualitative interviews. Key factors in municipal considerations are energy efficiency and carbon neutrality goals. Regulations and norms related to construction influence municipal activities as well. We find various drivers (e.g. supportive planning) and barriers (e.g. cost concerns) to wood construction. National programmes promoting wood construction have induced gradual changes and led to some municipal pilot projects. Despite these positive examples, it seems to take time before municipalities adopt wood construction more extensively. Simultaneously, their position at the intersection of different actors and activities involved in construction provides a fruitful base for promoting sustainable construction.

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Public sector; business administration; sustainability; municipality; wood

Introduction

> *For sure, it is the city that is running the show. The city has had several wood construction projects, and politics guide material choices and planning.*
> A representative of a middle-sized municipality in 2020

Societal developments and new technologies are inducing a change in construction. Importantly, ecological values are emphasized and low-carbon construction is advanced. Currently, the building and construction sector accounts for around 39% of all carbon emissions in the world (United Nations 2020a), and measures are taken to reduce this negative environmental impact, one example being the use of wood in construction. New developments concern, for instance, new business models in construction, prefabricated housing, and wood-frame multistorey construction (WMC) (Brege *et al*. 2014, Gosselin *et al*. 2017, Toppinen *et al*. 2019, Steinhardt *et al*. 2020), and citizens are also showing increasing interest in wood construction (Lähtinen *et al*. 2019, Viholainen *et al*. 2020). At the same time, associated regulations are under re-evaluation and change (de Vries and Verhagen 2016). Overall, we are witnessing political and societal pressure for more sustainable construction. However, while there may exist consensus about driving sustainability, different actors have different aims and means for action when realizing relevant changes.

We focus on environmental sustainability and our investigation of transformation in construction builds on the notion of actors being influenced by developments at multiple levels (Gluch and Svensson 2018, Toppinen *et al*. 2019). In addition, "the technical core in construction is, by definition, inter-organizational" (Bygballe *et al*. 2013), and sustainable construction calls for collaboration amongst actors representing different sectors: the public, private and third sectors. These actors enter into collaboration with participants from different backgrounds and with different agendas and goals (Fellows and Liu 2012). This forms an important premise for our study: while the key actors, such as construction companies, may aim for new

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sustainable innovations, actors representing other sectors regulate and affect their activities. Consequently, the research problem in this study is based on the question of whether the public sector actors, in particular municipalities, are actively promoting more sustainable construction and, if so, how they are doing this.

Municipal (public) authorities (representing regions, communes, and cities) are in several instances central decision-makers when it comes to construction. To start with, municipalities may lead sustainability transformation as customers, or partners in public-private-partnerships, when realizing public construction projects, thus influencing industry change and innovation as public clients (Gluch and Svensson 2018, Carbonara and Pellegrino 2020, Lindblad and Gustavsson 2021). Furthermore, construction is guided by national and local regulations, norms, and building codes, and local authorities are important decision-makers and the regulators of construction (de Vries and Verhagen 2016, Hurmekoski *et al*. 2018). For instance, zoning and city planning gives local authorities power to affect urban development (Franzini *et al*. 2018). In addition, municipalities need to put into practice the politically set targets for sustainability (Gluch and Svensson 2018). In Finland, the municipal planning monopoly, as well as local representative democracy, set a relatively strong political backdrop for the Finnish public planner in the international and even in Nordic comparison (Hytönen 2016).

This study pays particular attention to wood construction as an example of more sustainable construction. Using more wood alongside or instead of the typical materials of concrete and steel is widely advocated as a tool to advance environmental sustainability (Hurmekoski *et al*. 2015, Toppinen *et al*. 2018, 2019, Viholainen *et al*. 2021). Indeed, positive expectations related to wood construction today, as shown in the presentations of flagship multistorey buildings globally (Gosselin *et al*. 2017), in the media and public discussions (Lazarevic *et al*. 2020), and in citizen perceptions in various countries (Viholainen *et al*. 2020). These discourses highlight several positive features of wood, including the utilization of renewable resources, the speed of construction, and environmental friendliness. While some studies focus on public actors, for example, ministries—as intermediaries promoting wood construction (Vihemäki *et al*. 2020, so far, little attention has been paid to regional and local activities. Thus, while municipalities and cities are acknowledged in studies on sustainable urban development (Smedby and Neij 2013, Woolthuis *et al*. 2013), their potential role in promoting sustainability change by way of using wood in construction has not been investigated. This indicates an important gap in the existing studies. The question remains how actively and why municipal authorities promote sustainable construction.

The aim of this paper is to analyze municipalities' current role as the facilitators of transformation towards more sustainable construction. Here, *sustainable construction* denotes different actions taken to advance low-carbon or green building, where the promotion of wood construction is one potential avenue and therefore a particular focus area. The study poses the following (empirical) research questions: "What specific actions are municipalities taking concerning sustainable construction?" and in particular, "To what extent and how is wood construction promoted in the municipalities?" A description of these municipal activities contributes to the analysis of the role that municipalities (as representatives of the public sector) play in the ongoing sustainability-related societal transformation that involves construction. We take an inductive approach to the analysis and collect both quantitative data (from a telephone survey) and qualitative data (from interviews) for the study.

Our contribution is 2-fold: first, we provide a comprehensive description of municipalities' current activities related to sustainable construction and wood construction. Second, we build an analytic model where municipalities are positioned as a nexus connecting different actors involved in the promotion of sustainable construction. Their position also lies at the intersection of different multilevel forces that are influencing sustainability. As a result, we display the role that municipalities currently play in the promotion of more sustainable construction in general and wood construction in particular.

Our empirical setting builds on recent developments in one Nordic country, Finland. This national focus allows the depiction of processes taking place at different levels and across sectors within relatively set boundaries. Although we focus on one country, similar processes of promoting, for example, wood construction are ongoing globally (see, e.g. Bengtson and Håkansson 2008, Hurmekoski *et al*. 2015, Gosselin *et al*. 2017, Vihemäki *et al*. 2019, Steinhardt *et al*. 2020), and therefore, our study adds to the general understanding of transformation towards more sustainable construction.

The paper is structured as follows. We first review the literature on the construction industry under transformation and on municipalities as public

decision-makers in the field. As a result, we position municipalities in the multilevel emerging field of sustainable construction, specifically wood construction. The next section discusses the methodology for the empirical study. We then show the results of the empirical survey and interview studies. The discussion section investigates the present municipal practices in sustainable construction, in wood construction in particular, and summarizes the role of municipalities at the nexus of different actors involved in the process. We conclude with the implications of the study and potential avenues for future studies.

Literature review: transforming construction and municipalities

The construction industry under change

The grand challenge of climate change and the global trend of urbanization has led to a growing demand for climate-friendly construction. Indeed, construction and housing play a fundamental role when aiming at societal goals for sustainable development (Toppinen *et al*. 2018). The change is systemic, meaning that all entities are affected and different actors need to join forces for change. How this global and omnipresent issue is tackled depends on the construction industry, the involved actors, and their receptiveness to change.

This study relies on the concept of sustainable development and its social, environmental, and economic pillars (Elkington 1997, Hill and Bowen 1997, Goh *et al*. 2020). *Sustainable construction* thus denotes creating a built environment that incorporates actions that support the healthy and sustainable well-being of social (human), environmental and economic systems. A sustainable built environment is achieved by investing in resources and operations that have a positive and sustainable impact on these natural systems (Hill and Bowen 1997), and by adopting collaborative approaches (Smedby and Neij 2013, Lazoroska and Palm 2019). In our empirical study, we let the respondents define sustainable construction: in practice, they refer to low-carbon or green construction, and sometimes to wood construction. Consequently, we focus on environmentally sustainable construction and leave aside the social and economic aspects.

Transformation towards more sustainable construction solutions calls for innovations. However, changes in the construction sector are seen to "take a long time, due to slowly changing standards, norms, perceptions, education programmes and building culture" (Hurmekoski 2017), and the field is characterized by conservatism (Lazoroska and Palm 2019), as well as strong path dependencies and lock-in (Hurmekoski *et al*. 2015). Indeed, according to Dubois and Gadde (2002), the construction industry is a loosely coupled system in which the strong reliance on standardized components and interfaces does not foster innovation or technical development. Moreover, as noted by Gann and Salter (2000, p. 961), project-based firms in this industry "need to manage technological innovation and uncertainty across organizational boundaries, within networks of interdependent suppliers, customers, and regulatory bodies". Complex construction projects bring together a diverse range of professional experts who design, build and manage the projects and are active at different stages of the construction process (see, e.g. Slaughter 2000), thus adding to the challenges of change. Therefore, systemic change towards sustainable construction is not without problems.

The models used in discussing innovations in, for example, prefabricated housing (Steinhardt *et al*. 2020) and in project-based construction firms (Gann and Salter 2000, Bossink 2018) show different actors and knowledge flows, acknowledging government and local authorities as important actors that provide the regulatory and institutional framework for construction. Meacham and van Straalen (2018), in turn, highlighted the interactions between regulators and various stakeholders, and therefore framed the building regulatory system as a socio-technical system. We follow such lines of thinking and direct attention to the municipalities as regulators.

Regulations are an important force for change in construction. As an example, a change in the Swedish building code in 1994 allowed the use of timber as a framing material in multistorey buildings (Bengtson and Håkansson 2008, Levander *et al*. 2011), and this has led to an increase in WMC in Sweden; WMC now occurs there at a much higher tempo than in Finland, for example (Toppinen *et al*. 2019). The study by Toppinen *et al*. (2018) of the environmental concerns motivating WMC in Finland and Sweden found that the emphasis on sustainability is driven by the changing regulations (reflecting societal needs). Indeed, Giesekam *et al*. (2016) noted the need for "new regulatory drivers to complement changing attitudes if embodied carbon is to be established as a mainstream construction industry concern".

As far as companies' role in sustainability transformation is concerned, it is evident that companies are innovating and adopting new business models, as shown in the development of prefabricated housing and wooden multistorey buildings all over the world

(Gosselin *et al*. 2017, Toppinen *et al*. 2019, Steinhardt *et al*. 2020). However, studies indicate a strong path dependency regarding using well-established construction methods and materials (Viholainen *et al*. 2021). Concrete and steel are traditionally used structural materials for large-scale buildings, such as non-residential and multi-housing buildings, and while the use of wood has increased, it is still not common practice to use wood (Gosselin *et al*. 2017).

Expertise on sustainable construction is in many ways in the making, as it is a relatively new area where both regulators and companies are facing new information and demands. Bengtson and Håkansson (2008) note that wood is not a new building material, rather the question is about "reintroducing timber into construction", and yet, its adoption in the Swedish construction network was not without problems. From the perspective of adoption of new technological knowledge this change may be simple, but the existing resource interfaces influence and slow down the adoption of innovations (*ibid*.). For instance, the study by Bossink (2018) of eco-innovations in the Dutch house building industry shows that sustainable innovation creation takes place in specialized demonstration projects, but there are difficulties in the dissemination of the results to regular "business as usual" projects.

Indeed, there are many challenges in adopting new practices in construction (Brege *et al*. 2014, Steinhardt *et al*. 2020, Viholainen *et al*. 2021). Levander *et al*. (2011) analyzed industrial construction and noted the uncertainty and equivocality that both public and private business clients meet with when facing this new alternative. They see that "industrialized construction moves clients beyond their current frame of reference". Similar issues have been noted in addressing sustainability issues more generally: Quarshie *et al*. (2021) showed how individual change-makers need to tackle equivocality and uncertainty in the biodiversity protection field. All in all, previous studies show the importance of cross-sectoral collaboration and intermediates when aiming for sustainable development (see, e.g. Ritvala and Salmi 2010, Patala *et al*. 2020).

Wood construction is gaining global interest, and WMC has been widely analyzed (Gosselin *et al*. 2017, Toppinen *et al*. 2019). The interview study of Franzini *et al*. (2018) on the personal perceptions of municipal civil servants showed that WMC is considered to be an interesting and sustainable solution for improving urban citizen lifestyles. Moreover, it is seen to support local and national businesses and economies. Simultaneously, another (often intertwined) innovation concerns manufacturing off-site, also referred to as *pre-fabrication* or *industrial construction*. Industrial construction has been characterized as "disruptive innovation" (Steinhardt *et al*. 2020) and as radical change and innovation (Levander *et al*. 2011) because it can transform a complex housing product into more of a commodity product that needs less on-site production (Steinhardt *et al*. 2020). While such changes take place at the firm level and are thus outside of our study focus, they are bound to impact the connected actors in the construction network (or ecosystem) as well (Viholainen *et al*. 2021). Wood construction and prefabrication have been adopted globally but promoted to different extents in different countries. For instance, WMC is adopted in Sweden more quickly than in Finland (Toppinen *et al*. 2019), while the prefabricated housing industry in Australia and Sweden represent an early and late stage of industry emergence, respectively (Steinhardt *et al*. 2020).

To understand (sustainability-related) change in construction, several scholars use multilevel frameworks. Gluch and Svensson (2018) offered a "layered understanding on institutional work related to changes in the built environment driven by a sustainability agenda" and adopted a multilevel approach, where analysis concerns the organizational field, organization, and project levels to advance sustainability in a municipal context. Gann and Salter (2000), Bossink (2018), and Steinhardt *et al*. (2020) looked at actors representing the infrastructural framework, technological support, supply network, and projects, together with constructing firms. Bygballe and Ingemansson (2014) investigated innovation in construction by paying attention to the network of involved actors, as well as the organizational levels; they analyzed the achievement of innovations in construction using three organizational levels: project, company, and industry levels. Finally, the study by Vihemäki *et al*. (2020) on the facilitation of WMC and intermediaries also showed different actors and activities at multiple levels and focussed on, for example, ministries and organizations/programmes attending to national aspects.

The public sector and municipalities as change makers

The forces of change for sustainable construction arise from general global societal needs and developments (Whiteman *et al*. 2013), explicated and promoted by the UN Sustainable Development Goals (SDGs) (United Nations 2017, 2020b). In many countries, the state

plays an active role in promoting sustainability change in construction through legislative actions or interventions (Rasmussen *et al*. 2017). This is also the case in Finland, where the state has taken actions to advance more sustainable construction. The Ministry of the Environment published a roadmap to low-carbon construction in 2017. Furthermore, the use of wood in construction has been promoted by several governmental regimes since the mid-1990s by way of developing building codes, implementing policies, and launching various programmes (Vihemäki *et al*. 2020, Ministry of the Environment 2020a). The present government has set the goal of Finland being carbon neutral by 2035 and has the objective of reducing the carbon footprint of construction and housing (Government Programme 2019). One concrete goal set in the government programme is to double the use of wood in public construction during the government term.

Lazarevic *et al*. (2020) showed that the emergence of and innovation in WMC (since the 1990s) in Finland were mainly bolstered by national programmes. They identify two distinct periods of activity in WMC innovation, both of which were stimulated by government interventions. Vihemäki *et al*. (2020) added to the analysis by investigating organizations identified as intermediaries in industrial wood construction and in low-carbon construction. In their study, regime intermediaries turned out to be prominent actors. The focus of the study lies on ministries and national organizations or programmes, while municipalities gain less attention and are located at the outskirts of the network of actors.

The public sector has several means for advancing sustainable and green construction, including, for example, revising and simplifying regulations and building supervision, ensuring the re-education of the workforce, and launching new education programmes (Hurmekoski *et al*. 2018). Furthermore, constructive dialogue can be a tool for urban governance for sustainability as shown by Smedby and Neij (2013) in their investigation of six Swedish cities. The public sector can also promote innovations in construction, and its buying power is a factor that can support the policy initiatives of sustainable construction (Obwegeser and Müller 2018). Indeed, public clients have been identified as being of particular importance for driving change and innovation in construction (Bygballe and Ingemansson 2014, Lindblad and Gustavsson 2021), as well as local sourcing, which supports local industries (Franzini *et al*. 2018). Hynynen (2016), who discussed local and regional actors in the development of timber construction, noted that cities and municipalities can promote win–win situations as they are beneficiaries of the regionally entrenched value chains of the wood building industry.

The discussion so far shows that the advancements of sustainable construction are taking place at multiple levels—initiated by the global environmental challenges and adopted by, for example, national governments. These interlinkages and multilevel processes are also expressed by Gluch and Svensson (2018), who investigated sustainable public facilities management and noted that the need for the new practices complies with the holistic sustainability goals set by the local government, which in turn emerge from national and international sustainability targets.

Moreover, previous findings show the relevant role currently played by regulators and administrators in facilitating sustainability change. While national regulations are important, their implementation takes place locally, which shows the particular role of municipalities. Indeed, Franzini *et al*. (2018) noted that municipalities often act as important gatekeepers of urban development and construction given their authority to oversee or approve zoning and land-use plans. Municipalities are also affected and characterized by their specific features; for instance, they operate within a political context influenced by political bodies, and they need to adapt to short-term political decision-making horizons (Gluch and Svensson 2018). Previously, Vihemäki *et al*. (2020) have raised the need for understanding the regional- or local-level policy processes and the role of, for instance, city planners and architects in promoting wood construction.

We follow this advice and take municipalities to be influencers and potential change-makers in construction. The study focuses on the activities of municipal agencies that promote (or hinder) the ongoing system-wide change towards sustainable construction. It addresses an important gap in previous studies as it concentrates the analysis on municipalities, that is, on the level of regions and local actors—instead of on activities on a national scale.

To conclude, we view municipalities as a central actor in the overall transformation towards more sustainable construction. This framing builds on previous studies discussing multilevel frameworks for construction (Gluch and Svensson 2018, Vihemäki *et al*. 2020), as well as interdependencies between actors in construction (Gann and Salter 2000, Dubois and Gadde 2002, Bengtson and Håkansson 2008, Fellows and Liu 2012, Bygballe and Ingemansson 2014, Steinhardt *et al*. 2020). The field is influenced by the pressure

caused by general global societal needs and developments (Whiteman *et al*. 2013, United Nations 2017), as well as influential national policies and the public sector (Rasmussen *et al*. 2017, Vihemäki *et al*. 2020). Municipalities are one of the involved actors, being guided by national goals and interacting in the networks of local actors, including inhabitants (Lähtinen *et al*. 2019). Our contribution lies in investigating municipalities as a connecting link between national targets, and construction companies and residents, thus enhancing the target of more sustainable (low-carbon/wood) construction. This initial setting of the study brings to the fore the multiple levels of actors and activities involved in enhancing (or slowing down) more sustainable construction.

Moreover, in line with Anderson *et al*. (1998), we see that the position of an actor (here, a municipality) shows the stability dimension of networks and the role of an actor concerns the dynamic change dimension. Therefore, we will investigate municipal practices to understand how municipalities act in their role and interact in relation to the advancement of sustainable construction. Here, the term *practices* is an umbrella term for all measures that municipalities take when aiming for more sustainable construction, including, strategies and policies together with regulation and other (concrete) activities. As we see it, the field of sustainable construction (and specifically wood construction) is emerging, but for the development to gain momentum, there is a need for more data and empirical studies depicting the current situation in sustainability-oriented practices.

Methodology

Research approach

This descriptive study depicts a topical ongoing change in its focus on transformation towards more sustainable construction. With the empirical approach, we aim to reconcile conceptual work and practice (Turk and Klinc 2020). Currently, there is little knowledge about municipalities' views and activities related to the promotion of sustainable construction (both in Finland and more generally), and therefore, there is a need to attend closely to this context and allow findings to emerge from the themes inherent in empirical data. To this end, we adopt an inductive approach, and the analysis builds on a comprehensive data collection of data on municipal practices. While referring to the empirical setting of one country (Finland), we address developments that are taking place more broadly in Europe and globally (see, e.g. Bengtson and Håkansson 2008, Hurmekoski *et al*. 2015, Gosselin *et al*. 2017, Hurmekoski 2017, Viholainen *et al*. 2020).

The study relies on mixed methods and two types of data: a (telephone) survey and personal interviews conducted in 2020. The survey results provide us with a comprehensive view of the current practices of Finnish municipalities in the area of promoting sustainable construction. The interviews, in turn, provide more detailed examples of the practices and help us to understand in more depth the reasons and strategic aims that influence these practices.

The research context

Sustainable construction has been promoted in various campaigns in Finland. A notable example of a large-scale sustainability project targeted to municipalities, in particular, is the Carbon Neutral Municipalities network (called "Hinku"). It brings together municipalities that are committed to an 80% reduction in greenhouse gas emissions from 2007 levels by 2030. The network was grown from its initial five municipalities (in 2008) to include over 70 Hinku municipalities in 2020 (Carbonneutralfinland.fi 2020). Another nation-level activity supported the improvement of energy efficiency and promoted renewable energy use: the Energy Efficiency Agreement for Municipalities and the related municipal sector's energy programme 2008–2016. The essential goal of this activity was 9% energy conservation during 2008–2016, and it was targeted to small and medium-sized municipalities. When concluded, the programme had covered a total of 117 municipalities and 15 joint municipal authorities (Motiva 2020). The involvement of larger municipalities is exemplified by the voluntary climate network formed and led by the chief executives (mayors) of the six largest cities. This network, initiated in 2011, aims at versatile cooperation and aims to act as a leader in climate issues. In 2017, the cities jointly decided to increase wood construction and dedicate a specific area or target in which to increase the volume and quality of wood construction (see, e.g. City of Helsinki 2017).

When it comes to wood construction, the Ministry of the Environment has launched a national Wood Building Programme 2016–2022 for supporting the use of wood in construction and other products (Ministry of the Environment 2020a). One of the focus areas of this programme is to promote the use of wood in public buildings, and related activities include, for example, the provision of subsidies and information services to municipalities (ibid.). The share

of public construction in all new construction in Finland was 18% (i.e. 2800 million euros) in 2019. In September 2020, national targets for increasing public wood construction were launched. The target is to increase the market share of wood in all public construction from the prevailing 15–31% by the year 2022 (and to 45% by the year 2025) Ministry of the Environment 2020b). These actions have increased interest in wood construction and led to an increase in WMC. The share of completed wooden multi-storey apartments in Finland was 1% in 2010 and had increased to 10% in 2015 (Toppinen *et al*. 2018, p. 4). Despite these developments, the volumes of large-scale wood construction are still modest and WMC is still a niche undertaking (Lazarevic *et al*. 2020).

Our study focuses on Finnish municipalities. In 2020, Finland had 310 municipalities, 294 of which were located in mainland Finland. Most of the municipalities prefer to be referred to as *communes*, while 107 municipalities have chosen to use the term *town/city* to refer to themselves. Finland has nine cities with a population exceeding 100,000. Municipal local authorities have broad responsibility for the provision of basic public services to their residents; in the European context their sphere of duties is exceptionally wide and municipalities provide circa 2/3 public services in Finland. They have strong self-government based on local democracy and decision-making, and they have the right to levy taxes. The system of local authority management is characterized by division into political and professional management (Kuntaliitto 2020).

Research data

This study uses two sets of qualitative data collected in 2020: a telephone interview survey, which covered practically all Finnish municipalities, and personal face-to-face interviews with selected municipalities and companies of the construction industry field.

We first refer to the survey conducted among municipal representatives. In the study, 293 (out of a total of 294) of the mainland Finland municipalities were reached for a telephone interview. The initial list of contact information for the sample came from the database managed by a research company "Rakennustutkimus RTS Oy", which conducted the telephone interviews. This list was supplemented by information on municipalities' web pages together with the contact information provided by the municipalities reached. The survey was directed to civil servants who were responsible for construction in their municipality. The respondents were, for example, technical directors, building inspectors, or town managers. The responses thus represent the municipality as an organization and not the local politicians' views. In many cases (82 municipalities) several respondents, each representing a specific area of expertise, were involved in the interview. Table 1 shows the details of the roles of municipal civil servants included in the survey data.

Table 1. Role of the primary respondent in the survey data.

Primary* respondent	Number of respondents with this role
Building inspector	85
Technical director	60
Municipal mayor/town manager	29
Zoner, zoning manager	23
Land use manager	11
Development manager	8
City surveyor	7
Director of urban planning	6
Municipal engineer	6
Other**	58
In total***	293 responding municipalities, average interview length: 20 min.

*In 82 municipalities, two or more respondents participated in the telephone interview (35 of the additional respondents were building inspectors).
**For example, Housing manager, Municipal vitality director, Administrative director, Zoning architect, Regional architect, Land use engineer, City construction foreman, Industry director, and Civil engineering director.
***Data collection during 21.10.2020–6.11.2020. Total number of (mainland) municipalities: 294.

The survey covered different aspects of construction in the municipalities concerning three overall themes: (1) housing construction; (2) wooden apartment buildings and wood construction; and (3) business and service construction. The average interview length was ∼20 min. The present study draws on the questions that concerned sustainability and specifically wood when governing construction in the municipality. These (open-ended) questions were as follows: "What kind of goals and practices does your municipality have concerning sustainable development (in construction)?" and "In your municipality, what kind of (a) enhancing factors or (b) hindering factors do you see as influencing wood construction?"

We used an open-ended format for the question to give the respondents scope to raise any topic and to mention any number of practices. This approach of using open-ended questions is in line with our inductive and descriptive approach.

The data collection took place when sustainability-related issues in construction were widely promoted in Finland (Ministry of the Environment 2020a). In 2020, these developments gained new momentum: wood construction was again emphasized in the new government programme by Prime Minister Marin

(Government Programme 2019), and in September 2020, national targets for increasing public sector wood construction were launched (Ministry of the Environment 2020b). The survey among municipalities took place immediately after this, during October–November 2020. It provided us with a comprehensive but relatively thin understanding of the municipal activities that support sustainable construction, especially wood construction.

To gain a deeper and richer understanding of municipalities' role in transforming construction, we conducted personal interviews with the representatives of selected municipalities. These interviews took place in autumn 2020, that is, in parallel with (or soon after) the telephone survey and before analyzing the survey results.

We interviewed nine civil servants, who represented seven municipalities. Our respondent selection for personal interviews was based on both intensity and different perspectives (Creswell 2013, pp. 156–158). To cover for the former aspect, we aimed for information-rich cases, that is, municipalities that we knew (based on public data) had an interest in more sustainable construction. In particular, we searched for municipalities that had promoted sustainable construction in their operations by way of, for instance, launching wood construction. This search was based on media coverage, organizational websites, or other secondary data sources, which also provided us with the contact information of suitable respondents. For the aspect of different perspectives, we approached respondents from municipalities of different sizes, from large cities, through medium-sized towns to a very small town. Convenience sampling (Creswell 2013, p. 157) describes best our sampling strategy because we approached municipalities and their informants based on public information showing promotion of wood construction.

Different perspectives were also offered by the views gained from companies representing construction and the private sector. We rely on five interviews with company representatives conducted (mainly) in summer 2020. The respondents represent a construction company, an element producer, and three actors that are involved in the design phase of construction projects, namely two architects and one structural engineer. These interviews helped us to understand how other parties of construction networks perceive the municipalities' activities in construction. Tables 2 and 3 show the details of the personal interview data sources. When illustrating the respondents' views in our study through quotes, we also name the background of the respondent (size of the municipality or type of firm) to contextualize the comments. Otherwise, the respondents are kept anonymous.

The personal interviews focussed on wood construction as a concrete example of advancing more sustainable construction. The civil servants were asked to provide a brief description of how sustainable construction, especially wood construction is promoted in their municipality and the reasons for these activities. Therefore, these interviews form mini-cases of different municipalities. We gained supplementary information by following webinars, which showed additional concrete cases of wood construction in these or other

Table 2. Interviews with representatives of municipalities (public sector).

Type/size of municipality	Job title	Interview date (and length)
Large city	Planning engineer (Central administration)	26.11.2020 (55 min)
Large city	City architect	26.5.2020 (51 min)
Medium-sized town	Development manager	27.10.2020 (55 min)
Small town	Development director	10.11.2020 (60 min)
	Development manager	11.11.2020 (35 min)
Small town	Trade ombudsman	16.12.2020 (58 min)
Small town	Technical director	16.12.2020 (30 min)
	Business advisor	16.12.2020 (50 min)
Very small town	Chief executive	5.11.2020 (30 min)

Large city $>$ 100,000, Medium-sized town 20,000–100,000, small town 10,000–20,000, very small town $<$ 10,000.
In 2019, Finland had 5.5 million inhabitants and 311 municipalities. The average number of inhabitants being 17,766 (median 6066). Source: Kuntaliitto 2020.

Table 3. Interviews with companies (private sector).

Type of organisation (role in a construction project)	Job title	Interview date (and length)
Architect (design)	Architect	15.6.2020 (55 min)
Architect (design)	Architect	18.11.2020 (30 min)
Structural engineer (design)	Unit director	27.5.2020 (52 min)
Constructor	CEO	14.8.2020 (55 min)
Element producer	CEO	19.5.2020 (60 min)

municipalities or discussed sustainable construction issues.

All the respondents whom we approached replied positively to our request for an interview. The interviews were personal one-to-one meetings organized (due to practical reasons caused by COVID-19) online (*via* Zoom or Teams). We posed open-ended questions using a thematic interview guide, which included, for instance, the following questions: How does your municipality support and realize wood construction? What are the most important barriers to wood construction? Where, when, and why are wood projects realized? How do the national targets for wood construction impact your municipality? The full list of interview questions posed to the municipal respondents is presented in Appendix 1. The interviews with the company representatives followed these lines, but were more general, discussing sustainable construction, wood construction, and the roles of different actors in construction.

Analysis

The survey data is analyzed descriptively to provide an understanding of the current state (in the year 2020) in municipalities regarding their practices related to sustainable construction, especially wood construction. Thematic coding was used as the primary tool for the analysis of the interview transcripts and the open-ended replies to the survey. In this way, we (manually) aggregated the single replies into themes that are presented later. To provide an example of our coding, replies, such as "the building inspection aims to encourage new home builders to invest in energy efficiency", "wise use of energy" and "savings in energy use" formed the theme "Energy efficiency". In turn, the theme "Building according to rules and regulations" included such comments as "norms are followed", "regulations are followed" and "we take measures that are required by law". The theme "Strategic level carbon-neutral initiatives" included responses that emphasize sustainability in a strategic context, such as "we have formed a group to start renewing city's climate strategy"; "the city has a sustainability strategy"; "carbon neutral initiatives are noted in the city strategy"; and "a project plan on sustainable development is under way". We counted the codes and present them in the results of the survey to better indicate current municipal practices, although we primarily approach the data from a qualitative standpoint (cf. Creswell 2013, p. 185).

Our analysis of the personal, face-to-face interviews relies on finding concrete practices adopted for promoting sustainable or wood construction. We look for themes arising from the interview data. The interviews are an important addition to the survey analysis because they provide an opportunity to understand the adopted practices and strategies in more detail, as well as to elaborate on the reasons for their adoption. Furthermore, the company responses portray how external actors see the role played by municipalities in sustainable construction today.

The validity of our findings is shown in that they in many respects correspond with other studies discussing, for instance, views on WMC or barriers to wood construction. In addition, we have discussed the results with representatives of the construction industry and municipalities in, for example, webinars, and found confirmation from them. Our study points to some novel aspects as well, for instance, the need for contextual analysis, and this provides room for future studies. The study is limited to one country, but thanks to this choice, we can reach a comprehensive data set on the municipalities.

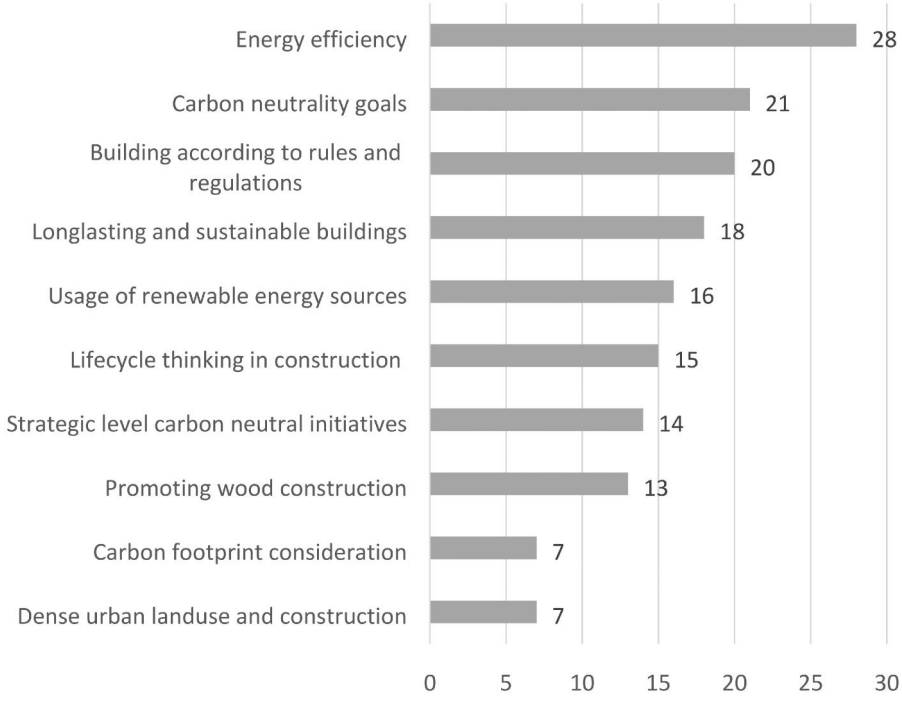
Results

Sustainable construction in Finnish municipalities

The results of the survey provide an overall understanding of how Finnish municipalities address sustainable construction. Most of them have goals and practices related to enhancing sustainable construction. The representatives of 166 municipalities (that is, 57% of the municipalities) replied to our first question: What kind of goals and practices does your municipality have concerning sustainable development (in construction)? The rest of the municipalities, 127, told us that they did not have any practices related to sustainable construction or at least no notable practices. The respondents could mention any number of practices, and we received 288 comments in total. The responses were grouped into aggregated themes, as shown in Table 4.

Among the actions related to sustainable development, the most commonly mentioned was "energy efficiency": 28 municipalities (that is, 17% of those having any practices) took up this topic. Twenty-one municipalities noted "carbon neutrality goals" and 13 of these particularly mentioned Hinku, the joint activity of the Carbon Neutral Community Network (Carbonneutralfinland.fi 2020). The point of "building according to norms and legal regulations" was raised by 20 municipalities. Potentially, such replies are due

Table 4. Sustainable development practices in construction in municipalities in 2020 ($n = 166$), number of respondents raising the theme.



to the recent or emerging regulations, or awareness of the national targets for wood construction, which had just been launched. On top of the list were also such topics as "long-lasting and sustainable buildings" and "renewable energy sources". Thirteen municipalities (8% of the respondents) paid attention to the promotion of wood construction.

To conclude, energy efficiency issues dominate in municipal work, which is probably due to the previous national programmes on the topic. Municipalities emphasize long-lasting and sustainable buildings, indicating also the relevance of PPP projects. However, attention to life cycle thinking is still relatively scarce, although the first versions of a national method for the whole-life carbon assessment of buildings (Ministry of the Environment 2019) have been presented. The data shows that Finnish municipalities are taking some steps towards more sustainable construction. Wood construction gains attention but still plays a marginal role in municipal activities.

Views on the drivers and barriers to wood construction

To delve into wood construction in more depth, the survey posed a question about the drivers and barriers that influence wood construction in municipalities: In your municipality, what kind of (a) enhancing factors or (b) hindering factors do you see as influencing wood construction?

We look first into the hindering factors to see what kind of hurdles need to be overcome before wood construction becomes more popular in Finland. Markedly, the majority (i.e. 191 municipalities—65% of all Finnish municipalities) informed us that there were no hinderances to wood construction.

Ninety-seven municipalities discussed some hindering factors. As Table 5 shows, the most important factor hampering wood construction was the question of cost and expenses—this was mentioned by 24 municipal representatives. Essentially, wood construction was perceived as an expensive way of constructing: this was particularly mentioned in connection with large buildings and when compared with using typical concrete in construction. Another concern (getting 13 responses) was related to the poor economic situation of municipalities, and in connection to this, some respondents also mentioned the COVID-19 pandemic as having a negative impact. Twelve respondents pointed to the prevailing traditions in construction which hinder new ways of construction, and 10 raised the issue of (restricting) building regulations. Respondents' comments on prevailing negative attitudes (or even prejudices), limited supplies, and a lack of skills seem to characterize the perceived state of

the wood construction industry: there is a need to gather both experiences and knowledge to advance the wider adoption of wood.

When turning to the drivers of wood construction, we find a very positive approach to wood construction (please see Table 6 for the responses related to the drivers). Only 55 (19%) of the municipalities found no factors for promoting wood construction. The foremost driver for wood construction is land-use planning and zoning; this was mentioned by 40 municipalities (14% of all the Finnish municipalities). The municipalities may permit wood construction, or they may direct construction towards wood construction through stipulations. These different perspectives are shown in the following responses:

> *In one planning project, we have considered enhancing wood construction and wooden multistorey buildings in particular.*
>
> *We prescribe wood construction in this particular zoning area.*

Table 5. Barriers to wood construction in municipalities in 2020, number of respondents raising the theme.

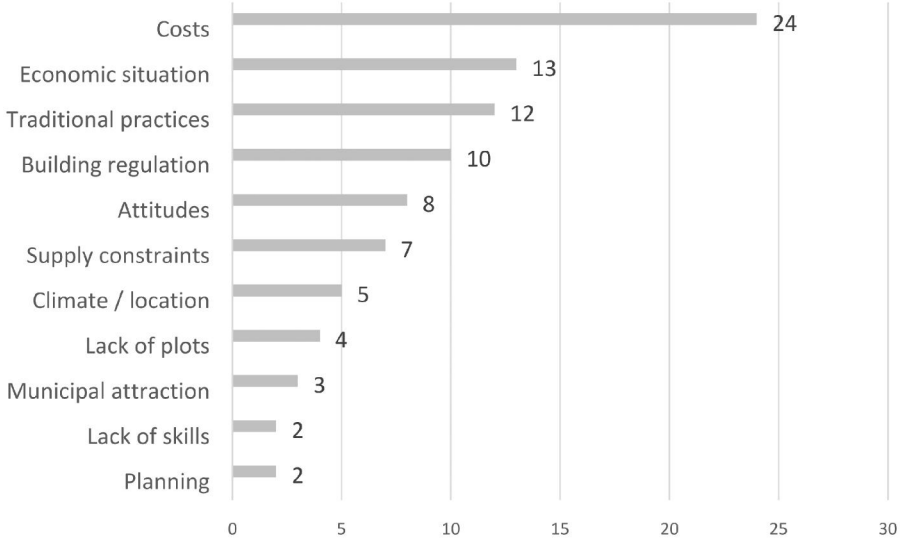
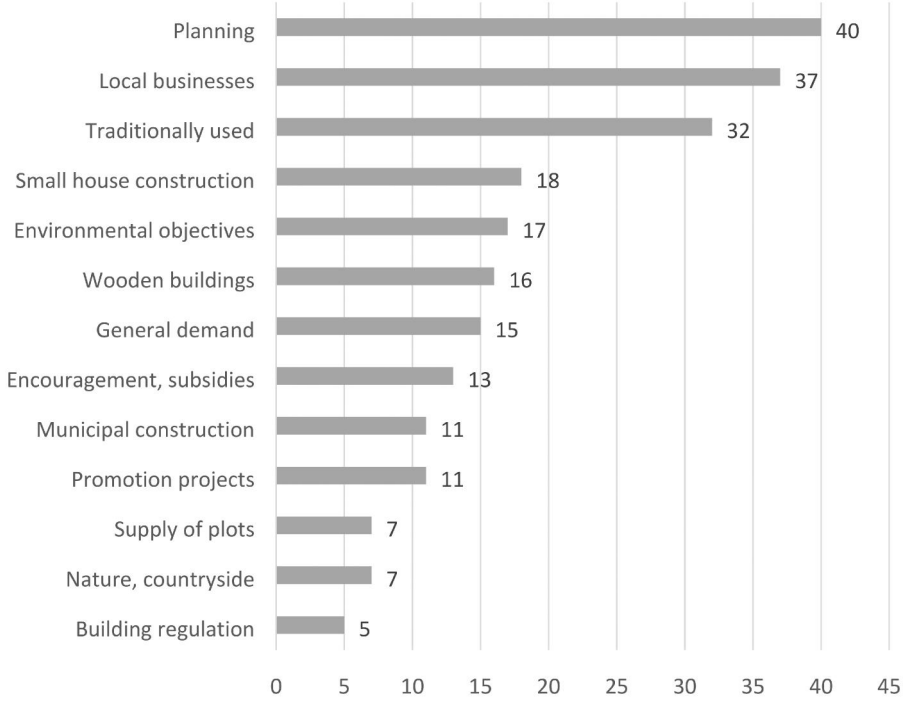


Table 6. Drivers for wood construction in municipalities in 2020, number of respondents raising the theme.



Another notable factor mentioned was the role of local actors, such as construction companies or material suppliers, indicating municipalities' interest in building on and supporting local resources. Several municipalities emphasized industrial policy and local actors in promoting wood construction. Typically, these replies concerned wood constructors, sawmills, or the forest sector in general, as shown in the following:

> *There is a factory that manufactures houses nearby.*

> *There is a goal of maintaining jobs through wood construction.*

The third factor enhancing wood construction pointed to the existing traditions, as noted by 32 (11%) of the municipalities. Here, the respondents mentioned in particular that small-scale, detached wooden houses have traditionally dominated buildings in Finland. Many respondents noted that wood was currently the dominant building material or referred to the existing wood buildings, as exemplified here:

> *This is a rural municipality, where the overall look encourages wood construction.*

> *Agriculture and forest industry dominate the municipality, and therefore, wood construction is common.*

Factors showing the influence of the developments in society at large include such drivers as environmental objectives, general demand, and subsidies or support received for wood building (these factors are all mentioned by more than ten municipalities). In addition, some municipalities actively run their own construction and promotion projects.

All in all, when investigating these impeding and enhancing factors, we find that they comply with typical views presented, for instance, in the webinars of the field, and they indicate a slow pace of change in the field—attitudes, and practices change slowly and actors stick with the prevailing or traditional ways of running municipal construction. The comments given by the respondents in the telephone interviews were relatively brief while longer elaborations and more contextual understanding were received in the personal interviews that are discussed next.

The experiences of municipalities and firms related to wood and sustainable construction

Our personal interviews with the representatives of **seven municipalities** show the public sector work for sustainable construction in more detail. Several respondents noted that sustainability issues were, in one way or another, included in the municipal strategies. In the following case, the municipality linked construction to its critical strategic areas of growth and sustainability:

> *Our strategy notes that the municipality should grow. […] And then, we have these targets related to the environment and sustainability. And there too, this construction side is one important area. In a similar vein, perhaps, higher usage rate of premises could be one area [of promoting sustainability]. That is, to not build so much and, rather, to build less and to build with higher quality.* (a representative of a small town)

Evidently, the focus lies on decreasing carbon emissions and energy savings while only some municipalities see wood construction as a tool for sustainable construction, as exemplified in the following views:

> *We are currently drawing an action plan for low carbon operations. And we have, for instance, a team working on energy savings.* (a representative of a small town)

> *If you consider the strategic targets of the city, today they note that the city should be carbon neutral by 2030 and there is a programme for energy and climate.* (a representative of a medium-sized town)

> *Our city has now made several decisions on increasing wood construction and promoting the use of wood as a building material. So, I follow this and try to promote this or to at least make these advancements possible.* (a representative of a large city)

Large-scale wood construction in particular was seen to be a novelty. So far, the municipalities had typically only realized smaller wood buildings. Indeed, the tradition of wood construction is visible, but the municipalities are still hesitant about realizing large-scale wood construction:

> *Large-scale wood construction – it is in my view a fairly new thing. In addition, legislation in Finland has perhaps hindered building multistorey wood buildings. Nevertheless, wood construction itself is not anything new, we have strong traditions of wood construction [in the region].* (a representative of a small town)

> *We primarily have these smaller buildings because schools, day-care centres and those sorts of projects are largely made of wood … being traditionally locally built. So, we do not have massive wood or CLT [cross-laminated timber] or anything like that. […] For instance, we do not have any special zoning for or requirement for using wood there. […] so, we have not in any way supported or particularly emphasised [wood building]. We have considered it, probably euros have been our consultants; that is, we have not been ready to pay more for massive wood.* (a representative of a small town)

Indeed, wood construction was often perceived to be an expensive option. When the municipality had

received project support from the Ministry of the Environment (through the Wood Building Project, Ministry of the Environment 2020b), we asked explicitly about the importance of this endorsement. It seems that this governmental funding, while not launching new activities, speeded up many processes. As noted by two respondents:

> *I believe it was fairly important [for the municipality] to venture to test this [multistorey wood building]. It is anyway a new concept, so I suppose [the funding] was a pushing force in the end. This will now be realised within a shorter schedule. I believe though that this would have been accomplished anyway, but it could have taken more time.* (a representative of a small town)

> *We have started a project on multistorey wood building, it will be used as a pilot. A critical factor is to get governmental financial support.* (a representative of a medium-sized town)

Another response to our question about whether the municipality would have started their wood building project without the support from the Ministry of the Environment shows not only the importance of the funding but also its role in raising new ideas:

> *I do not believe [we would have started it] or at least it would have required a lot. … This building, once realised, probably raises new thoughts.* (a representative of a medium-sized town)

In fact, the role of the Ministry of the Environment as a promoter of wood construction was noted in several ways. One of the respondents noted that the city had received good instructions on how to write a funding application, and another commented on the importance of having a personal contact in the ministry. However, the national targets for wood construction (launched in September 2020) had not (yet) had any notable effect, as seen in the following views:

> *I find that having a personal contact has been helpful. […] The Ministry representatives have their own pressures to create jobs and possibilities. In my view, our cooperation has gone well. The Ministry is not [bureaucratic], at least not in my view; sometimes people have the impression that ministries are so theoretical.* (a representative of a small town)

> So far *[the national targets for wood construction] have not really had an influence, at least not here.* (a representative of a small town)

The importance of the local issues, businesses, and conditions (e.g. the local construction industry) noted in the survey came through in the interviews as well. If there is, for example, a wood industry close by, the municipality itself is motivated to promote wood buildings. Indeed, the local industry structure is a critical factor and in some cases, the municipality raised the need for being unbiased in its supportive actions:

> *We have local production of concrete elements and steel structures, as well as glass-aluminium production. In addition, we even have production of wood buildings. … So, we have production of all materials in this area. … Therefore, it is hard to favour any of them.* (a representative of a small town)

In regard to external stakeholders, one municipality notes the involvement of citizens and engagement in dialogue with the stakeholders:

> *When the energy and climate programme was created, we relied on interaction. We cooperated with different experts from the university and we engaged citizens too.* (a representative of a middle-sized town)

When asked about interaction within their own organization, the respondents brought up both hindering and promoting factors in relation to sustainability. Collaboration across functions and units internally may work well or impede sustainability work, as exemplified in the following:

> *If we take, for instance, the technical sector [within the city organisation] – because it is the most central for construction – they operate in long-standing historic silos … there is internal competition for funding and resources, and this impedes sensible actions.* (a representative of a middle-sized town)

> *We had active planners [in zoning] who wanted this but did not really manage to go further. It was really like piloting in nature –some small [projects] here and there. But then we got these climate targets, where wood construction was one of the measures. … In addition, we have now this climate team.* (a representative of a large city)

While the respondents noted different actors' role in wood construction, the emerging overall picture gives the municipality a key role in influencing how construction develops, with linkages to local politics as well. On wood construction, one city representative noted the key role of politicians in influencing planning and commented:

> *For sure, it is the city that is running the show. The city has had several wood construction projects and politics guide material choices and planning. In particular, the Green council group is the biggest [in politics] and their representatives are very active in the city planning committee.* (a representative of a large city)

To understand the role of municipalities in the sphere of wood construction activities, we also address firms' perceptions. Our **interviews with the five firms** confirm the key role played by municipalities in promoting wood construction by both offering

support to businesses and being a client, as well as forming partnerships with the construction companies:

> *The municipality wants to promote regional wood constructors; for instance, it organised a trip to Kiruna in Sweden to see if someone would manage to create contacts there as they are relocating the entire town there. All the [local] wood building manufacturers went along. The municipality supports everyone and has meetings where all companies are gathered, and tries to promote [business].* (an element manufacturer)

> *Public construction (e.g. health care centres, senior homes, schools, etc.) is driving the market at the moment.* (a CLT manufacturer)

> *And Tampere has proclaimed itself as a city of wooden (multistorey) blocks. In this way these partnerships – in student housing – in almost all cities have awakened. (a constructor)*

One company acknowledges the critical influence of municipalities but also emphasizes the responsibilities of constructors. Accordingly, companies need to develop and provide competitive wood products to the markets:

> *Cities play a big role, starting from zoning and all … The city has acted in an exemplary way in these developments. Now we have cooperated in the zoning of one target close by to here. … This zoning [planning] side is important. A counterargument that I have used when defending wood construction is that we cannot take it for granted that here is an area zoned for wooden blocks and that no one can come and build something else. … In my view, this is the wrong way to go because one must make this product and make this way of constructing both competitive and a concept that works in free markets.* (a constructor)

Several interviewees emphasized the role of decision-making and collaboration in the early phases of construction projects. The idea of using wood may be present early on, but discussions with, for example, structural engineers and architects are needed to develop the idea into a concrete product and building. Good planning is central for a successful wood project, and again, the influence of politics and the need for more information is present, as seen in these quotes:

> *We structural engineers plan for the unit person who starts a construction project – for instance, a public sector representative, like a representative of a town or municipality … We provide alternatives; one is usually seeking the most economically advantageous or safest solution, and for us, different materials are equal in this. In this sense, we are independent consultants and we only consider the technical and economic issues. These political issues do not influence us. If a municipality is a constructor and they have a manufacturer of certain products in their area, they may want to use those products and press or recommend using a certain material. … They usually have something related to their culture, personnel or skills, and we need to support it, act accordingly.* (a structural engineer)

> *The buyer (the orderer) should have a crystal-clear target regarding what they are aiming for with this. … Today, if it happens that the buyer sort of has an idea that it would be nice to use wood but does not really know a lot about it, then it largely falls to the designer to give information to the buyer.* (an architect)

The responses from the municipal actors showed that the national targets (launched in 2020) for public wood construction have not yet influenced the market. The governmental and municipal targets for carbon neutrality are, however, carefully followed and will cause changes in the future. This is seen, for instance, in the following response, elicited when an element manufacturer was asked whether municipal targets for carbon neutrality are visible in wood construction:

> *Not yet, but they will be visible soon for sure. Finland has decided to be carbon neutral by 2035, and the city wanted to go further and announced that it will be carbon neutral by the year 2030. For us, because the city forms a large market, this would mean the carbon neutrality would influence us. But we do not know yet how it is calculated because the regulations have not yet been nailed down.* (an element manufacturer)

Municipalities as the promoters of wood construction

Drawing on our empirical findings, we investigate the role of a municipality at the nexus of different actors and as a promoter of sustainable construction, in particular wood construction. We see that municipalities are embedded in a network, which includes different actors involved in construction, and they interact with actors representing various sectors. Furthermore, they operate at the intersection of different expectations and demands for sustainable construction, especially wood construction. This analytical frame is presented in Figure 1. We analyze which actors are most relevant when the municipality acts on sustainability issues (actors are shown as circles in the figure) and discuss the interaction between the actors (indicated by the arrows).

The network includes the state as a governing actor who provides the legal rules and norms for municipal behaviour. Increasingly, governmental guidance is given in the form of different programmes aimed at more sustainable construction and/or wood

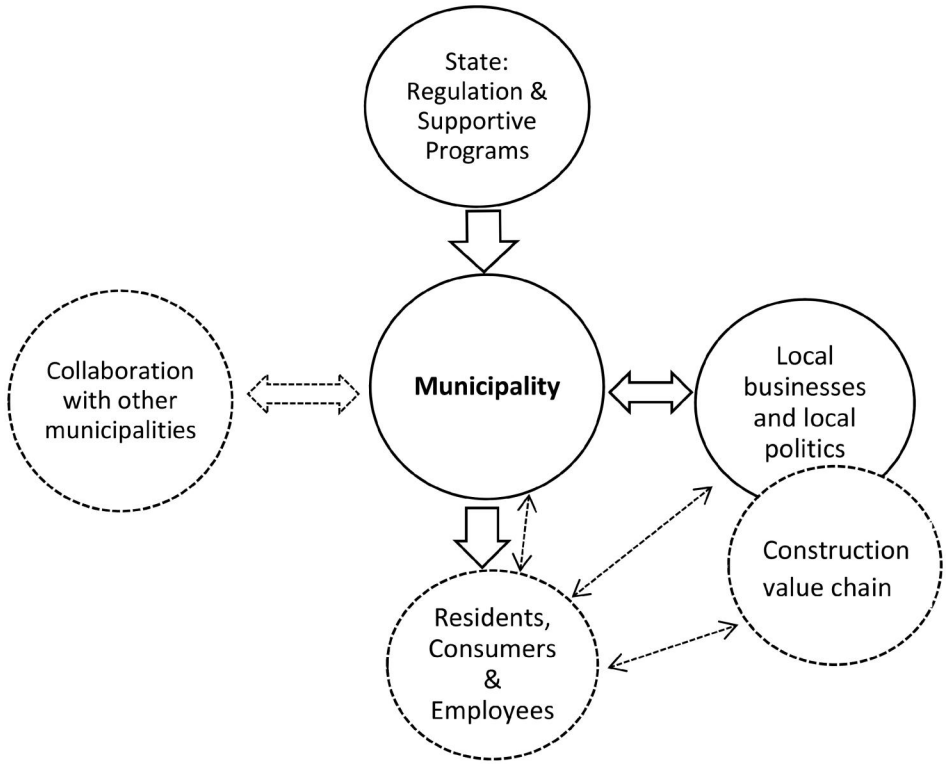


Figure 1. Municipalities at the intersection of different actors and activities in promoting sustainable (low-carbon/wood) construction.

construction, and such programmes have previously been shown to be important intermediates in the field (Lazarevic *et al*. 2020, Vihemäki *et al*. 2020). In our study, some, but only a few, exemplary cases of initiating wood construction projects as a consequence of governmental support were raised.

We mainly find a one-directional influence from the state as municipalities followed the given norms and rules. The figure denotes such regulation from state to municipalities by a solid-lined arrow. However, in cases where some special projects had received funding from, for example, the Wood Building Programme (Ministry of the Environment 2020a), more intensive interaction took place between the parties. Several municipalities also commented positively on the guidance and help received from the ministry representatives. This implies that networking and learning processes are taking place between the intermediaries (cf. Vihemäki *et al*. 2020).

The municipalities themselves emphasize the role of local businesses and industrial policies in their decision-making. While municipalities are willing to build on local resources (Hynynen 2016), they need to consider local businesses broadly and impartially. Several municipalities explicitly referred to companies representing the construction field; companies belonging to wood construction value chains were given particular support if they were sole businesses in the region. The figure illustrates this by connecting the local businesses and the wood construction value chain.

Some cooperation between municipalities takes place in the promotion of carbon-neutral or wood construction (e.g. within the Hinku network). This implies that networking and learning processes are taking place between the intermediaries (cf. Vihemäki *et al*. 2020). Here, such relationships connecting municipalities were not explicitly addressed. We note, however, this potential activity with the dashed arrow joining municipalities because such cooperation has been discussed in other contexts and the secondary data, and we expect it to increase in the future. The value of such relationship building and information sharing has also been indicated in the study by Smedby and Neij (2013) of collaborative and integrated urban governance for a sustainable built environment.

Finally, the influence of residents and consumers was commented about in generic terms; their role was implicitly presented in, for example, the municipalities' aims for providing good living conditions for the residents. This is in line with the study by Franzini *et al*. (2018), where civil servants perceived WMC as a

solution for higher-quality construction and improved quality-of-life aspects for end users. Furthermore, one example of the engagement of residents in the development of a carbon-neutral town strategy was presented. Obviously, municipalities' actions related to construction will eventually also influence residents (depicted by the one-directional arrow in Figure 1). The study by Toppinen *et al*. (2018) on WMC showed that the sustainability topic is driven by changing regulations (reflecting societal needs) rather than consumer needs. We expect that in the future, citizens will be more active in demanding wood buildings and putting pressure on construction companies, as well as on local politicians, given the recent positive citizen attitudes towards wood construction (Viholainen *et al*. 2020). This potential influence is indicated by the dashed arrows in Figure 1.

In addition to analyzing the position of municipalities in the sustainable construction network, we investigate their role there (Anderson *et al*. 1998) by looking into their actions and practices (as presented in the survey and interviews) in more detail. Interestingly, on some issues, the municipality can be seen to play the role of an enabler as well as an inhibitor. For instance, the municipalities reported the use of planning and zoning as vehicles to promote a certain type of construction. Simultaneously, some respondents referred to there still being too many restrictions on zoning as forming a barrier to wood construction. Another ambivalent theme was that of traditions: on the one hand, traditions were presented as a natural base for wood construction since wood has been extensively used, in particular, in smaller detached houses. On the other hand, the respondents noted that the long tradition of and skills in building with concrete or steel makes a transformation to wood difficult.

Municipalities' activities that boost wood construction are still relatively modest. Large cities have been more proactive and taken wood construction into their agendas. Examples include, for instance: Tampere, which aims to be the leading city in wood (Tampere 2020); Helsinki, which has included an increase of wood construction in its strategies (City of Helsinki 2017); and Jyväskylä and Joensuu, which have supported the building of multistorey wood buildings. Tampere was a forerunner in zoning a city block for WMC, in which the first WMC with eight floors in Finland was raised in 2015 (Puuinfo 2020), and Joensuu boasts about the internationally recognized tallest all-wood building in the world: a 12-storey apartment building (National Geographic 2020). Activities of such committed municipalities (as well as some included in our interviews) are similar to the activities of intermediaries promoting wood construction nationally.

Discussion

This study sheds new light on municipalities' role as the facilitators of transformation towards more sustainable construction. It has adopted a multilevel perspective to study the transformation, thus following the lines of some previous studies (Gluch and Svensson 2018, Vihemäki *et al*. 2019, Lazarevic *et al*. 2020). The analysis started by delineating the position of municipalities in such a multilevel system. From this rough base categorization, we moved on to analyzing municipalities and their context. Our key contributions are the comprehensive description of municipalities' current activities related to wood construction in particular and the analytic model showing the position of municipalities as a nexus connecting different actors in sustainable construction (see Figure 1). Our study took place in a setting where pressures for more sustainable construction appeared at different societal levels. A case in point is formed by the UN SDGs, which pave the way for a more sustainable future, as well as underscore the need for timely data with which to measure progress and inform decision-making (United Nations 2017, p. 2). With its empirical focus, this research aims to contribute to such an information base, in particular, in relation to wood construction.

The strength of this study is that it provides a comprehensive view of current practices in Finnish municipalities, thus addressing the need for quantitative studies and surveys with good coverage to complete previous interview studies (Franzini *et al*. 2018). The findings show that almost 60% of the municipalities had practices targeting sustainable construction, and typically, the municipalities aimed for energy efficiency and carbon neutrality. Our focus on wood construction contributes to the literature on material-based sustainability transition in construction (Viholainen *et al*. 2021). The study notes similar barriers to the adoption of alternative materials (such as wood) as those found in the study by Giesekam *et al*. (2016). While 65% of the municipalities replied that there were no hindrances for wood construction, only 13 municipalities paid specific attention to the promotion of wood construction.

The survey data showed various drivers (e.g. supportive planning and the recognition of local businesses) and inhibiting factors (e.g. price and economic

considerations, as well as the customs of construction) influencing the use of wood in municipal construction. These findings were aligned with the views expressed in the interviews and with previous studies on the individual perceptions of municipal civil servants (Franzini *et al*. 2018). The themes emerging from the data were largely the same topics that have been present in media and public discourses, as well as in previous studies on, for example, motivators and barriers for wood construction (Gosselin *et al*. 2017, Hurmekoski *et al*. 2018, Toppinen *et al*. 2019).

All in all, our results show relatively minor advancements in public wood construction so far. This finding echoes the point made by Lazarevic *et al*. (2020) that—despite a lot of media coverage, discussions on the favourable impacts of wood construction, and positive expectations—the field of wood construction still holds a niche market share. These results are in line with previous studies explicating that the construction industry is characterized by slow change processes and path dependencies (Hurmekoski *et al*. 2015, Hurmekoski 2017, Viholainen *et al*. 2021) and its move to implementation of sustainable practices in a consolidated manner has been relatively slow (Goh *et al*. 2020). Furthermore, wood construction seems to be adopted in Finland at a slower pace than, for instance, in another Nordic country Sweden (Bengtson and Håkansson 2008, Levander *et al*. 2011, Toppinen *et al*. 2019). It appears that top-down measures (regulation and support from the state) gradually trickle down to municipalities and to the construction sector, but it takes time before one sees any considerable changes in the realized volumes of wood construction.

This study highlights local conditions and the context of the municipality, which have received scarce research attention so far. The responses by municipalities to the barriers and drivers for wood construction brought forward various (network) connections, indicating the relevance of interaction and relationships with other actors when promoting sustainable construction. Such relationships or networks were not the focus of this study, but apparently, their more systematic use could provide new solutions for construction (cf. Bygballe *et al*. 2013). Furthermore, as shown in the study by Smedby and Neij (2013) of collaboration aimed at sustainability in urban development, in addition to building relationships there is an apparent need for active work to ensure mobilization around sustainability issues. Obviously, there are only a few Finnish municipalities that have been active in such mobilization to adopt wood construction on a larger scale. However, municipalities' position and role allows for significant influence on sustainable construction (cf. Anderson *et al*. 1998). Indeed, because of their position, municipalities can adopt the role of both supporting and forcing actions (cf. Bossink 2018) towards wood construction, for instance.

Municipalities' emphasis on local actors, if they belong to the wood construction value chains, is in line with the finding by Franzini *et al*. (2018) that civil servants were interested in WMC if its diffusion was seen to bring benefits to other municipal stakeholders (such as support to local industries or locally sourced wood). Similarly, Hynynen (2016) noted the connections between regional value chains and municipalities. These previous studies, together with our findings, emphasize the need for understanding local conditions and actions: municipalities are closely knit with other actors in their region, and therefore, the civil servants, as well as politicians, need to make decisions that are contextually tied to local conditions.

A key finding of our study is that municipalities have a position in the intersection of different actors and activities that allows for significant influence on sustainable construction. The numbers are still low, but in some cases, we found that the municipalities acted as promoters of sustainable construction. Some larger and committed municipalities (e.g. those of Tampere and Helsinki) seem to be taking on the intermediary role of promoting wooden construction. Consequently, their activities are similar to the ones specified by Vihemäki *et al*. (2020) for state actors, namely, the articulation of expectations and visions, building networks, engaging in learning processes, and exploration. Without a doubt, such activities are needed if the wood building is to increase and a change to more sustainable construction is to take place. Indeed, for a systemic change towards more sustainable societies, the workings of such intermediaries are crucial (Ritvala and Salmi 2010, Patala *et al*. 2020). The study by Vihemäki *et al*. (2020) focussed on ministries and state-associated agencies, and on promotional activities that had a national or regional focus. Our study has filled a gap in the literature with its focus on municipalities and local conditions.

Our findings show the key role of municipal decision-makers in regulating public construction and their role as customers (especially in the early stages of construction projects). Slaughter (2000) pointed to the different roles that companies (and individuals) can take in construction innovation as the process goes through different stages. Presumably, the public sector and municipalities may take on different roles when addressing wood construction, for example, the role of

a gatekeeper (who scans and assesses) or a champion (who encourages innovation). In essence, local politics guide construction, showing the strong linkages between politics, and social and environmental issues, and explaining variation across different municipalities.

Given the novelty of many types of sustainable construction and the prevailing uncertainty that many respondents emphasized, there is an evident need for interaction and boundary spanning across different organizations. This, in turn, calls for careful boundary management (Fellows and Liu 2012) and crossing learning boundaries (Bossink 2018). Furthermore, we show that the actors are facing uncertainty and equivocality when addressing the transformation, as previously shown in connection with construction (Levander *et al*. 2011) and sustainability (Quarshie *et al*. 2021). Apparently, more piloting and information sharing on wood construction is needed to alleviate these problems. The study by Bossink (2018) indicates that innovative knowledge in sustainability that is developed in demonstration projects tends to exclusively flow to its participating firms. Therefore, there is a need for support and force from the regulatory and institutional network to ensure dissemination of the results—here, municipalities can take a proactive role.

Because of our inductive approach, we let the respondents define sustainable construction, and consequently, the emphasis lies on environmental aspects. Municipalities elaborated very little on the social or economic dimensions of sustainable construction. A comprehensive lifecycle analysis including all three sustainability aspects, which is relevant for advancing sustainable construction (Goh *et al*. 2020), was not (yet) adopted at the municipalities. On the other hand, the results show attention on local aspects, and therefore, the strength of and opportunity for municipalities is to actively engage stakeholders and promote collaborative platforms at the project levels, which according to Goh *et al*. (2020) is another critical aspect when adopting triple bottom line in sustainable construction.

Conclusions

Sustainability concerns and climate change actions are on the agenda of decision-makers in the EU and globally. The Finnish governmental programme includes several targets for increasing sustainable construction; for instance, the Ministry of the Environment has launched a long-term wood construction programme. This has influenced regional and municipal strategy work and promoted new types of construction (e.g. types that have increased use of wood). In these ongoing processes, how municipal authorities interact with construction companies (and designers, architects, and other actors) becomes particularly important. We note that municipalities operate in interaction with different actors, representing different sectors of society, as well as at the intersection of different expectations and demands for sustainable construction (including wood construction).

Municipal authorities, therefore, act as gatekeepers who can either promote or hinder new sustainable ways of construction. We investigated the intermediary role of municipalities and showed that the local context impacts the practices of the municipality in sustainable construction. Interviewee perceptions concerning wood construction, such as quotes about the public sector "driving the market" or cities "running the show", explicate the key role played by cities and municipalities at the moment.

Our study also offers practical implications for municipalities and other actors who aim for promoting more sustainable construction. Firstly, municipalities have several means (e.g. zoning and land-use plans) for influencing construction, and their role is particularly important in the first stages of construction projects. Indeed, many of the comments made by the interviewees point to the critical role of planning and preparation in wood construction, and they deserve attention from managers and scholars in future studies. The role of municipalities is widely acknowledged by other actors, and therefore, municipalities occupy a position where they can actively promote (or hinder) sustainable construction. Secondly, there is a need for pilot projects and information sharing to reduce the prevailing uncertainty and risk aversion in relation to new solutions and wood construction. Thirdly, municipalities' responses in the study only address environmental sustainability. In the future, there is a need for a more holistic approach to sustainability (e.g. in the format of integrative life-cycle analyses) to account for the social and economic aspects as well if municipalities aim to drive the more sustainable construction that the society needs.

The focus on environmental sustainability is a limitation to our study as well. Future studies can therefore add to this by investigating the social and economic pillars of sustainability. Our framing of municipalities at the intersection of different actors and activities in relation to promoting sustainable construction (used here to frame environmental aspects) allows for such extensions as well. Another suitable avenue would be comparative studies in other

countries that would add to our single-country study. Such an investigation would help in understanding more generally how different institutional forces and conditions impact developments in sustainable construction. In addition, in-depth case studies of particular municipalities would shed more light on the local conditions and on politics—topics that arise in our study and deserve more attention.

We show that the process of moving towards more sustainable construction has started but tends to be slow. It takes time for the factors pushing from above to gain concrete results, and systemic change is not without problems. Some cities and municipalities are leading the way by realizing pilot projects. Explicating the complexities and successes in these interactions in more detail in coming studies will contribute to fostering sustainable construction in the future. Although the volumes of (public) large-scale wood construction are still low (and lagging behind in comparison with many other countries) and there remains much to do, our study shows that important developments in the areas of sustainable construction are already underway and municipalities play a critical role in this process.

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References

Anderson, H., *et al.*, 1998. Position and role: conceptualizing dynamics in business networks. *Scandinavian journal of management*, 14, 167–186.

Bengtson, A. and Håkansson, H., 2008. An interactive view of innovations: adopting a new timber solution in an old concrete context. *The IMP journal*, 2 (3), 19–35.

Bossink, B., 2018. The influence of knowledge flow on sustainable innovation in a project-based industry: from demonstration to limited adoption of eco-innovations. *Journal of cleaner production*, 193, 249–262..

Brege, S., Stehn, L., and Nord, T., 2014. Business models in industrialized building of multi-storey houses. *Construction management and economics*, 32 (1), 2, 208–226.

Bygballe, L.E., Håkansson, H., and Jahre, M., 2013. A critical discussion of models for conceptualizing the economic logic of construction. *Construction management and economics*, 31 (2), 104–118.

Bygballe, L.E. and Ingemansson, M., 2014. The logic of innovation in construction. *Industrial marketing management*, 43 (3), 512–524.

Carbonara, N. and Pellegrino, R., 2020. The role of public private partnerships in fostering innovation. *Construction management and economics*, 38 (2), 140–156.

Carbonneutralfinland.fi, 2020. Hinku network – towards carbon neutral municipalities. https://hiilineutraalisuomi.fi/en-US/Hinku

City of Helsinki, 2017. Kuuden suurimman kaupungin kaupunginjohtajien ilmastoverkosto 14.12.2017: Aloite 13. Puurakentamisella vahvistetaan kaupunkien kestävää kasvua [Climate network of the mayors of the six largest cities 14.12.2017: Initiative 13. To strengthen sustainable city growth through wood construction]. https://www.hel.fi/static/liitteet/kanslia/ilmastoaloite-puurakentamisen-edistaminen.pdf

Creswell, J. W., 2013. *Qualitative inquiry and research design: choosing among five approaches*. 3rd ed. Thousand Oaks, CA: Sage Publications.

de Vries, H.J. and Verhagen, W.P., 2016. Impact of changes in regulatory performance standards on innovation: a case of energy performance standards for newly-built houses. *Technovation*, 48–49, 56–68.

Dubois, A. and Gadde, L.-E., 2002. The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction management and economics*, 20 (7), 621–631.

Elkington, J., 1997. *Cannibals with forks: the triple bottom line of 21st century business*. Oxford: Capstone.

Fellows, R. and Liu, A.M.M., 2012. Managing organizational interfaces in engineering construction projects: addressing fragmentation and boundary issues across multiple interfaces. *Construction management and economics*, 30 (8), 653–671.

Franzini, F., Toivonen, R., and Toppinen, A., 2018. Why not wood? Benefits and barriers of wood as a multistory construction material: perceptions of municipal civil servants from Finland. *Buildings*, 8, 159.

Gann, D.M. and Salter, A.J., 2000. Innovation in project-based, service-enhanced firms: the construction of complex products and systems. *Research policy*, 29, 955–972.

Giesekam, J., Barrett, J.R., and Taylor, P., 2016. Construction sector views on low carbon building materials. *Building research & information*, 44 (4), 423–444.

Gluch, P. and Svensson, I., 2018. On the nexus of changing public facilities management practices: purposive and co-creative actions across multiple levels. *Construction management and economics*, 36 (5), 259–275.

Goh, C.S., *et al.*, 2020. Revisiting triple bottom line within the context of sustainable construction: a systematic review. *Journal of cleaner production*, 252, 119884.

Gosselin, A., *et al.*, 2017. Main motivations and barriers for using wood in multi-story and non-residential construction projects. *Bioresources*, 12 (1), 546–570.

Government Programme, 2019. Programme of Prime Minister Sanna Marin's Government 10 December 2019. Inclusive and competent Finland – a socially, economically and ecologically sustainable society. http://urn.fi/URN:ISBN:978-952-287-811-3

Hill, R.C. and Bowen, P.A., 1997. Sustainable construction: principles and a framework for attainment. *Construction management and economics*, 15 (3), 223–239.

Hurmekoski, E., 2017. *How can wood construction reduce environmental degradation?* Joensuu, Finland: European Forest Institute.

Hurmekoski, E., Jonsson, R., and Nord, T., 2015. Context, drivers, and future potential for wood-frame multi-story construction in Europe. *Technological forecasting and social change*, 99, 181–196.

Hurmekoski, E., Pykäläinen, J., and Hetemäki, L., 2018. Long-term targets for green building: explorative Delphi back casting study on wood-frame multi-story construction in Finland. *Journal of cleaner production*, 172, 3644–3654.

Hynynen, A., 2016. Future in wood? Timber construction in boosting local development. *European spatial research and policy*, 23 (1), 127–139.

Hytönen, J., 2016. The problematic relationship of communicative planning theory and the Finnish legal culture. *Planning theory*, 15 (3), 223–238.

Kuntaliitto, 2020. Finnish municipalities and regions. Association of Finnish Municipalities. https://www.localfinland.fi/finnish-municipalities-and-regionsandkuntaliitto.fi

Lazarevic, D., Kautto, P., and Antikainen, R., 2020. Finland's wood-frame multi-storey construction innovation system: analysing motors of creative destruction. *Forest policy and economics*, 110, 101861.

Lazoroska, D. and Palm, J., 2019. Dialogue with property owners and property developers as a tool for sustainable transformation: a literature review. *Journal of cleaner production*, 233, 328–339.

Levander, E., *et al.*, 2011. Construction clients' ability to manage uncertainty and equivocality. *Construction management and economics*, 29, 753–764.

Lindblad, H. and Gustavsson, T.G., 2021. Public clients' ability to drive industry change: the case of implementing BIM. *Construction management and economics*, 39 (1), 21–35.

Lähtinen, K., Harju, C., and Toppinen, A., 2019. Consumers' perceptions on the properties of wood affecting their willingness to live in and prejudices against houses made of timber. *Wood material science & engineering*, 14 (5), 325–331.

Meacham, B.J. and van Straalen, I.J., 2018. A socio-technical system framework for risk-informed performance-based building regulation. *Building research & information*, 46 (4), 444–462.

Ministry of the Environment, 2019. Method for the whole life carbon assessment of buildings. Publications of the Ministry of the Environment 2019, 23. http://urn.fi/URN:ISBN:978-952-361-030-9

Ministry of the Environment, 2020a. Wood building program. https://ym.fi/en/wood-building

Ministry of the Environment, 2020b. Wood in public construction. https://ym.fi/en/wood-in-public-construction

Motiva, 2020. Energy efficiency agreements. https://www.motiva.fi/en/public_sector/energy_efficiency_agreements

National Geographic, 2020. Will the skyscrapers of the future be made out of wood? https://www.nationalgeographic.com/science/article/skyscrapers-of-the-future-will-be-made-out-of-wood

Obwegeser, N. and Müller, S.D., 2018. Innovation and public procurement: terminology, concepts, and applications. *Technovation*, 74–75, 1–17.

Patala, S., Salmi, A., and Bocken, N., 2020. Intermediation dilemmas in facilitated industrial symbiosis. *Journal of cleaner production*, 261, 121093.

Puuinfo, 2020. Wood info. Puukuokka-kerrostalokortteli (Puukuokka – Wooden apartment block). https://puuinfo.fi/arkkitehtuuri/asuinkerrostalot/puukuokka-kerrostalokortteli

Quarshie, A.M., Salmi, A., and Wu, Z., 2021. From equivocality to reflexivity in biodiversity protection. *Organization & environment*, 34 (4), 530–558.

Rasmussen, G., Jensen, P., and Gottlieb, S., 2017. Frames, agency and institutional change: the case of benchmarking in Danish construction. *Construction management and economics*, 35 (6), 305–323. https://doi.org/10.1080/01446193.2017.1298824

Ritvala, T. and Salmi, A., 2010. Value-based network mobilization: a case study of modern environmental networkers. *Industrial marketing management*, 39, 898–907.

Slaughter, E.S., 2000. Implementation of construction innovations. *Building research & information*, 28 (1), 2–17.

Smedby, N. and Neij, L., 2013. Experiences in urban governance for sustainability: the constructive dialogue in Swedish municipalities. *Journal of cleaner production*, 50, 148–158.

Steinhardt, D., *et al.*, 2020. The structure of emergent prefabricated housing industries: a comparative case study of Australia and Sweden. *Construction management and economics*, 38 (6), 483–501.

Tampere, 2020. Project: increasing multi-storey wood buildings in Pirkanmaa-region. Wood construction in Tampere and Pirkanmaa, 29.9.2020. https://www.metsakeskus.fi/puukerrostalorakentaminen-kasvuun-pirkanmaalla

Toppinen, A., *et al.*, 2018. The future of wooden multistory construction in the forest bioeconomy –a Delphi study from Finland and Sweden. *Journal of forest economics*, 31, 3–10.

Toppinen, A., *et al.*, 2019. Internal and external factors of competitiveness shaping the future of wooden multistory construction in Finland and Sweden. *Construction management and economics*, 37 (4), 201–216.

Turk, Z. and Klinc, R., 2020. A social–product–process framework for construction. *Building research & information*, 48 (7), 747–762.

United Nations, 2017. The sustainable development goals report 2017. https://unstats.un.org/sdgs/files/report/2017/TheSustainableDevelopmentGoalsReport2017.pdf

United Nations, 2020a. Development goals. https://www.un.org/sustainabledevelopment/sustainable-development-goals/

United Nations, 2020b. Environment programme. 2020 Global status report for buildings and construction: towards a zero-emission, efficient and resilient buildings and construction sector. Nairobi. www.globalabc.org

Vihemäki, H., *et al.*, 2019. Institutional and policy frameworks shaping the wooden multi-storey construction markets: a comparative case study on Austria and Finland. *Wood material science & engineering*, 14 (5), 312–324.

Vihemäki, H., Toppinen, A., and Toivonen, R., 2020. Intermediaries to accelerate the diffusion of wooden multi-storey construction in Finland. *Environmental innovation and societal transitions*, 36, 433–448.

Viholainen, N., *et al.*, 2021. Bringing ecosystem thinking to sustainability-driven wooden construction business. *Journal of cleaner production*, 292, 1-13.

Viholainen, N., *et al.*, 2020. Citizen views on wood as a construction material: results from seven European countries. *Canadian journal of forest research*, 51, 647–659.

Whiteman, G., Walker, B., and Perego, P., 2013. Planetary boundaries: ecological foundations for corporate sustainability. *Journal of management studies*, 50, 307–336.

Woolthuis, R.K., *et al.*, 2013. Institutional entrepreneurship in sustainable urban development: Dutch successes as inspiration for transformation. *Journal of cleaner production*, 50, 91–100. http://dx.doi.org/10.1016/j.jclepro.2012.11.031

Appendix 1. Interview themes

The role of cities and other municipalities in wood (low-carbon) construction

1. Please describe your job and tasks, and how they relate to wood/low-carbon construction.
2. How does your municipality support and realize wood construction, large-scale wood construction in particular? Who supports it and how?
3. Please tell us about the history of wood/low-carbon construction in your municipality? How and when has it emerged? Why?
4. How is wood/low-carbon construction perceived/supported internally (within your municipality/across units)?
5. With whom does your municipality cooperate in this area? Which are your most important stakeholders in wood/low-carbon construction (e.g. construction companies)?
6. What kind of concrete practices do you adopt in the support of wood construction (e.g. zoning, providing lots, self-construction)?
7. What are the most important barriers for wood construction? Who or what curbs wood construction?
8. Is wood construction included in the municipal strategies? If so, how?
9. What is the role of inhabitants or consumers? How are they engaged in wood construction or urban development?
10. What is the role of local politics?
11. Please, provide examples of wood construction—where, when and why are wood construction projects realised? How do the projects develop, and how does their future look?
12. How do national targets for wood construction (e.g. the governmental programme, the national targets of the Ministry of the Environment) impact on your municipality? What kind of impact does the support (the subsidies) from the ministry have?
13. What kind of education on this topic does your municipality offer or need?
14. What kind of wishes do you have related to this matter in relation to your municipality/Finland?
15. How can the university/researchers contribute to this area?
16. Is there any other issue you would like to raise here?