Market opportunities in

INDUSTRIAL WOOD CONSTRUCTION IN FINLAND

2016

CONTENTS

INVEST IN FINLAND

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Foreword - Business opportunities in wood construction in Finland

In Finland, wood solutions have a strong position in the construction sector and the use of wood as a building material is widely accepted. Wood construction is growing in the Nordic countries and Finnish companies have also become more active in the sector. New players, both domestic and international, have entered the market and this indicates new growth opportunities in wood construction. Recent examples include CLT Finland Ltd in Alajärvi, Crosslam Kuhmo and Binderholz Group which acquired Vapo Timber's sawmills in Nurmes and Lieksa. In addition, Stora Enso is starting LVL production in Varkaus in 2016.

The largest industrial log house manufacturers in the world are Finnish companies. We have the tradition, knowledge and industries in place for the use of wood. However, there is a lack of top-level knowhow when it comes to industrial wood construction, high-rise construction and new building systems, especially in connecting customer need and service design with production technology. In fact, we see opportunities for innovative companies in all phases of the wood construction value chain in Finland.

Finland is an excellent location for the wood building industry and element manufacturing because we have well-managed and certified forests that produce high-quality wood. Finland is Europe's most heavily forested country with 86% of its land area under forest. As the growth potential for sustainable harvesting is currently 60 per cent, there are plenty of possibilities for the production. We also have a sawmilling industry with a long tradition. There are currently about 170 industrial sawmills in Finland that operate all year round and export their products globally.

We see opportunities for companies providing top-level knowledge and efficient industrial manufacturing capacity for solutions in multi-storey wood frame construction and special structures. There is a potential to develop new building systems based on the companies present knowledge of wood construction of two-floor high buildings. The companies can benefit from high-quality workforce and the possibility for development and investment funding.

This report was ordered by Finpro's Invest in Finland unit. It is an update on the situation in Finland in terms of large-scale industrial wood construction and in order to give our customers and network more background information about the business opportunities offered by this growing sector.

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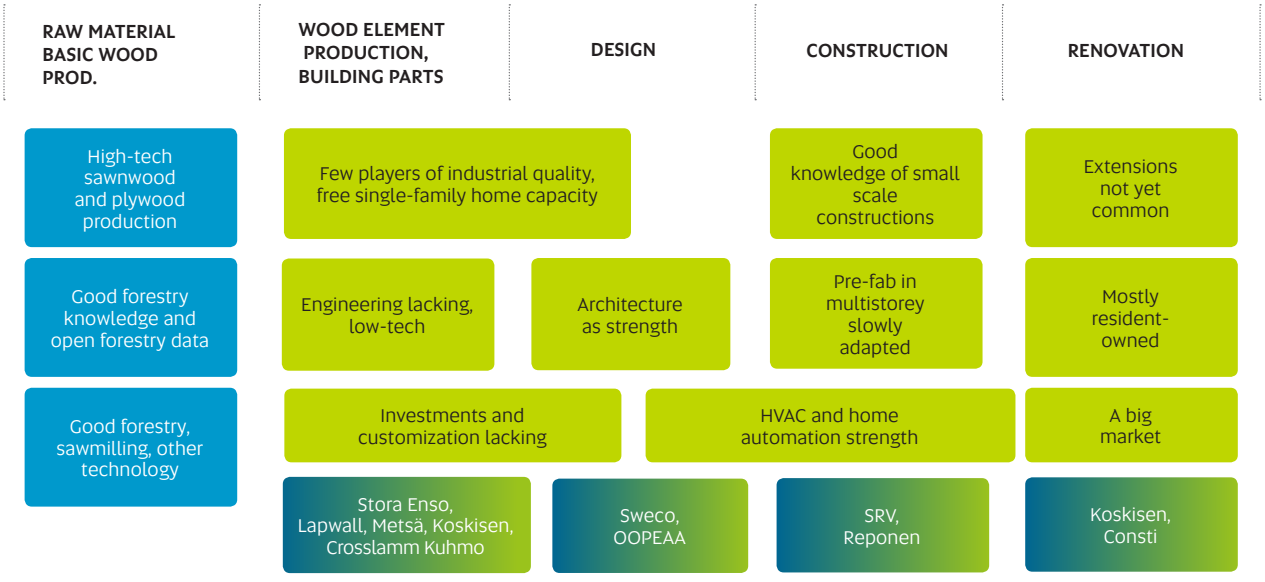
WHY FINLAND

- Finland is excellent location for wood building industry and element manufacturing because we have sustainable,well-managed and certified forests that produce high-quality, competitively priced wood
- There is solid, existing knowhow, industries and wide acceptance for the use of wood in construction
- We have long traditions in sawmilling and the wood industry – we are known for it world-wide
- The high-rise wood construction market is rapidly growing in Nordics
- We also have a large-scale wood exporting industry which is open to partnership discussions
- Finland is a acknowledged laboratory, developing and producing state-of-the art, competitive wood export products

BUSINESS OPPORTUNITIES

- New players, both domestic and international, have entered the market indicating new growth opportunities in wood construction
- The largest industrial log house manufacturers in the world are Finnish companies. We have the tradition, knowledge and industries in place in the use of wood.
- However, there are business opportunities for companies providing top-level knowhow when it comes to industrial wood construction, high-rise construction and new building systems, especially in connecting customer demand, service design andproduction technology.
- The size of the construction market is currently about EUR 22 billion, and increasing wood's market share by 20% would translate to EUR 4 billion of new business in the wood construction sector.

FINNISH WOOD CONSTRUCTION VALUE-CHAIN



Introduction

The forest sector has always played a major role in the Finnish economy. Currently the industry directly employs 50 000 persons, of which 54% are in the wood products industry. The furniture industry employs another 10,000 persons. The forest industry accounts for 18% of total industrial production in Finland and about a fifth of the country's exports. All the factors of production are domestic.

The wood products industry has a total production value of about EUR 7 billion. The value of wood products exports is EUR 2.5 billion. The wood industry uses 40% of industrial roundwood, 60% by the pulp and paper industry. Due to the different stump prices, about 70% of the forest owners' income comes from the wood industry. Between 70-80% of the wood industry products is used in building and construction.

Foreign investments in Finland in the wood-based industrial construction value chain are scarce. There are few industrial sawmills owned by foreign companies. Recent investment was made by Austrian Binderholz group. Operating a sawmill and establishing further processing capacity in Finland would only be justified if the company has already secured a product and customer base in the target market. However, there are possibilities for foreign investors in a further processing capacity, especially when this is combined with market expertise.

There is plenty of knowledge in veneer, plywood and LVL production in Finland. In addition, Finnish birch is a very suitable material for plywood because of its excellent strength to weight properties. A Latvian producer Latvijas Finieris Group acquired a Finnish operation in 2013 and is now producing birch plywood.

The forest industry accounts for 18% of total industrial production in Finland and about a fifth of the country's exports.

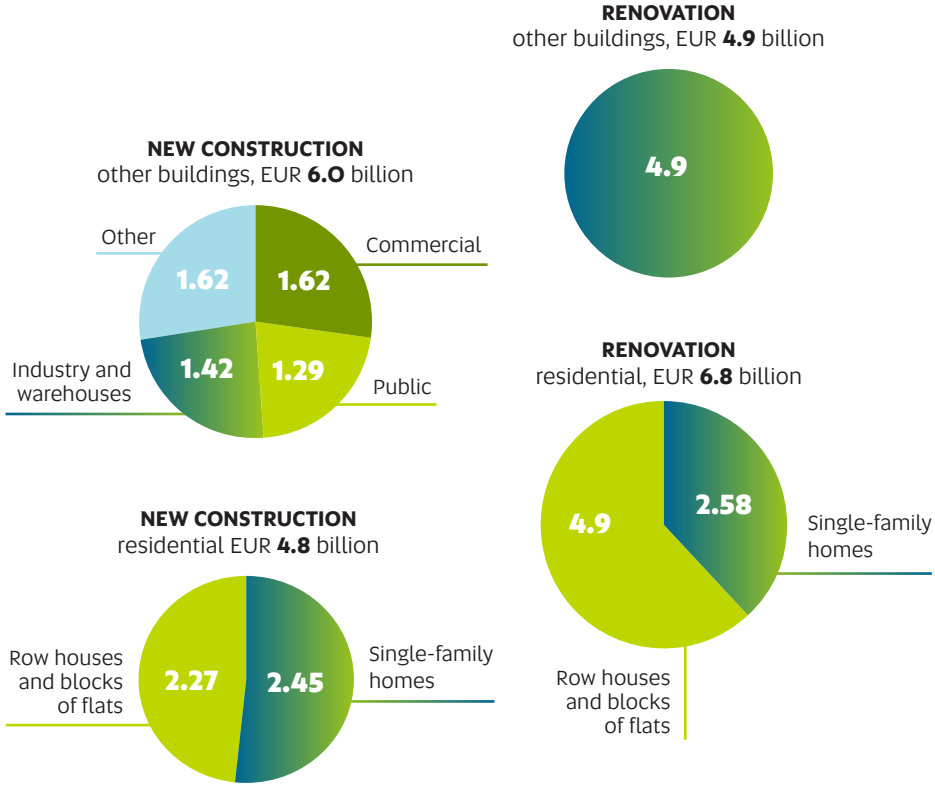
Industrial log house production in Finland is the most developed in the world. One of the main markets for log houses is Russia and consequently there has been some interest to invest in log house production in Finland.

In the single-family home business, Swedish house manufacturers are active in Finland. Fiskarhedenvillan is the latest one entering in the market, participating in the Vantaa housing fair in 2015. Swedish companies Älvsbyhuset and BoKlok (Skanska and Ikea) have production facilities in Finland and are well established. There are also Estonian housing companies delivering ready-made houses to Finland.

Statistics on the construction sector in Finland

In 2014, the value of all building and construction in Finland was EUR 28.5 billion. Building construction accounted for EUR 22.4 billion and infrastructure investments for EUR 6.1 billion. The total value of building construction was divided as follows:

Renovation as total was bigger than new construction, especially in residential and public buildings. New home construction is lower than the estimated demand. About 27,000 units were built in 2015. The arrival of tens of thousands of refugees in Finland is increasing the need for new living spaces.



Wood Construction in Finland

Wood use is widely accepted in Finland because wood construction solutions already have a strong position in the building market. There is knowledge, industry and acceptance for the use of wood. Wood has a dominant position in the detached house construction market as well as in the recreational home market, and in agricultural buildings. The total market share of wood is about 37%, calculated in terms of building permits and building volumes. Pre-cast concrete elements are the predominant material in apartment block construction, accounting for over 70% per cubic metre of new starts. In 2015, wood had a market share of 6% in the construction of multi-storey buildings.

The greatest potential for increasing the use of wood products is in the construction of multi-storey apartment and office buildings and in larger public buildings. The size of the construction market is currently about EUR 22 billion, and increasing wood's market share by 20% would mean EUR 4 billion worth of new business in the wood construction sector (based on calculations by the Finnish Forest Industries Federation). Wood use should be augmented especially in the professional building sector and the degree to which wood products are processed should be increased. Finland is an important laboratory for developing competitive wood export products. Stora Enso LVL investment

in Varkaus is one example as well as fast growth of company Lapwall which has Finland's largest wood element factory in Pyhäntä.

Last years wood had a market share of 1-2% in Finland for buildings over two storeys high, depending on the year. The history of wooden multi-storey building construction in Finland is short, even though many Finnish people want to live in homes built from wood structures. Official regulations have only allowed the construction of four-storey wooden buildings since 1997. Since 2011, it has been possible to build eight-storey wooden residential buildings thanks to new fire safety regulations. In the government's Strategic Programme for the Forest Sector, which ended in 2015, the national objective for wood construction was to boost the market share of wooden multi-storey buildings to 10% of new building production by the year 2015.

By the end of November 2015, wood had gained a more solid position in the market. A total of 47 modern multi-storey buildings with four or more floors have been completed, providing 1129 living units. But the real push for wooden multi-storey buildings and related wood products is currently being drafted on drawing boards across Finland. Work is underway on new projects, small and large, that will result in over 6,000 apartments in wooden multi-storey buildings. In 2016 alone, about 1500 units will have their building permission granted and/or their construction will commence. The 10% target will definitely be achieved. Wood façades are now very popular, with a market share of 50% of all new buildings started in 2014, followed by steel, concrete, brick and others. The total market for façades is 7.1 million square metres in new construction and 4.2 million square meters in renovation.

Public procurement procedures that combine economic and environmental objectives offer possibilities for boosting the use of wood. The public sector is in the best position to develop procurements strategies that take the environmental impacts into use. In line with this, the Finnish government is committed through different kind of measures, such as decisions of principle in public procurement, to enhance sustainable choices.

The total market share of wood is about 37%. In 2015, wood had a market share of 6% in the construction of multi-storey buildings.

It is recognised that there are several regulations that affect on to increasing wood construction in Finland. For example, the building code is interpreted differently in different parts of the country. This leaves space for attitude-based requirements that reduce interest in wood usage. There are also in-built discriminatory rulings in the building code that work against the use of wood – mostly in the fire code, but also in other parts like the interpretation of what is the net surface area in square metres from a gross floor area. The Ministry of Environment is currently preparing a new revision of the fire code.

The objectives for wood construction in Finland can be achieved by creating new industrialised products, processes for construction, hybrid structures and joint technology, façade solutions and composites.

Wood construction value chain

Forestry

The Finnish forests are well managed. There is a long tradition and well-developed know-how in intensive forest management. Wood production from Finnish forests has always been sustainable in terms of the volumes grown and harvested. There are strict rules about reforestation. During the last 20 years, forestry has also been developed to take into account other objectives, such as the protection of endangered species and habitats, recreation, other forest products such as berries and mushrooms, hunting and landscape values.

Finland has been at the forefront of developing the widely spread PEFC (Programme for the Endorsement of Forest Certification schemes) system. There was a need to develop a system suitable for the forest ownership structure of families and small forest owners, since FSC (Forest Stewardship Council) has its roots in a tropical forest management and ownership structure. These two certification systems today are very much alike in terms of requirements for the management. The majority of the Finnish forests are PEFC-certified (90%), while a growing share is also FSC-certified (now about 4 %), of which most is also PEFC-certified. There is a sufficient supply of certified fibre and wood.

French investment company Axa Investment Managers has been investing in Finnish forests. The Finnish company UPM has sold recently about 6000 hectares of forests to Axa, which also owns about 14,000 hectares of forests in France. The Finnish forests produce high-quality wood, with high visual quality and strength values. There is an increment in the growth due to rising temperatures, but the risks will also grow in the terms of wind and insect damages. These affect to the profitability of forest ownership.

Wood products industry

The development of the sawmilling and wood-based panel industry has been difficult during the last ten years but now there is a positive trend. In sawn wood production, output has declined from over 12 million cubic metres in 2007 to 8 million cubic metres in 2009. Recently, the production has recovered to about 11 million cubic metres. The plywood industry has experienced same kind of turmoil, with the record production of 1.4 million cubic metres in 2007 dropping to 0.8 million cubic metres in 2009, and recovering to 1.16 million cubic metres in 2014. The sources for raw material have been fewer, since imports from Russia have decreased. The global economic crises hit the Finnish economy and the building sector especially hard. Even though the wood industry is an export industry, Finland's domestic market has also been and will remain very important.

Most of the forest owners' income comes from the sales of roundwood to sawmills or plywood mills. A prerequisite for profitable bioenergy and pulp (and other bioproduct industry) is a profitable or surviving sawmilling industry. There are several ongoing investments in bioproduct mills (formerly known as pulp factories)and biofuel production. The largest investment ever (EUR 1.2 billion) in the history of the Finnish bioeconomy is under realisation in Äänekoski, Central Finland. The plant will increase the need for pulpwood by 4 million cubic metres, which represents a total increase of 10% increase in harvesting. There are other similar projects at the planning stage.

The need to increase harvesting will create a need for investments and development in the wood products industry.

GROSS PRODUCTION VALUE OF THE WOOD PRODUCTS INDUSTRY IN 2014

Sawmilling (incl. further processed goods)	EUR 3.8 billion
Wood-based panels	EUR 0.6 billion
Wooden houses and other building parts	EUR 1.3 billion
Other wood products	EUR 0.2 billion
Furniture	EUR 1.0 billion
Wood products industry, Total	**EUR 6.9 billion**

The Finnish governments continue to support the shift towards bioeconomy also in building and construction. The research agenda of the wood products industry is linked to the government-run National Bioeconomy Strategy and the leading projects in the government´s strategic programme. These include accelerating research and development to generate new products, promoting wood products industries, increasing the use of wood in building and construction by renewing building codes, supporting digitalization as well as enabling circular economy.

The joint lobbying and research and development activities for the wood products industry have been centralised under the Federation of the Finnish Woodworking Industries during 2015. The branch or product based organisations are gathered together to build up a stronger message for wood and minimize overlapping activities. A new research agenda for the whole industry has been created, with the following priorities:

1. Resource efficiency
2. Environment
3. Development of materials
4. End-user applications

Especially the research activity has been low in wood building and construction. There is a need for scientific and applied research in cooperation between the companies and universities. Aalto University has established a new professorship in wood construction to be active in the beginning of 2016.

Companies and production data

There are about 170 industrial sawmills in Finland, that operate all year round and export their products. The production capacity for these mills is about 14 million cubic metres but only 60-85% of this has been utilized during the past 8 years. In addition, there are about 1200 small sawmills that use less than 10,000 cubic metres of saw logs annually.

Plywood mills, using birch and spruce, operating now number 9 units, LVL (Laminated veneer lumber) has 2 units, veneer 4 units, fibreboard and particleboard only 1 unit each. Stora Enso is building a new LVL-mill in Varkaus, ready for supplies in the second half of 2016.

Plywood production has been fluctuating between 1.4 million cubic metres in 2014 and 0.8 million cubic metres in 2009. In recent years, it has recovered to a level of 1.2 million cubic metres. UPM Oyj and Metsä Wood are the main producers.

After the bankruptcy of Visuvesi Oy and Vammalan Vaneri in 2011, Latvian company Riga Wood Oy (part of Latvijas Finieris Group) acquired the machines and business at Vammala, named Sastamala nowadays.

The Finnish governments continue to support the shift towards bioeconomy also in building and construction.

Latvijas Finieris Group has production in all the Baltic States and Finland, and a turnover of about EUR 187 million in 2013.

Particleboard production has been decreasing since the production in Puhos Board ended in 2011. No buyer has been found for the operation since then.

Fibreboard production is in the hands of Suomen Kuitulevy Oy. It has one production facility with a capacity of 63,000 m3 for building and furniture boards. Fibreboard imports have risen significantly, reaching 167,000 cubic metres in 2014. The import of other wood-based panels is small.

Metsä Wood produces Laminated Veneer Lumber (LVL) under the trade name Kerto®in two locations, Lohja and Punkaharju with a capacity of about 200,000 cubic metres. Stora Enso´s new LVL plant will start production in the second half of 2016 at the latest, with a capacity of 100,000 cubic metres.

MDF (medium density fibreboard) is not produced in Finland. The high investment cost and the fairly small domestic market has held back the investments. In addition, there is plenty of MDF supply in Europe.

A panel product that has grown in importance in Europe during the last ten years is three-layer board (3-schicht Platten). The product is a thin cross-laminated glued panel used for interiors, cabinets, furniture and exterior cladding. It is now imported in small amounts mainly from Estonia.

Structural glue laminated timber is produced in 10 units in Finland. Additionally, there is production of other glued products such as glued beams (duo- and triolam) and glued logs. Total annual production is about 295,000 cubic metres. Japan is the main market for glued products with the export of 224,000 cubic metres in 2014.

Cross-laminated timber (CLT) is produced in one mill in Kuhmo. The annual capacity of the unit is 20,000 cubic metres in two shifts. A new company has been founded in Alajärvi, named CLT-Finland Oy. Its investment schedule is not yet known.

Cross-laminated timber (CLT) production has emerged in Finland.

The production of modified wood products has been increasing, especially in the heat treatment of wood. Thermowood® is a patented heat treatment for wood that has been developed in Finland since the 1980s. The International ThermoWood Association was founded in 2000. The aim of the association is to promote the usage of ThermoWood® products in general. Only members of the International ThermoWood Association are allowed to use the ThermoWood® trademark. They cooperate in standardisation, quality control, and research, in order to enhance the use of the products. In Finland, the membership consists of eight producers and one kiln manufacturer. The total production of thermowood in 2014 was about 146,000 cubic metres, predominantly in Finland.

Traditional pressure impregnated wood is the main product still finding new markets in addition to its traditional use for decking and fencing. The wood preserving industry, using pressure impregnation technology, is still strong in Finland. There are 20 production units, with a total production of 320,000 cubic metres, of which 238,000 cubic metres was sawn wood and 66,000 cubic metres electricity poles.

There are about 250 wooden house and log house manufacturers in Finland, and nearly 700 production units in the construction carpentry industry. Units producing furniture number about 1500. The Finnish companies Kontiotuote and Honka are the biggest industrial log house manufacturers in the

world. The production processes are highly automatized and very efficient. Log house manufacturers are also active in the school, day-care and elderly peoples care home market.

Finnish single-family home manufacturers have a limited possibility to serve the professional buyers and other types of construction. Without more investments, their production lines cannot produce elements that are suitable for multi-storey houses, for example. This creates opportunities for foreign investors.

The building carpentry industry and woodworking industry have a strong position in the domestic market in Finland. Stairs, doors and windows are mostly Finnish produce. Other cabinets and furniture is mostly imported. There are also some companies doing exports, but the volumes are quite small. One window manufacturer, Skaala, has production in Russia.

The production of sawmilling and other wood processing machinery is an important part of the Finnish metal and machinery industry. There are several companies exporting machinery worldwide, such as Raute, HewSaw, and Heinola Sawmill Machinery.

Total investments in the whole forest industry are estimated at about EUR 584 million, not including the Äänekoski bioproduct investment in 2015. Of these investments, 49% is directed to new capacity creation in the existing mills.

The latest new investment in the wood products industry is Stora Enso's LVL mill in Varkaus, which will start production in summer/autumn 2016. The capacity of the mill will be 100,000 cubic metres of LVL for element manufacturing and posts and beams. The wood industry is also investing into improving the production processes of sawn wood and kilning.

PuuMera in Vantaa Finland is Europe's largest, multi-story wooden residential building.

Prefabricated building elements

The possibility for pre-fabrication is viewed as the main competitive edge for wooden structures and solutions in the building sector globally. The benefits are obvious, such as shortened construction time, better quality control, improved production efficiency, possibilities for automatization and utilisation of production robots, etc. The prerequisites for this development are well-developed software for design and engineering. Logistical expertise is also important.

In Finland, there has been a shift in the prefabricated building element business from small to medium-sized and large companies. The medium-sized companies also have their background in wood processing as well as in the building industry. Two of the three forest industry giants, Metsä Wood and Stora Enso, are active in developing building solutions. UPM is focusing on sawn wood and plywood among the wood products. The main companies in the industrial wood frame construction are:

STORA ENSO WOOD PRODUCTS

- A part of the Stora Enso Oyj Wood products division (called Building and Living until the end of 2014) had a turnover of EUR 1.73 billion in 2014. It has 20 production units located in Europe. Stora Enso produces a great variety of wood products for the building purpose, interior solutions, and energy production.
- In Finland Stora Enso's activity in industrial wood frame construction is focusing on the usage of CLT (cross-laminated timber) imported from its own mills in Austria. Stora Enso has been actively developing a modular building system for apartment buildings. Major customers have been Lakea (developer owned by municipalities in western Finland) and BoKlok (joint venture between Ikea and Skanska).
- Stora Enso has been forced to build the house-frames themselves, which is not its core business.
- The latest investment by Stora Enso in Finland is a LVL (laminated veneer lumber) mill in Varkaus. The mill has a capacity of 100,000 cubic metres of LVL. The market for the products are replacing imported CLT in their building element production and the traditional uses of LVL at the domestic and export markets.

METSÄ WOOD

- Metsä Wood, which is a part of Metsä Group, produces sawn wood, glulam, LVL (Kerto®), plywood, heat-treated wood, roof and floor elements, etc. Its turnover was EUR 897 million in 2014.
- In the industrialized building sector, Metsä Wood is focusing on LVL-based post and beam structures and box-beam floor and roof elements, under their own building system for multi-storey buildings and in large-span structures.

BUILDING COMPANY REPONEN OY LTD

- Reponen is a building company specialized in multi-storey passive and wood-frame apartment buildings as a KVR-builder (comprehensive responsibility). The turnover of the building company is about EUR 80 million. Its daughter-company manufactures pre-cast concrete elements. Wooden elements are bought from the market.
- Reponen is the most active building company in the multi-story wood-frame construction segment. They have a long-term development strategy to develop passive and wood-frame construction profitability.

LAPWALL OY LTD

- The building company LapTi Group founded the company in 2011, and it is now the largest producer of panel elements in Finland. LapWall produces the total framework for multi-storey buildings, and

other spaces as panel elements. The company also erects the frames. In 2015, its turnover is EUR 21 million.

- The company is looking for further production growth and increasing the share of exports, which are now about 20%. Its export markets are mainly in Scandinavia.

KOSKISEN OY LTD

- Koskisen is a family owned wood industry company whose major products are sawn wood, plywood and particleboard. Its turnover in 2014 was EUR 206 million.

- Koskisen produces pre-fabricated single-family homes under the brand name Herrala. During the last five years, the pre-fabrication unit was modified so it could produce panel elements for multi-storey buildings. The company has been involved in several industrial wood-frame construction projects as a producer of panel elements. In the spring of 2015, the company introduced a type of multi-storey wood frame building. Koskisen is also active in added floor construction development and realisations. In 2014, its turnover for building elements (both single family and wall-elements) was EUR 12.8 million. This is expected to grow significantly in the near future.

PRT-FOREST OY LTD

- PRT-Forest Group had a turnover of EUR 117.8 million in 2014. The group has been hit by the diminishing market for single-family homes, which were the main products of the group. It was also affected by the general depression in the building sector. The group is investing more into log house manufacturing and to business-to-business products and services with industrial wooden elements.

- Kontiotuote Oy Ltd, the world's largest industrial log house manufacturer, is part of the group with a turnover of EUR 50 million. The company has invested in production quality and processes and is getting new markets in the public building segment, such as schools and day-care buildings and elderly people's homes

- PRT-Pro™ is a new trademark for the company's services to professional builders. The company has been developing its own multi-storey wood-frame concept since 2015.

IIN FASADI OY

- Iin Fasadi Oy is a producer of panel elements for their own single-family house production and to other projects. Its turnover was about EUR 10 million in 2013.

- The company has the ability to design and build multi-storey apartment buildings.

SOME OTHER INDUSTRIAL PRODUCERS OF PANEL ELEMENTS:

- Suomen Rakennustuote Oy, panel elements
- Teeri-Kolmio Oy, panel elements
- Elementti-Sampo Oy, modular and panel elements using CLT (investment ongoing)
- Elementit-E Oy Ltd, modular stick frame elements
- Simons Hus Oy Ltd, modular stick frame elements
- Cramo, temporary modular elements,

The number of companies is increasing, but the level of technological know-how and automatization is still low.

Competition

The competitors for the industrial wood frame manufacturing are on-site stick building with wood and pre-cast concrete element industry. In the process of developing design tools and knowledge, the on-site construction will decrease. There is no available estimate of the level of prefabrication in the present wood frame market. In single-family homes, about 80% of the houses are industrially prefabricated. The opportunity lies in taking market share from concrete.

The total turnover of the concrete industry in Finland in 2014 was EUR 896 million, from which elements accounted for EUR 513 million and on site cast concrete EUR 267 million. Building elements split according to products:

Hollow core slabs	EUR 80 million
Façade elements	EUR 180 million
Intermediate walls	EUR 60 million
Posts and beams	EUR 45 million

The figures for the production of concrete products show that there are possibilities to increase the market for wooden solutions:

Hollow core slabs	2.1 million square metres
Wall elements	769,000 square metres
Façade surface elements	226,000 square metres
Partition walls	567,000 square metres

There is a potential to substitute concrete in all the building parts, but especially in the wall elements and partition walls. Steel is also very much used in the partition walls.

Finland is internationally known as a wood building nation.

Design and engineering

Finland is internationally known as a wood building nation. Wood has a strong position in the education of interior designers, architects and engineers. Wood as a material is common to everyone who graduates in design or engineering. The problem has been the lack of demand for the knowledge to design larger and more demanding buildings with wood.

As a part of the National wood building programme, engineers have received further education in demanding wood structures. This further education activity is continuing in the coming years and will fulfil the need for experienced engineers. For demanding wood construction, there is a special requirement to have external supervision for the structural design.

The consolidation of the engineering sector has been strong. The companies are Nordic, European and worldwide groups that merge smaller regional ones. The major ones in wood engineering are:

Sweco Finland
Ramboll Finland Oy
A-insinöörit
Insinööritoimisto Tanskanen Oy

The capacity for engineering industrial wood frame construction is in full usage. In some projects, it has been the bottleneck for moving forward with the building project. The companies are not capable of transferring knowledge from other affiliates abroad to Finland. There is a need for better support from the producers to the building engineers and architects.

An architect´s knowledge of designing a wooden house is required to make it competitive and gain the benefits fully. Currently, there are few specialised architects in this area. Below is a list of offices that have knowledge of several demanding industrial wood-frame building systems:

OOPEAA – Office for Peripheral Architecture
Vuorelma Architects Ltd
Architectural Office HMV Oy Ltd
SARC Architects
Helin & Co Architects
Arkkitehtityöhuone Artto Palo Rossi Tikka Architects
JKMM Architects
K2S Architects Ltd.
Lahdelma ja Mahlamäki Architects
Architectural Office Ari Mäki-Marttunen Ltd
HPK Architects Oy Ltd.

Construction companies

There is need for construction companies to develop systems, know-how and competitiveness in the Finnish wood construction sector. This again creates business opportunities for new comers. The use of wood is of course common, but to utilise the possibilities of prefabrication and develop the systems with the producers is in the hands of few pioneering companies like construction company Reponen and Lakea. The largest companies Peab, Lemminkäinen, YIT and NCC are following the development, but are not active players.

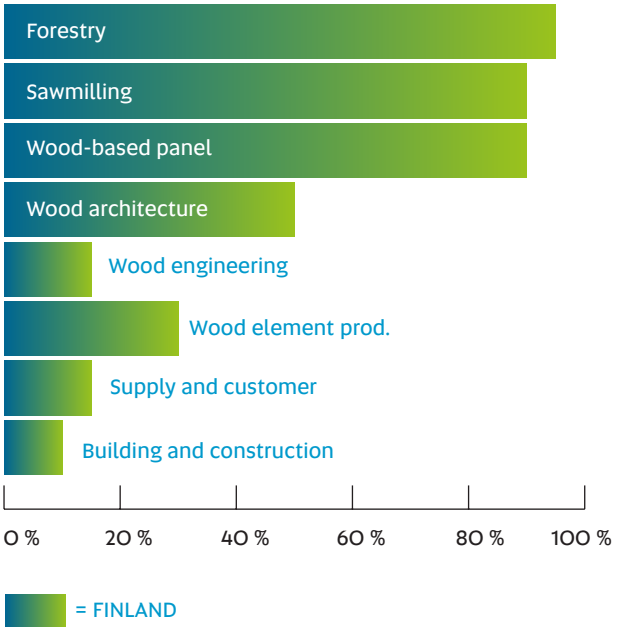
Regional small and medium-sized companies are more familiar to building with wood, including single-family homes, townhouses, schools and day-care centres. They have a tendency to stick to old working methods and products, but also they have a permanent workforce to keep occupied. Therefore, they may prefer not to use prefabricated elements. The economic realities hinder these companies from starting a multi-storey apartment house project normally.

Wood building is in the hands of few pioneering construction companies.

Research and development needs for developing industrial solutions

The chart below shows level of know-how in the Finnish industrial wood building value chain compared to the best actors. It clearly shows that there is a need for companies to invest in knowledge about customer needs and production technology in order to exploit the opportunities in the process from design to manufacturing to installation. This creates business opportunities for new players.

LEVEL OF KNOW-HOW IN THE WOOD CONSTRUCTION VALUE CHAIN



The wood-based solutions for multi-storey buildings are seen as a promising option for the future. The fact that there are different systems developed separately by different companies is a strength. In addition, the communal housing builders are interested in developing the solutions. Building companies are also active but might have different goals, like just keeping an eye on the competition. The main topics in wood construction development in general are:

- Foundations in a wooden house, savings potential
- Competitive benefits of the existing building systems
- Effect of the building systems to the architectural, apartment floor plan, and HVAC-planning
- Stiffening of higher wooden houses
- Speed in construction as a competitive factor
- Benefits to the residents
- Carbon footprint and resource efficiency as a competitive factor
- Value chain development
- Economic competitiveness.

The renovation market is also very lucrative. There is research and development needed in:

Façade renovation with prefabricated elements
Added stories, process development

Strengths and opportunities in wood construction in Finland

STRENGTHS

- Significant forest resource and ongoing renewal of the sector
- Continuing state support
- Prefabrication know-how
- Familiarity of the material
- Ecological and resource efficient material and processes

OPPORTUNITIES

- Renewal to a full-range bioeconomy from buildings to everyday goods and specialities like medicines
- European regulation, carbon calculation, material efficiency, public procurement
- Shortened building time, "dry-chain" and freedom from disturbances in building construction
- Innovations in prefabricated efficient building systems
- Added quality with no extra costs
- Architecture, 2nd change for architecture (renovation)
- Growing renovation market, added stories, extensions etc.

Opportunities and possibilities can be found at every level of the value chain. There is a need for additional knowledge in every phase. The production-oriented industry is not serving the building sector and the final consumer. The amenities provided are not sufficient.

Some interesting product solutions creating opportunities:

- high tech timber engineering services
- carpenter companies producing unique wood structures (Holzbaufirmen)
- hybrid-structure prefabrication (wood-concrete)
- design products for niche markets

Long-term perspectives

The environmental arguments are turning into a real competitive factor for wood construction in the coming decade. The awareness and measures for reducing fossil based materials and the use of fossil fuels is under realisation in national politics, in company actions and in the consumers' decision-making. Many investors are pulling out of investments in fossil energy production.

The development of wood use in building and construction will be greatly affected by how the relationship between forest usage and climate change is defined. This depends on the EU legislation for building products and CE-marking requirements. Internationally it is not clear which kind of forest resource utilisation creates the greatest positive climate benefit. This means taking into consideration carbon storage in the forests and forest soil, and the deduction of emissions gained through harvested wood products and forest-based bioenergy. Still the forest losses account for 10% of the world's total GHG-emissions, which casts a bad image on wood use.

In general, the biomass carbon cycle from the forests is viewed as a carbon neutral cycle, when fossil fuel combustion transfers geologic carbon into the atmosphere as a surplus. The carbon neutrality of wood biomass is currently noted in the international climate agreements. The difficult question is how the substitution of fossil-based energy and of material produced using fossil energy by forest-based products is taken into consideration.

If forest harvesting increases, the carbon storage in the forests decreases. However, if wood is used in construction, the carbon is stored for more than 20 years, which provides a notable climate benefit. This benefit could be further developed through product development, reusing the products and recycling the fibres.

In general, wood construction will become more common in Europe, but there is a lack of investments and companies. Especially the renovation sector will continue growing, also using wood-based solutions. In the future, wood construction will be developed under bigger and more holistic frameworks. Green, smart and low-cost solutions, together and individually, guide the political and regulatory environment and thereafter building and construction.

Opportunities in hybrid-structure prefabrication.

Conclusions

The construction market in Finland is estimated to grow by 3-3.5% in 2016, especially in residential and office buildings. There is demand on the market. The growth will concentrate in the Helsinki metropolitan area and Tampere. Residential construction will shift more to blocks of flats, because of the urbanisation and change in the age structure within the population. There will be more one or two person households, which has an effect on the need for housing solutions.

Finland will become more interesting for foreign investments in the bioeconomy in the coming years. This involves the utilization of forests in many different ways, in construction, chemical industry, fabrics, etc., where sustainably is the strength. There will be extensive research and development activities going on in wood construction, wood chemistry, wood modification and wood-plastic composites.

Finland will have a sufficient number of experts available for developing new products. The long history and education in all levels is dealing with wood fibres. Nanopulp applications and still partly unknown wood chemistry innovations will appear on the researchers' tables.

The forest-based industry in Finland has always been export industry. The local market is small, with 6 million inhabitants, but the use of forest-based materials will remain familiar to the Finns.

To process wood in different ways has always been at the core of the Finnish economy. The importance of the sector is will also be visible in the country's education system. The cost of labour will be around the European average.

In the Northern hemisphere, the forests will continue to grow faster than they are harvested, which is also the case in Finland.

The value-chain from the forest to further processing will be very highly developed. All the trees in Finland will appear on a 3D-model of the forests. To utilize the forest and tree data and combine it with further needs in product development and production will create huge new opportunities for the wood-based industries.

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