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## FUTURE IN WOOD? TIMBER CONSTRUCTION IN BOOSTING LOCAL DEVELOPMENT

**Abstract:** Large scale timber construction has been on the upswing for some time in many European countries. Besides the building cluster, also regions and cities have taken advantage of the ongoing timber boom in their economic and spatial development. In this article the focus is on the South Ostrobothnia region and the city of Seinäjoki in Western Finland, where the potential of the business is quite weakly exploited regardless of favourable preconditions. By studying the key actors of the innovation network we are able to better understand the premises of the local development platform that should aim at boosting timber construction.

**Key words:** urban development, regional development, timber construction, innovation network, development platform.

### 1. INTRODUCTION: TIMBER CONSTRUCTION IN TURNING POINT

One objective of the Finnish government's programme in 2011 was to promote large-scale timber constructions such as, for example, multi-storey apartment blocks. The government's resources in contributing to the success of one branch of industry are usually limited, but in this case the passing of favourable legislation and the launching of a dedicated development programme have been decisive.

Behind the programme there are global pressures to develop more advanced technologies and systems for timber construction. The advantages of more extensive use of wood in combating climate change seem undeniable. Due to the surge of the timber-based building industry in central Europe, Sweden and Norway, there are expectations for growing demand and business potential in Finland. Among other reasons for interest in wooden buildings is, for example, a steady increase in moisture problems often found in buildings made of concrete.

Now, in the autumn of 2015, the four year term of the Finnish government has expired, and the extent of the realisation of these objectives should be critically

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assessed. Regarding timber construction, the situation seems quite good. The aim was to increase the share of wooden multi-storey apartment blocks from one to 10% of the annual production of flats, and this objective is almost being met. However, despite the progress, the situation is still critical. There is a risk of increase in price of widely-used CLT (cross-laminated timber) -based modules due to lack of competition in the trade. This would be harmful, since an increase in the use of wood in the building industry can only come about if it is competitively priced. In this sense the development of timber construction, which started well, may have entered a decisive turning point.

The impacts of developments in wood construction are not limited to environmental assets or to business opportunities of timber producers and the building industry. The potential of timber construction could be conceived in broader terms, as value chains tend to be more geographically decentralised compared with other industrial building technologies. This aspect could have significance in regional and local strategies if taken seriously into consideration. Earlier, as all CLT-elements were imported from Austria, these issues were irrelevant, but now CLT-elements are also produced in Finland. In summary: the turning point that was mentioned above should not be considered insignificant when we are developing our cities and regions.

Raw material for timber construction is produced and processed all over Finland. The whole production chain of wood from forest to construction site could be easily handled by small and middle-sized firms. According to the studies of Finnish PTT-research centre<sup>1</sup>, the growth of timber construction has positive impacts on the national economy (Esala *et al.*, 2012; cf. Petersen and Solberg, 2005). In addition, studies made in the Ruralia Institute of the University of Helsinki point out that there are positive impacts on the regional level as well (Männistö *et al.*, 2012).

It is fair to say that cities, municipalities and regions should now seize the current momentum. Of course there are other important local and regional actors, but the support of public bodies is vital, as there are rates of employment, tax revenues and the future prospects of small and middle-sized companies at stake. On the other hand, local and regional authorities have an access to effective means and instruments to promote this kind of development.

However, because of the complicated nature of local development, we need to have a closer look at the drivers and potentials of timber construction, as well as the central actor networks and possible development platforms. The findings and arguments in this article are based on the results of our research project “Puu-Hubi” (Wood-Hub) that was carried out in the South Ostrobothnia region in Western Finland between the years 2012–2015. The aim of the Puu-Hubi project was to identify the information needs of the firms in new timber construction technologies. Based on this information, the project team organised training for the firms

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<sup>1</sup> <http://ptt.fi/en>

to provide competences to meet their needs. The project was a joint effort of Seinäjoki University of Applied Sciences and Tampere University of Technology, and it was funded by ESF (European Social Fund) -financing. (Hynynen *et al.*, 2015).

## 2. DRIVERS AND POTENTIALS

The ruling megatrend that contributes to an increased use of wood in building industry is obviously climate change. Large wooden buildings serve as a good long-term repository for carbon. The sustainability aspect gets even stronger if the design is based on the principles of a circular economy, as in the car industry. (cf. Petersen and Solberg, 2005).

The scientific community and governments all over the world are gradually reaching agreement on the reasons and impacts of climate change, albeit common policy formations will take a longer time. Some signs of progress are emerging here and there, like the ERA17-action plan (Energy-Smart Built Environment 2017) in Finland, which aims at substantial improvements in energy-efficiency of the built environment. In practice this means the implementation of related EU directives on a national level, as well as life cycle assessments of buildings. Arguably these kinds of policies will favour the use of wood-based materials in building.

In addition, there is also a programme for promoting bio-economy in Finland. According to the programme's website:

Bio-economy means an economy which utilises the biological natural resources and turns them into food, energy, and other products and services. It is characterized by the use of clean technologies which save the environment and by efficient recycling of materials. Bio-economy makes us less dependent on fossil fuels, prevents the impoverishment of ecosystems, promotes economic development and creates new jobs.<sup>2</sup>

It seems quite obvious that these kinds of prospects offer strong support for timber construction.

From the standpoint of local development, the positive impacts on regional economies seem especially interesting. As mentioned earlier, the Ruralia-institute of the University of Helsinki carried out a study in South Ostrobothnia where they applied their RegFin –model<sup>3</sup> for simulating the economic impacts of increasing timber construction. The results pointed out that one euro invested in timber construction pays another euro in the regional economy. In the analysis, the chosen target level for the growth of timber construction was 20% of the whole field of construction industry in the region. Consequently, the rate of employment would

<sup>2</sup> <http://www.biotalous.fi>

<sup>3</sup> <http://www.helsinki.fi/ruralia/research/regfin.htm>

climb 1%, which is equivalent to 550 work years. This positive impact would radiate towards other branches, like the lumber industry, woodworking industry and the real estate business. The analysis was based on the assumption that the chain of raw material is only partly self-sufficient regionally. If the whole chain were regional, the rate of employment would climb by as much as 1,5%, creating 1300 new jobs. (Männistö *et al.*, 2012.)

In addition to new construction, there is a growing business potential in the renovation of buildings. It has been estimated that the size of the renovation market in Finland falls somewhere between 30–50 billion euros. The annual revenue of the renovation business has already reached the level of new construction. In the near future, the emphasis of the construction industry will be on the renovation and infill of 1960s and 1970s suburbs built of concrete elements. For this purpose, the so called TES-system (timber-based element system) has been developed in international collaboration of research institutes since 2008. TES provides technology for repairing exterior wall elements by replacing the outer concrete panels with prefabricated wooden elements. This method allows continued residence during the repair work. The technology is ready to use, but before this new system is adopted, construction firms, municipal planning offices, and building inspection authorities need to become more familiar with it. (Soikkeli *et al.*, 2014; Heikkinen *et al.*, 2009).

Interesting possibilities are now within reach, as the new building act in Finland allows high apartment blocks up to eight stories to be made of wood. By using CLT-elements these could be easily erected. Actually, the first eight-storey buildings have already been built in Jyväskylä, Finland. Moreover, in Bergen, Norway, a 14-story wooden apartment block will be soon completed, and in Vienna, Austria, they have ambitious plans to build an 84 meter wooden high-rise (The Guardian 2015). It seems that timber buildings are also considered adequate for completely urban settings. The cities of Växjö and Skellefteå in Sweden are good examples of using novel timber architecture in public and private urban development.<sup>4</sup>

At the moment, there is not enough consumer demand for wooden flats in Finland, but the situation will probably change as environmental issues gain more urgency. There are also studies ongoing that will provide more information on building physics and other kinds of durability and reliability issues that might influence public confidence in timber construction.

It seems that, at least in principle, new timber construction technology could open tempting opportunities for the developers of cities and regions. On the other hand, timber-based building clusters also need supporting acts and interventions from the side of local municipalities and regional authorities in order to take advantage of the emerging market potential.

<sup>4</sup> e.g. <http://www.nordicwoodencities.com/website4/1.0.4.0/3/1/index.php>

### 3. INNOVATION ENVIRONMENT

In the South Ostrobothnia region the main issue is economic competitiveness. Municipalities and firms are already aware of the growing market potential of wooden buildings, but the ability to realise the business potential requires that building clusters have competencies that exploit new technology and markets. In practice, the firms should be able to complement their own internal resources and competences by obtaining complementary resources from external sources. In this sense the *innovation environment* of timber construction is the specific part of the operation environment that provides complementary competences and resources the firms need in their innovative endeavours. However, the innovation environment is not the same for all enterprises, since their needs are different. (Cooke, 2004; Kautonen, 2008) Yet, from the standpoints of local and regional development, the *regional innovation environment* could be considered a common innovation environment for some specific field of industry. Important elements of these environments include, among other things, education, research and development, technical infrastructure, management consultancy and financial support (Camagni, 1991; Virkkala, 2008.)

The term “regional” does not imply that all the resources and competencies will come from the local region. Local and global entities should form a fruitful collaboration to create new know-how. Local arenas are needed for close interaction, and global connections are needed for distant communication. No region is self-sufficient enough to be able to provide all the necessary competencies. In addition, the geographical scales of firms vary (Kolehmainen, 2004; Lechner and Dowling, 2003), as some companies, even in South Ostrobothnia, have established international trade relationships.

It is important to note that firms do not innovate alone. Innovations are developed in networks that consist of diverse actors which include clients, subcontractors, competitors, financiers, administrators, trade associations and research institutes. *Innovation network* refers to all those players that contribute to innovation processes (Cooke *et al.*, 2000; Lundvall, 2001; Virkkala, 2008). If the processes take place in the normal practices of firms, they are sometimes referred to as *open innovation*, as opposed to science-based processes. Some studies point out that innovations are mostly developed in production-based settings (Harmaakorpi *et al.*, 2011; Chesbrough, 2003a, 2003b).

Innovation networks consist of social relations. The qualities of those relations have an effect on the performance of the networks as facilitators of production and economy. Network relations can be divided between those with strong ties and those with weak ties. Usually the strong ties are based on trust between parties, common goals and easy communication due to common language and similar basic access to information. However, strong ties do not necessarily encourage

firms to combine different ways of thinking and acting that finally might result in innovations. Studies have pointed out that open innovation utilizes the weak ties of networks especially. Weak ties force firms to seek solutions from new kinds of reference groups, which might result in fruitful mixes of information and, perhaps, ultimately in innovations. (Burt, 1992; Granovetter, 1973.)

A good example of the utilisation of weak ties is the case of the construction company Lakea Oy, which could be considered the most innovative firm in the field in the South Ostrobothnian building industry. Lakea Oy has been developing building systems based on CLT-modules mentioned in the beginning of this article. There have not been ready-made concepts available, so Lakea Oy has sought co-operation with innovative architects and researchers outside the region. In other words, a relatively underdeveloped innovation network has forced the company acquire competences from elsewhere.

It is not possible to anticipate or control the processes that take place in innovation environments, but the innovation environment itself could be developed deliberately (Sotarauta and Srinivas, 2006). For example, regional arenas for interaction and collaboration between different competences could be organised. These kinds of settings have been termed *development platforms* by some researchers (e.g. Harmaakorpi *et al.*, 2011). Competence-based platforms are able to combine diverse knowledge and create novel variations of competences, as experts from industry, universities and municipalities gather around some common theme or technology.

Development platforms are fundamentally future-oriented arrangements (Harmaakorpi *et al.*, 2011). Technological development by its own right is capable of creating new platforms, but usually they are based on the evolution of existing platforms. In South Ostrobothnia the development paths of timber construction can be easily traced back in the region's history. Traditional rustic houses, high-grade carpentry skills and a strong entrepreneurial culture are well-known characteristics of the region. Yet it requires a visionary mind-set to recognise the elements of evolving platforms that could merge existing potentials and global flows into a local success story. Also, innovation policies should be targeted to the specific features of regional innovation environments.

#### 4. PRECONDITIONS FOR A BREAKTHROUGH

In our Puu-Hubi project the central network of regional players is easily distinguishable, although all the actors do not recognise their own role as an effective node in the innovation network. The key players are in most cases building cluster firms like wood producing enterprises, construction firms, property developers,

architecture offices and civil engineers. Some companies have acquired a lot of knowledge in new construction technologies such as wooden frame systems, fire safety or architectonic possibilities. The common feature of all innovative firms is their connectedness to supra-local value networks, whether it comes to information or business. Yet the market potential would allow much more significant economic performance in the region.

What kinds of supportive resources and competences could the region of South Ostrobothnia offer for the firms? The main goal of the Puu-Hubi project was to figure out the information needs of the firms in new timber construction technologies. Many different theme areas were named, and our task was to organise training for the firms to provide competences to meet their needs. The best experts in Finland were used, so it was anticipated that the feedback from the firms would be positive. Nevertheless, it is not realistic to expect that there will be immediate impacts on numbers of innovations or production volumes. Other resources beyond purely cognitive ones are needed as well. The firms should possess a so called *absorptive capacity* (Cohen and Levinthal, 1990; Zahra and George, 2002). In other words, they need capabilities to evaluate, adopt and apply new information. But even if the firms have these capabilities, the birth of an innovation is anything but a systematic process, and lucky coincidences will still be needed. As we know, innovations can't be pushed, but it is possible to fuel the flow of information in innovation environments.

Of course other organisations besides private firms need absorptive capacity as well. Cities and municipalities are well aware of the market potentials of new timber construction in Finland. At the same time they strive to develop attractive housing and business environments to entice a skilled workforce and promising firms to their area. They place significant resources into marketing efforts by launching trendy urban innovations. Yet it is unusual when these efforts are propelled by the possibilities that timber construction could offer. In Sweden the cities of Växjö and Skellefteå have gained worldwide publicity by creating innovative combinations of timber-based industry, academic research and urban development.

Actually, local governments would have several opportunities to promote timber construction, if they really wanted to. For example, in municipal land-use planning it is possible to regulate building materials, and building inspection authorities have a say in applying fire safety regulations. At least in Finland there are big differences among municipalities in how they apply regulations. In many cities land-use planning and business development offices have been linked together for more efficient urban development. This kind of model offers good chances for simultaneous promotion of the innovative building industry, urban development and energy-efficient economy, as administrative borderlines do not restrict absorptive capacity.



Sometimes we might hear city leaders saying that public authorities can't one-sidedly promote any one single building material, since that would favour certain firms while excluding others. It is fair to say that the increasing use of wood in the building industry will decrease the use of concrete to some degree. However, concrete is also still needed in wooden buildings, at least in foundations and basements. It is also debatable whether higher than 8-storey timber buildings are practical on the whole, but the coming years and ongoing building projects will provide valuable information on this issue.

We can also consider timber construction as one branch of the emerging bio-economy, which might lead, according to some scenarios, to more extensive structural changes of production and the overall economy. This would not be a new situation, as we have seen these kinds of changes before. Like always with structural changes, there are winners and losers, and this conclusion has usually been expressed in the statements of politicians as well as economists. Popular reasoning leans on the statistics describing ongoing economic globalisation. In timber construction it is as much a question of globalisation, as slowing down climate change requires international measures. According to the theories of ecological modernization, the most sinister scenarios of risk to societies do not have to be realised if the environmental risks can be turned into technological development and business opportunities (Spaargaren and Mol, 1992).

Also, the institutions of local government belong to the innovation network of timber construction. For example, the Finnish Forest Centre has been active in promoting timber construction in South Ostrobothnia. The Centre is a state-funded organisation that covers the whole country. It is tasked with promoting forestry and related livelihoods, advising landowners on how to care for and benefit from their forests and the ecosystems therein. But like the university units acting in the region, the Forest Centre is dependent on competitive project funding. Quite often the projects are financed from the EU structural funds that are regionally administered by the Regional Council of South Ostrobothnia and the Centre for Economic Development, Transport and the Environment. Consequently, these institutions are also important parts of the innovation environment in question.

As mentioned in the introduction of this article, the Puu-Hubi project was funded by ESF-financing. The rules of the applied ESF-programme allowed training only for enterprises, although it would have been reasonable to promote mingling of firms and municipal officers in common sessions and workshops. Of course local funders cannot be blamed for this, since they are not responsible for the rules. Some scholars point out that these kinds of institutional restrictions might lead to over-controlled and inflexible operation environments, which do not support creative knowledge-based economies. There should always be some space left for unplanned and unanticipated incidents and encounters (Kautonen, 2008).



In our subject region there have been many discussions on the possibilities of timber construction. The amount of information is no longer the decisive bottleneck in the breakthrough of the industry. Instead, *strategic awareness* should be awakened somehow (Sotarauta *et al.*, 2007; Heifetz, 2003). University-led projects and workshops will not suffice as the only means, but real leadership is now needed. Somebody has to get down to the business with clearly defined goals and geared with abilities to lead networks. The first task is to create a storyline where diverse players are able to identify their roles and interests in a common endeavour. For example, firms and municipal development offices, as well as education and research institutes, should conceive their interdependence in an innovation network as a positive opportunity.

It is really a question about storytelling, where the narrative is able to clarify the information flow by selecting and connecting elements into one line that could direct concrete development actions. A good and useful story is based on past development, on a realistic understanding of the present situation and, finally, it should make visible future opportunities and risks (Sotarauta *et al.*, 2007; Simmons, 2001). The value of storytelling lies in the idea that the story is not one-sidedly received, but also participated in by the local and regional players by attaching subjective and meaningful elements to it.

## 5. FROM STORYTELLING TO CONCRETE ACTIONS

For being able to take advantage of timber construction in the development processes of regions and cities, the actions should be locally entrenched. Usually this takes place by setting up a new organisation or by integrating new actions into existing organisations. However, there is still a need for strategic awakening and storytelling in the South Ostrobothnia region before any meaningful concrete actions might occur.

The role of local government in promoting timber construction was highlighted earlier in this article. Based on the ideas above, the story (whoever tells it) should point out the added value and common goals of timber construction as well as the basic developmental objectives of the local government. Municipalities and cities have urban development projects in progress that could increase in value if they were built of wood. For example, in the city of Seinäjoki (the regional centre of the South Ostrobothnia region) they are preparing extensive plans for the railway station area which will constitute a new 20 hectare core for the central business district. The area is important not only for the city of Seinäjoki, but for the whole region, as it functions as a central transportation hub with travel and logistics centres.

In addition, the area is now one of the target areas in the European<sup>135</sup> architectural competition, which will entail plenty of international publicity. The city of Seinäjoki has a unique occasion to create a new and innovative wooden city centre. Moreover, no extra resources would be needed compared with conventional construction systems. Thus far, however, this is only an option. The issue should be to mobilise strategic awareness, display visionary thinking and channel political will. At their best, the results could radiate through diverse branches and reinforce the region's standing as a specialist in emerging bio-economic development. In the national INKA (Innovative cities) -programme Seinäjoki is one of three responsible cities of bio-economy with its expertise in innovative food systems.

At the moment the University Consortium of Seinäjoki is preparing a new professorship with the University of Vaasa. The branch of science will be business of timber construction. If the consortium succeeds in funding the chair, the new specialist would have an interesting role in the innovation network. Will the new professor prove to be a decisive node in the network? Either way, the chair will provide permanence and continuity for the innovation environment, but its holder will also be an important storyteller. The new storyline should make visible the business potentials of timber construction in a very concrete manner. It should also increase the strategic awareness of the local government as a primary agent of public procurement.

## 6. CONCLUSIONS

Wooden multi-storey apartment buildings have been common in North America for a long time. Now, large-scale timber constructions are proliferating in Europe as well. The main drivers for this development include, for instance, favourable environmental impacts of wooden building materials as well as general moisture problems associated with concrete buildings. Growing demands for efficiency in the construction business have entailed unrealistic timetables that do not allow proper periods for draining concrete structures, whereas new timber construction technology is based on prefabricated dry elements and fast assembly on the construction site.

In addition, the timber-based building industry has potential to support regional economic development. This is true especially in countries like Finland, which have strong forest and wood industries, as well as long traditions in timber construction.

Based on these views, it would be assumable that there should be more development in the trade than there actually is. One explanation is the fierce competition

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<sup>5</sup> <http://www.euopan-europe.eu/>

in the construction business. Building firms do not easily change their familiar production platforms because of fear of economic risks. Also, producers of concrete materials are campaigning for their continued dominance. However, it is important to understand that the renewed interest in timber construction technology is only just getting started.

Our Puu-Hubi project highlighted interesting aspects of the roles of local and regional actors in the development of timber construction. In particular, cities and municipalities could promote win-win situations, as they are beneficiaries of regionally entrenched value chains of the wood building industry. They also have authority in writing and applying laws and codes that have impacts on building costs. Municipal and regional developers could support wood building in many ways by including it in their programmes as the Swedish cities mentioned earlier in this article have.

Also, other institutions, like universities, have chances to participate in the development of timber construction. At least academics in technical sciences consider it important to be involved in developing new technology. Quite interesting triple-helix combinations are now emerging in Finland, as some regional organisations and enterprises establish new professorships on timber construction with universities. For example, the city of Kouvola with Aalto University, as well as organisations and firms in South Ostrobothnia with the University of Vaasa, have ongoing recruiting processes. These kinds of processes indicate that regional potentials have been well-recognised. The arrangements can be seen as efforts to complement regional innovation networks by providing missing nodes and links.

At the moment, those involved in new timber construction technology are trying to probe its limits and possibilities: what kind and how big can wood buildings reasonably be? Another question is whether there will be enough consumer demand for wooden apartments. Moreover, will there be enough competition between the producers of wooden elements and modules for attaining competitive cost levels? And finally, some researchers and regional actors have recognised the regional potentials of timber construction, but will they be realised? It seems that there are more questions than answers but, as mentioned before, there is momentum, and it remains to be seen how well these hopeful expectations will bear fruit.

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