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Communicating Added Value in Wooden Multistorey Construction

Cecilia Mark-Herbert, Elin Kvennefeldt and Anders Roos

Abstract

Climate changes point to the needs to find sustainable materials for residential multistorey housing as a growing proportion of populations across the world live in urban areas. Despite positive environmental effects, wood has a limited use in multistorey constructions even in countries with a strong tradition to use wood in residential housing, such as Sweden. As new materials, techniques were developed and studies of properties of wood as a construction material were communicated, and legislation was altered in Sweden in the mid-1990s, allowing for the use of wood in multistorey housing. The expected market growth was slow and uneven even when incentivizing programs were developed. This chapter explains consumer perspectives in a town, Växjö, where the tradition of using wood in multistorey construction is strong. It points to the needs of knowing more about consumers' perspectives—in order to communicate added values, that is, environmental benefits, in suitable market channels.

Keywords: consumer perceptions, product-dominant logic, residential construction, service-dominant logic, sustainable development

1. Sustainable development in residential construction

The world population is projected to increase by more than 1 billion people in the next 15 years, reaching 8.5 billion in 2030 and 9.7 billion in 2050 [1]. This forecasted growth in population points to an increase in demand for housing where a growing proportion of the population will live in cities. The projection points to an increase from the current 54 to 66% living in cities by the middle of this century [2]. Cities will continue to be the arena for residence and for commercial activities, a place with needs for sustainable changes.

Sustainable construction, for residential and commercial needs, can be seen as an opportunity for the construction industry. According to Bordeau [3, p. 364], the main challenge is “*to transform the demand for sustainable development into an opportunity, to create and access new markets, and to innovate responses which satisfy traditional industry demands and the new societal demands for sustainable development.*” It is claimed that the construction and utilization of buildings could be reduced as much as 40% of the energy consumption, the use of extracted materials can be reduced by 50%, and the total GHG emission could be reduced 35% [4]). The call for sustainable methods in construction is clear, and goals are set up globally in Sustainable Development Goals as well as locally in political goals and corporate objectives.

In recent years, a positive spread of wooden multistorey construction (**WMC**) in the Nordic countries points to business opportunities as part of an emerging forest-based bioeconomy [5]. However, changes in construction practices in multistorey construction for residential use are slow. The aim of this chapter is to explain factors that influence consumer behavior, focused on purchasing an apartment in a wooden multistorey construction (house), which ultimately may decide how markets for WMC develop.

The following text starts with a brief overview of factors that influence the development of markets for wood-based residential construction. Perspectives on wood as a construction material, policy aspects, and market development serve as a background for understanding how consumer perceptions are developed. The following subchapters account for a theoretical understanding of consumer behavior, an empirical study in light of local market development and a discussion of what can be learned from the case study with regard to the consumers' roles in the development of markets for WMC. A case study of Växjö in Sweden serves as inspiration for learning about market development for WMC.

1.1 Construction materials

Perceptions of physical properties of wood-based materials influence the current practices as well as the development of policies that regulate the use of wood in construction. Properties of wood can be divided in accordance with a number of factors related to, for example, the production of the raw materials (wood), use of raw materials in construction of houses, use of the house or the apartment in the house itself, and last but not least, deconstruction of the house when it is no longer needed. A brief overview of wood properties that have a bearing on its use in construction from a product-dominant logic perspective is provided in **Table 1**.

The list of characteristics of wood can be made much longer, but these properties have a bearing for the empirical study and the context in which it is conducted (Sweden). The perceived characteristics are by no means static, which indicate that as new technologies, products as well as techniques, are developed, some of the perceptions of wood are renegotiated, which may lead to changes in policy and legislation.

1.2 Markets

Historically, wood and stone have served mankind as construction materials for residential housing as well as commercial buildings. The tradition of building residential single houses in wood is well established in Sweden [6] where about 90% of new residential houses are built in wood (wooden frames and/or wood exterior and interior as a major part of the construction material). However, the development of multistorey constructions has been slow in progress in spite of promotional activities to spur market development.

Since 1994 when the legislation for multistorey construction was altered in Sweden, to allow for wood as a construction material (again) in multistorey housing in Sweden, the market has been very slow in development. Promotional activities sanctioned by the Ministry of Industry in 2002 were followed up by more local initiatives, neither of which led to any major market developments. Lately, however, additional governmental efforts, based on political objectives in line with Sustainable Development Goals (**SDG**) and an increased insight in how forestry may serve in the development of bioeconomies, are made to promote wood as a construction material for WMC, for local as well as international markets [7].

Characteristics	Effects	Perspective
Renewable, part of a circular bioeconomy	Carbon sink, an arena for ecosystem services (other productions on the same land), part of bioeconomy system and partial solution to some of the Sustainable Development Goals (SDGs) in more local political objectives and agendas	Society
Traditional and suitable material for house construction	Traditional material that is culturally grounded and part of architectural practices Skills are well developed for family housing construction but less so for multistorey house construction Part of the local construction culture Suitable (light weight) material for prefabrication and fast on-site assembly	Society Industry Consumer
Physical properties with regard to temperature, sound, and weight	Product and process innovation has paved the way for fire-resistant alternatives and safe use of wood in construction frames Offers possibilities for modular prefabrication construction where the efficiency in material use is higher Flexibility in the construction process makes it easier to adapt to the physical context for the construction. Wood is also a lighter material than concrete, which points to usefulness when the grounds are not stable Wood materials offer a nice atmosphere when used internally in a construction. Moisture, fire, and sound properties need to be taken into account in the adaptation of the production as well as use of the house	Society Industry Consumer
Availability and ownership of wood materials	Wood is naturally occurring in Sweden and the ownership structure promotes development of markets. In the future, forest-based resources may be given additional importance as part of creating bio-based economies	Society Industry Forest owner

Table 1.

Perceptions of wood properties in light of use in multistorey construction based on a review with minor modifications from Sjöström [6].

With a forecasted annual need for 93,000 new homes per year in Sweden, the predicted construction of 120,000 homes for 2018–2019 does not cover the forecasted market needs. Of these new homes, about 10% are currently flats in WMC apartment houses [6]. With an understanding of wood as a construction material and a political will to develop WMC markets, what are the views of consumers?

1.3 Needs to learn about consumer perceptions

Consumers' views are greatly influenced by norms in society [8]. An increased awareness of human influence on sustainable development is reflected in societal dialog in channels such as media, social media, NGO influences, and more traditional elements of culture such as family and traditions. Consumer expectations, values, and communicational traditions are therefore of tremendous importance for understanding decision-making in purchasing an apartment (often referred to as an example of an investment product).

Communication is seen as key in the purchasing process since it concerns a lot of money, and a product that consumers may not be capable of evaluating all aspects of *ex ante*. We assume that consumers need information to make a well-grounded decision about a major investment, their new home [9]. Given the understanding of wood properties, a need for housing, and consumers' need for information about an investment, their home, our aim is to explain the perceived advantages among apartment owners in wooden multistorey houses.

Themes for questions	Theoretical starting point
Awareness of living in a WMC apartment Where did you get information about the wooden construction of the house?	Consumer awareness of alternatives in consumption [10]
Information about climate-related properties of a wooden house	Information about wood properties [11, 12]
Channel for information (about wood properties and climate properties)	Channel for communication [8]
Factors that influenced the decision to buy the apartment	Decision-making [10, 13, 14]

Table 2. Themes for the interview with residents in apartments in multistorey constructions, in Växjö and theoretical origin for the theme [9].

1.4 Approach

An empirical case study was conducted with the ambitions to investigate consumer perceptions of the apartment they own (in a wooden multistorey house) [9]. A small town in Sweden, Växjö, was selected because the WMC tradition was well developed. Växjö is often referred to as “wood construction town”, and it is seen as a forerunner for urban development in Sweden.

Three WMCs were selected (Strandsnäckan, Wälludden, and Portvakten), and in these houses, (11, 14, and 17, respectively), randomly selected residents were willing to contribute to the project in an interview (in February–March, 2018). After receiving an informed consent from the respondents and a promise for the respondents to be anonymous, the interview was made as a leisure dialog, based on open-ended thematic questions. Themes for the interview covered were connected to factors that the literature review had pointed to as key for making a residential purchasing decision (Table 2).

The result from the interviews in the selected houses and randomly selected residents does not lend itself to generalization. It should be seen as indicative of what might have explanatory power and what we need to investigate further.

2. Understanding consumer perspectives

Market development can be explained from various perspectives. Policy instruments, such as taxes, information campaigns, and legislation play instrumental roles in promoting desired behaviors. Industrial development such as research and public private partnerships may also account for market development. In this case, our focus rests on the role of the consumer.

2.1 Marketing

A traditional view of a theory for consumers’ purchasing behaviors for investment products is described in these phases [10] as part of a planned behavior (theory of planned behavior):

- I. Need recognition
- II. Searching and gathering information
- III. Evaluating the alternatives

IV. Actual purchase of the product or the service

V. Postpurchase evaluation

Although the process appears to be linear, it is normally an iterative process, in which the consumer gains additional understanding of choices made and choices to be made. Communication fills important roles throughout the purchasing process [13]. It may seem strange that we did not focus on phase II–IV but rather on V, the after-purchase evaluation in our study. This is explained by our understanding that consumers' postpurchase behavior is assumed to influence their future purchases as well as in their roles as ambassadors, in communication with other consumers.

2.2 Marketing communication

The marketing mix (product, price, promotion, and place) [10] serves as a starting point in the purchasing process. This model offers an understanding of marketing from a producer perspective. The classical model is reinterpreted, focusing on the four P's in terms of customer perspectives as *customer solutions*, *customer costs*, *communications*, and *convenience* [13] in order to understand consumer views. The big difference in perspective, from P:s to C:s, deserves to be emphasized as it gives the consumer a key role in a possible market development for the WMC apartments.

3. The housing situation and markets for multistorey construction (WMC) in Sweden

The markets for residential constructions, houses as well as apartments in multistorey constructions in Sweden, are changing slowly and it does not meet captured in the word, *shortage*. The housing situation varies from one municipality to another, which in part can be explained by political ambitions and by corporate investments. In the metropolitan regions of Stockholm, Gothenburg, and Malmö, housing construction is expected to increase significantly over the coming years to meet the current housing shortage in the country [15] illustrated in **Figure 1**.

The needs for residential house construction in **Figure 1** are clear. According to this forecast, some 90,000 additional homes are needed annually between 2018 and 2024 [15, p. 20]. Looking more closely on what has been completed in terms of residential houses since the late 1930s (**Figure 2**) further supports the understanding of market development needs [16].

Figure 2 shows the number of apartments and single-family houses since the 1940s in Sweden. The new residential construction has been below the needs of markets since the 1970s. The graph also indicates that since 2010 the rate of construction for multistorey houses (apartment homes) is increasing. In 2017, some 51,500 new homes were completed in Sweden, which is a much needed increase. This is explained by a population growth and continued movement of individuals to urban contexts, especially metropolitan areas, from rural areas. However, even with this increase in new homes, it does not cover the forecasted needs of 90,000 new (additional) homes on an annual basis [15].

3.1 Traditions of using wood in construction

A tradition to use wood in house construction in Sweden is well established. Of the approximately 10,000 new single houses that are built in Sweden on an annual basis, some 90% are built in wood [17]. The situation for multistorey construction

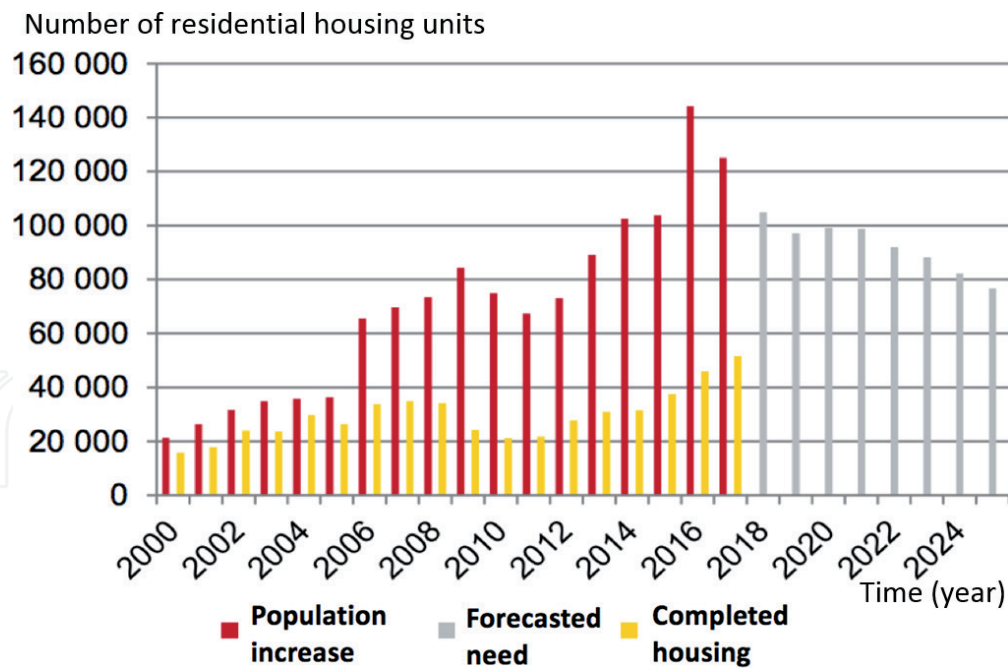


Figure 1. The relationship between completed housing construction and the forecasted need for housing up to the year 2025 [15].

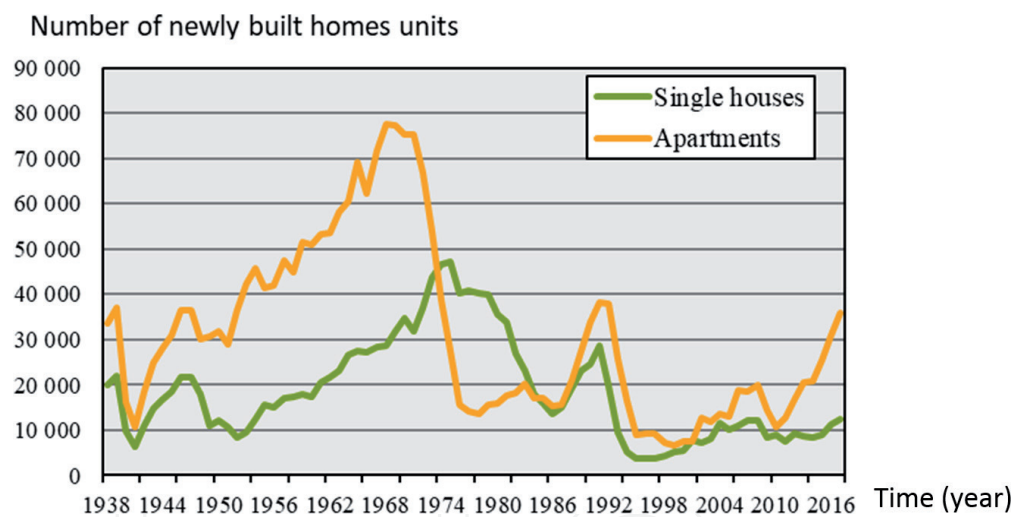


Figure 2. Number of completed apartments in multifamily houses and single-family houses from 1938 to 2017 in Sweden [16].

is quite different. Due to fear of fire, a legislation has been limiting construction in wood (over two levels). However, since 1994, it is permitted to use wood as a bearing material in multistorey residential construction in Sweden. Development of new techniques, materials, and tests of the properties of wood in construction has proven that wood serves as a safe and esthetically pleasing material, in addition to the properties that benefit sustainable development.

The ban to use wood in multistorey construction has had consequences on the market in terms of a deprived skills and technological development [13]. Other construction materials, such as concrete and steel, have taken the lead in practices for multistorey construction. When the legislation was altered in 1994, the market did not respond, which is explained by a change of practices and skills in major stakeholder groups (construction workers, engineers, architects as well as in procurement stakeholders representing municipalities) [18].

Political efforts were made to support the reestablishment of wood practices in multistorey construction in Sweden. In 2002, the Ministry of Enterprise and Innovation presented a proposal to develop a strategy for increased wood construction in Sweden, “More wood in construction DS2004:1” [19]. It was based on the understanding of a need to meet needs of homes located in urban areas, land use, and sustainable development objectives for construction. In spite of political efforts on national and local levels, the market development has remained very moderate.

In 2018, the Swedish Ministry of Industry presented a policy document “Focus on Wood Construction” [20], which clearly voices the understanding of needs for multistakeholder dialogues in order to promote a market development. It points to key stakeholders as forest-based industry corporations, municipalities, architects, and consumers as drivers of a change in construction practices. Representing the government, representatives of the Ministry describe perceived benefits in terms of creating new jobs, technological development, and increased housing production, with an understanding of these outcomes as part of sustainable development.

At a local level, Swedish municipalities address political objectives related to sustainable development and residential construction with different objectives. One of the municipalities that has worked with wood in multistorey construction in a very structured way is Växjö.

3.2 Consumer perspectives in Växjö

The town, Växjö, is often referred to as a “wood construction town” with an ambition to be a center for wood construction expertise. It is located in the southern part of Sweden, surrounded by forests, which explains the well-developed industrial system that uses the forest resources. Municipal ambitions of sustainable development efforts as well as traditions may account for politically well-founded public procurement efforts for wooden multistorey constructions (WMCs). Their local strategies have supported WMC for a long time [21] with ambitious goals set for 50% of the new constructions of multistorey homes to be in wood by 2020. Municipal bold objects set in 2013 and efforts to follow up on progress have resulted in 44% new WMC already by 2015 [22]. The efforts continue to reach the 50% target by 2020 [23].

Assuming that municipal politics and actions reflect consumer values and needs, this pilot study set out to investigate consumer perspectives of WMC. The interviewed residents of apartments in WMC houses were interviewed, and **Table 3** provides an overview of the results [9]. The 42 interviews in three residential areas are merged, as they did not show any major differences from one residential area to another.

Empirical results (**Table 3**) from the interviews indicate that a majority of the apartment residents are aware of that they live in a WMC apartment. The source of that information is less clear, which might be explained by some time having passed since the purchase was made or not being the first owners of the apartment.

Channels for information about climate properties of wood construction is preferred in word of mouth dialogs, web pages, printed matters, and media information in general.

The last theme for the interview, the factors that were of major importance for purchasing an apartment or not, points to the importance of the location of the apartment. Size, price, and atmosphere also play important roles. The last listed factor, environmental properties, offers some food for thought.

Thematic questions	Results from interviews (in total 42)
Awareness of living in a WMC apartment	34 knew they lived in a WMC apartment
Source of information about WMC apartment	6 thought it was a concrete house 3 did not know about the construction material 12 persons are aware of having been given information about WMC Oral information from sales agent and printed information from the house association
Information about climate-related properties of a wooden house	14 are aware of having been given information 22 do not recall any information 6 do not know
Channel for information (about wood properties and climate properties)	21 prefer to get information in personal dialogs (word of mouth) 12 would prefer to get information on a web page 11 request printed information and 7 reply that TV and radio is a good channel for communication
Factors that influenced the decision to buy the apartment	The location of the apartment (34) Size of apartment (16) Price (13) Atmosphere (13) Environmental properties (6)

Table 3.

Results from interview with 42 residents in apartments in wooden multistorey constructions (WMCs) in Växjö (February–March, 2018) [9].

4. Communication and market development

The development of a market can be seen from many perspectives. Starting with a product-dominant logic, focusing on the product (an apartment in a WMC house), we continue the discussion with a more service-dominant logic [21] perspective focusing on societal and consumer needs.

4.1 A product-dominant perspective—consumer behavior

This project set out with an understanding of the importance of communication as means to promote consumer behavior. Previous research on consumer awareness in purchasing apartments in WMC [24–29] points to shortcomings in communication regarding climate effects.

Our empirical study shows that efforts to communicate have been made, which is to be expected in a “wood town” like Växjö, but the consumers’ recollection of the information from the purchasing situation was not very clear. This may be explained by some time having passed since the purchasing decision was made, information materials that were not tailored to the needs of the consumers, the interviewee not being the person that made the purchasing decision or information that was provided in a communication channel that was not suitable. The level of awareness of benefits related to wood as a construction material in WMC appears to be limited. Consumers’ limited insight to technical production-related benefits is expected, but the awareness of physical properties in use and environmental benefits with WMC also appears to be moderate among the interviewees. There is, clearly, room for improvements if consumer awareness is seen as important.

The last question in the empirical study, about factors that determine a purchasing decision of an apartment in a WMC house, points to needs to rethink our

understanding of what influences market development. The first thing we need to problematize is that of the difference between *preference* and actual *purchasing decision*. Housing preferences are influenced by a number of factors [14], for example, household size, transparency of the housing market, availability of alternative housing options, and lifestyle-related factors. All of the above, in addition to personal budget constraints, financial institute conditions for taking loans and governmental policy systems that may or may not offer tax deductions and subsidies, on the other hand, influence purchasing decisions. It seems that studies of conditions of consumer awareness of environmental aspects of WMC require a contextual understanding of institutional conditions for making decisions.

Worth noticing is that the consumers did not mention health aspects influencing their purchasing decision in our empirical study, which is somewhat surprising. After all, the indoor environment is important for an individual's life, especially in temperate climate such as that of Sweden. Burnard and Kutnar [28] point to health aspects in terms of wood as a construction material that may relax stress.

Given the current shortage of housing alternatives in Sweden [15], there might not be a need to communicate WMC benefits. Consumers in need of an apartment will buy it, independent of construction materials used in the house [9]. Furthermore, the importance of location points to that this will be key if consumers are given alternatives.

As pointed out by Jansen et al. [14], availability of housing alternatives plays a key role. If there are no WMC apartment available in a particular geographical area, of a requested size and price range, that will limit the consumer's possible choice of a WMC apartment. The logic is the same as that of buying food in a food store. It is the management's portfolio decisions in a food store that will set the limits to what products that I may purchase in that food store.

4.2 A service-dominant perspective—societal and consumer needs

In this case, goals for expanding markets for WMC were set on a national level as a way to meet forecasted housing demands, preferences, and work toward sustainability objectives in an industry that uses a substantial amount of resources. Some municipalities, like Växjö, picked up on these national objectives and made it their local agenda, but the vast majority of municipalities in Sweden have not.

A service-dominant logic starts with consumer needs and looks for ways in which these needs can be met. With an understanding of consumers' limited capacity to influence the material choice in house construction, it seems that other economic and macrolevel incentives are needed. Standards and sustainability ecolabels would be one way to go [30], but Hurmenkoski et al. [27] call for regulatory frameworks to support the WMC market developments. Although the environmental benefits in using wood for house constructions are associated with societal benefits [31], it cannot be assumed that consumers fully comprehend the benefits or are willing to pay extra, which points to needs for policy instruments to be used such as taxes and subsidies to promote market development in a direction toward sustainable development.

Looking into the future, Høibø et al. [32] suggest that future generations are more environmentally aware when it comes to paying attention to house construction materials. Their findings support other researchers' views [8, 13, 14] that younger generations, the future inhabitants of apartments in WMC houses, future generation of business leaders, and politicians will be more aware of SDGs in their private life as well as in their professional conduct. Given the lasting character of a house that may last for hundreds of years, it is important to include educated guesses of where the future is taking us in strategic choices.

5. Conclusions

Communicating climate effects of WMC appears to be critical in business to business (B2B) relations, in private and public procurement. Consumers are not making the portfolio decisions related to building WMC houses. It is the construction agents, municipal planning board, and suppliers in the construction industry, like architects, construction planners, and construction workers who set the market in which consumers usually only can make a choice of an apartment. That is to say that in a town that does not have political objectives to develop WMC, there will be less apartment in wooden houses (WMC) and the consumer would have to make a choice from what is available on the market.

In the presented case of Växjö [9], bold political objectives were set up and communicated. They serve as an action plan and a collective contract to work toward sustainable development in the construction of residential housing as part of what Beltz and Peattie [13] refer to as *sustainability marketing transformations*.

Shortcomings in development of a housing market with options for the consumer to make a choice from (WMC or concrete buildings) are clear. They can be explained by a number of factors, for example, relating to:

- current practices in the construction industry (ongoing contracts and habitual practices) [3]
- organizational arrangements [6]
- skills that are built up over time using the current materials [18]
- training programs of professionals, architects, construction planners as well as construction workers [18, 33]
- political objectives and priorities (what is built where) [3, 29]
- the current housing situation reflected on the market [14]

All of these factors may serve as market development constraints, and they need to be further investigated to provide an understanding of the context for WMC market developments.

In conclusion, wood offers superior qualities with regard to developments of circular bioeconomies, as part of sustainable development. Consumer awareness of WMC as means to make choices in support of sustainable development is important. Consumers may not influence the current market offers directly in their purchasing decisions, in a short time frame. They will have to make a choice among the current offers if they need a house or an apartment now, but they may still influence political policies and actions in voting procedures, NGO engagement, and taking the role as a WMC ambassador in everyday dialogs.

Continued research is needed to explain policy implications of stimulating the market for WMC. Examples of such areas have to do with organizational aspects as well as policy implications of market transitions toward sustainable development, where an increased use of WMC is seen in models for circular bioeconomy. Organizational aspects of markets where the WMC has been successful are associated with collaboration efforts in so-called public-private partnerships [6]. Experiences from recent political efforts of market transitions [13, 34] are seen in banning the old light bulbs, stimulating markets for solar panels and bicycles

with batteries through subsidies. All of these examples might serve as inspiration to forecast how policy instruments can be used efficiently to promote sustainable development in the development of WMC markets.

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Author details

Cecilia Mark-Herbert*, Elin Kvennefeldt and Anders Roos
Department of Forest Economy, Swedish University of Agricultural Sciences,
Uppsala, Sweden

*Address all correspondence to: cecilia.mark-herbert@slu.se

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