RECENT DEVELOPMENTS IN GLOBAL CROSS-LAMINATED TIMBER (CLT) MARKET

Raquel R. Albee1*, Lech Muszyński1, Eric N. Hansen1, Christopher D. Knowles1, Pipiet Larasatie1, Jose E. Guerrero1

ABSTRACT: Cross-laminated timber (CLT) has grown from an invention to a much-celebrated product and building technology revolutionizing the use of massive timber in construction. The CLT industry is concentrated in Alpine Europe, where the technology was originally developed. Despite great interest, the rate of adoption of CLT technology outside of the region is slow, reflecting uncertainty whether the European models can be successfully transplanted in different business environments. The goal of this project was to assist development of the CLT industry by providing insights into the global sector’s structure, output potential, internal diversity, and perceived barriers to further expansion. Survey data collected from CLT manufacturers are supplemented with information obtained from other sources including site visits and interviews. The primary finding is that the CLT manufacturing industry is very diverse and unique in the commodity-oriented forest sector in that most of its production is custom-made for specific projects. Most of the CLT is produced for small to medium-size multi-family housing, public, and industrial structures. There is a high level of collaboration along the CLT supply chain, including vertical integration. Nearly one-third of respondents are involved in building construction.

KEYWORDS: cross-laminated timber; CLT; global survey; supply chain; vertical integration; diversity

1 INTRODUCTION

The growth of cross-laminated timber (CLT) technology, from concept to viable industry, has revolutionized massive timber construction in just 20 years [1]. To-date, most of the growth has taken place in Alpine Europe and adoption elsewhere has been relatively slow. Beyond Europe, CLT plants operate in Canada, New Zealand, Japan, and most recently in the US and Australia [2]. The slow pace of adaptation outside Europe is likely due to uncertainty whether business models and strategies developed organically in Europe will prove viable in the different business environments[3][4].

Existing CLT operations provide guidance for understanding how the CLT industry may function in other business contexts. The first survey of the global CLT industry, launched in 2016, created a snapshot of the global industry, including basic production characteristics, business models and innovativeness. The survey results, combined with information gathered from field trips and relevant trade publications, have been recently summarized by Muszynski et al. [5].

The primary finding was that the CLT manufacturing industry is very diverse and unique in the commodity-oriented forest sector in that most of its production is custom-made for specific projects. While much of the hype surrounding CLT is focused on tall buildings, most of the CLT is produced for small to medium-size multi-family housing, public, and industrial structures. The CLT companies have a very extensive supply chain (Figure 1) and there is a high level of collaboration along the supply chain, including substantial vertical integration. Nearly one-third of respondents are involved in building construction (Figure 2).

1 Raquel Albee, (presenter), Oregon State University, U.S.A., Raquel.Albee@oregonstate.edu
Lech Muszyński (corresponding author), Oregon State University, U.S.A., Lech.Muszynski@oregonstate.edu
Eric N. Hansen, Oregon State University, U.S.A., Eric.Hansen@oregonstate.edu
Christopher D. Knowles, Oregon State University, U.S.A., Chris.Knowles@oregonstate.edu
Pipiet Larasatie, Oregon State University, U.S.A., Pipiet.Larasatie@oregonstate.edu
Jose E. Guerrero, Oregon State University, U.S.A., Jose.Guerrero@oregonstate.edu

Figure 1: Level of vertical integration reported by responding companies (based on [5] and later findings)
While most of the global CLT production is still concentrated in Alpine Europe, there most recent growth is observed outside of that original cluster. These operations outside the organic growth of the CLT industry in the Alpine cluster are often new national CLT industries emerging because of governmental policies or incentives in Canada, Japan, and France. We are also aware of plans to stimulate similar developments in Great Britain and Australia. These are of particular interest for a nascent US CLT industry and internal CLT market, as well as policy makers seeking ways of promoting economic development and job growth related to both. We are interested in the differences in perception of opportunities, risks, challenges and constraints and the related business models, strategies, contextual policies, in existing CLT manufacturers operating within and outside the Alpine CLT industry cluster.

Another curious development largely overlooked in the 2016 survey was emergence of large number small-scale lines manufacturing nail laminated CLT licensed ad MassivHolzMauer or MHM. There may be as many as 30 such plants operating across Europe (orange markers in Figure 3). The 2016 survey captured only a small subset of these operations and their relation and contribution to the global CLT industry needs to be further investigated in the follow up surveys.

Along with the new iteration of the global industry survey to be launched in 2018, that is aimed to capture changes in the “essential vitals” of the industry, we planned targeted site tours in countries that recently saw rapid development of CLT manufacturing capacity triggered by various local opportunities or incentives (France and Japan), or are on record as currently laying ground for such development (New Zealand and Australia). The specific objectives of the site tours are:

1. Tour the new CLT manufacturing lines and selected plants along the local CLT supply chain and conduct; interviews in order to collect first-hand information on launching the regional CLT capacity in regions with no previous history of CLT production.
2. Collect information on the state of market environment and opportunities, government or regional policies (local building code adjustments), their specific goals/motivations, incentives, expected outcomes as well as barriers and roadblocks experienced in this process.

These first-hand, pre-scripted interviews and direct observations help us in build more holistic image of these new regional CLT industries rich in contextual details and fill in blanks not covered by the surveys.

The objective of this paper is to present the first cut of the information gathered in the first set of such site tours of the selected CLT operations in France, and how the new information augments our understanding of data gathered via surveys.

France was a country of specific interest for manufacturing site tours, due to certain similarities to the United States for CLT markets. Of interest are the similarities in the development timeline, technological progress and implementation (or scale and level of automation in the production lines,), and factors including market development, barriers, risks, challenges, and incentives, which can provide initial information towards future expansion efforts and recommendations.

2 METHODS

2.1 Selection of the sites and organization of the tour

In this section, the reporting is focused on the first segment of a larger research project. The presented information was collected during on-site tour of three of the five existing CLT manufacturing plants in France in September 2017. A semi-structured interview with follow ups to the pre-scripted questions when appropriate, included questions about markets, technologies, and challenges. Interviews were conducted by four researchers as part of a research team. These four researchers had diverse backgrounds in marketing and technology. The results of these site visits, to three companies, were then analysed, aggregated and prepared for publication, so that the confidentiality of data collected from individual companies was protected.

France was the first of four countries included in the site visits program. The other tours to Japan, Australia and New Zealand were scheduled for August 2018. Of those countries, France is the only one with close geographic proximity and strong economic ties to the Alpine Europe. The tour of French CLT plants provided unique insights in the challenges and opportunities of developing a new CLT industry in a neighbourhood producing about 75% of global CLT production.

The sites were first pre-selected by identifying all companies known to produce CLT in France regardless of the production capacity ranges. Then the specific sites and the order of the site visits was chosen based on the responses from companies, the availability for site tours within the same week and the logistics of transportation within France, so that the tour would efficiently fit within the project budget. Only one of the known MHM companies was targeted for the tour.

2.2 Semi-structured interview protocol

The semi-structured interview protocol was organized as a series of questions covering topics ranging from marketing, and market strategies to technological options:

1. The year of launching CLT production.
2. The structure of the company’s ownership.
3. The role of state, provincial or regional government incentives for the decision to launch a CLT line.
4. Other types of incentives and opportunities for companies to develop CLT within France that could explain emergence of four new CLT lines in one year (2013/14).
5. Level of coordination between manufacturers, especially when dealing with government.
6. Main challenges for new CLT plants after launching the production.
7. Perception of main challenges and threats for CLT manufacturers in France in general. Progress in adjusting building codes and product standards to allow CLT technology.
8. Expected developments and dynamics within the CLT market in France in the near future.
9. Structure of the value chain for the company.
10. Employment structure (number of employees, with distributions between administration, production, sales, engineering and project management, as well as gender divisions and % of women in top management positions).
11. Current CLT production capacity and actual annual production volume.
12. Average number of shifts worked per day.
13. Company plans for major increase of CLT output volume, and the mode and scale of planned increase if any.
14. Maximum dimensions of CLT products possible in the production line.
15. Type of press and adhesives used in production.
16. Wood species used for CLT production and sourcing of raw materials.
18. Scale of the CLT projects (expressed as number of storeys).
19. Geographical distribution of projects (proportion of regional, national, or international projects)
20. Market for unfinished CLT.

2.3 Typical site tour structure

Our respondents were company representatives assigned to host the OSU touring party. Initially contacts were sought via the company websites, then this was moved to either one or two company representatives who the research team maintained contact with through the site tour. The company representatives ranged from lead engineer to general manager of the company.

The questions listed above were used as starting points, with follow-up questions based upon the responses offered throughout the site tour visit, both in the conference rooms and during the production site area.

Typical site visit scenario would consist of a question and answer session with the assigned company host in a conference room, followed by a tour of the production floor, with further opportunity to ask questions about the manufacturing process.

2.4 Data collection and processing

Data analysis was conducted in a series of steps in which the link of the individual responses was gradually replaced by aggregate information. Only the aggregates were prepared for public consumption. However, the outcomes of individual steps and related notes were recorded in a confidential report to ensure traceability of aggregate decision points and ability to track and correct any bias and inaccuracies that might occur in such process.

During the site tours each member of the OSU team compiled notes taken during including the responses to the semi-structured question and answer sessions and the observations from the production floor. This was done for all three of the sites visited within France.

After the tour was completed, the individual notes from all team members were arranged side-by-side for each question from the interview protocol. The juxtaposition included also the follow up questions. These results were then examined for potential misunderstandings and apparent contradictions, and, after a team discussion, aggregated for each company.

In the next, the semi-aggregated responses from these three companies were then compared side-by-side for discussion of common themes and contrasts. These data were then aggregated again so that all information easily identifiable to individual companies participated in this research project were carefully removed.

Due to sensitivity of data including production data and technological advancement, aggregations are intended to capture the CLT industry within France more broadly and general, not making companies that participated in these site tours distinguishable. Averages and/or ranges are included for numerical data to reduce the risks of the easy identification of which specific companies out of the five currently operating in France were actually visited and interviewed.

Comparison between the site tours and previous summaries [5] were then done to check for contradictions, a form of triangulation validity checking. This allowed for tracking of changes between this survey and the site tours.

3 Results

3.1 Geographic Distribution

Currently the largest concentration of Cross-Laminated Timber industry is within Alpine Europe, including the Bavarian region of Germany, Austria, Switzerland, and Northern Italy (Figure 3). The CLT manufacturing sites in France are spread throughout the country with no competition within their respective regions (Figure 3).

3.2 Company Information

The companies within France were well established manufacturers of other structural wood products such as glulam and sawn lumber prior to beginning CLT production. Company size and level of vertical integration varied. Some of the companies had been operating for many decades, despite France historically low interest in timber structures when compared to its neighbours in the Alpine Europe region.
The interviewees unanimously stressed the need for meaningful alliances with architects, builders, general contractors, and others above and below the actual production line within the supply chain. These alliances were important for establishing a successful position in the market.

Figure 3: Map of the CLT manufacturing sites within Central Europe and France (yellow markers show plants producing adhesively bonded CLT, orange markers show plants producing nail bonded CLT or MHM).

They sought these alliance relationships through various means, including from state and/or regionally sponsored design and building competitions held both regionally and nationally. The interviewed companies expressed their interest in these types of initiatives, which were perceived as leading to opportunities for their companies, promotion of their products. Domestic production of CLT was promoted as part of the image of sustainability desired by the public.

3.3 French CLT Association

CLT France Association, tied to the governmental agency, Federation of the Wood Construction Industry, was created in response of growing presence of foreign CLT projects in France and predates launching the first French CLT lines. Currently, it associates domestic and international companies who have ties to the French CLT market including manufacturers, who are provided with resources, association meetings, and other tools to expand the French CLT market [8].

The association has 21 members, which include both French and foreign manufacturers of CLT, builders, architects, engineers, designers, developers, and connections and fastening companies. Out of these 21 members, 9 are international companies operating or interested with the French CLT market, and 10 being CLT manufacturers either French or international (Figure 4).

The CLT France Association is assisting in changing the building code to allow more CLT in larger buildings. According to our interviewees, as of September 2017, CLT buildings could be no taller than three stories. This association is working with government and building officials to change this building code.

Other goals of this association include educating architects, designers, engineers, builders, and the public including all French people about CLTs strengths including within environmental and sustainability, application, and achievements in buildings through photo galleries and supporting information within a central resource location for CLT reference documents.

Figure 4: French CLT Association Members: Domestic and International [8]

3.4 Motivation for Entering CLT Market

Each of the companies interviewed launched CLT production within the past 5 years, but each quoted different motivations for their decision. The main reasons quoted being economics, ease of extending the existing production lines to CLT production based on products already produced, public interest, and governmental incentives. The observed influx of foreign CLT to France increased domestic awareness and know-how, so the domestic French companies determined they need to be a competitor within this “new” market.

Particularly, expanding from existing glulam production, which requires the same starting dimensional lumber and initial processing, the start-up costs were perceived as manageable.

One of the companies completed own market study within France looking at new trends in the wood market, interviewing architects, engineers, and constructors, deciding towards CLT for the future. Another company decided to invest in CLT, as a way to upgrade and modernize the mechanical process and machinery.

Public interest in more environmental friendly, sustainable solutions to building construction pushed the French government to create government incentives.
(2013-2016) for CLT production. All interviewed company representatives referred to this government incentive program, which included government sponsored training, building and design competitions to showcase CLT, tax relief for purchasing equipment. This incentives program was removed as building construction in France began to pick up again. Although the interviewed companies attributed this termination in part to counter lobbying of concrete and steel companies.

Another form of incentive was a push for French wood species use, with government funds being dedicated towards researching the feasibility of the use of these species in French CLT.

3.5 CLT Markets and Production Profiles

The 2016 CLT industry survey has shown that diversity of production profiles (Figure 5), production volumes (Figure 6), levels of vertical integration and approaches to competitiveness and innovativeness are unique characteristics of the global CLT industry.

CLT production globally is dispersed evenly between multi-family housing and medium sized public buildings (Figure 5). By contrast the interviewed French companies reported that most projects these companies completed were medium size public buildings for recreation facilities (swimming pools, gymnasiums, and tennis courts) and school educational buildings. Two of the three companies noted that within the residential market that individual and collective housing units made up a small part of their business.

This local distinction is important to consider while analysing other local markets, and should allow us to investigate potential segmentation of the local approaches by country or geographic region.

3.6 Production Profiles

Two different press types were observed during the site visits: vacuum and hydraulic. Interviewees were convinced that they got the press that worked for their type of operation. Two types of adhesive systems were mentioned. All CLT facilities mentioned their ability to produce 3.5 and 7 ply layered CLT within their facilities, some with volumetric limits due to crane capacities within the facility.

The production shifts for CLT ranged between one 10 to 12 hours shift, to 3 shifts per day. The employment of the entire company including production workers of both CLT and non-CLT products, engineers, designers, etc. ranged from 65 to 400. Each company had a different structure. The proportion of employees dedicated to the CLT production alone was not reported.

The maximum product dimensions is limited due to transport challenges within the narrow roads of France and the physical sizes of the presses. The maximum size of the panels produced varied from 13 meters by 2 meters to 17.8 meters by 3.5 meters.

The dimensional lumber commonly used within French CLT panels was Spruce and Douglas-fir (Pseudotsuga menziesii). The Douglas-fir was being sourced mostly domestically within France, while spruce being mostly sourced from Sweden. More research is currently occurring for consideration of other domestic French wood with potential to be used in CLT panel production.

3.8 Challenges and Constraints

The interviewed companies cited a lot of challenges since launching their production of CLT. The slow recovery of the construction economy after the 2008 recession was cited as very challenging to the French CLT manufacturers as the product was perceived new and volatile in the market. This economic downturn affected the entire wood products industry in France.

Currently, French building code allows for mass timber structures only up to 3 stories tall. While the CLT France Association is working to address that issue, the restriction limits the competitiveness of CLT in the building market, specifically within cities who must build up due to land restrictions. This therefore takes potential CLT buildings out of a large portion of the
building and construction projects being planned in France. The sentiment was that the French building market still is not fully ready for CLT.

3.9 Market Presence

As shown within the geographic map of CLT production facilities, French CLT production is spread throughout the country evenly (Figure 3). All three companies interviewed stated that most of their projects were located within their region mainly and thus they were not involved in much internal competition.

Some companies mentioned working on projects outside of their region, or even in other countries (Netherlands, Spain, and Great Britain). This however still means that French CLT is not being used in projects far away geographically, rather regionally and domestically mostly.

3.10 Other Observations

The CLT market in France was noted as quite small (September 2017) and that each of the interviewed companies had different plans for moving forwards.

One company did not plan to increase production, while the other two did but in each in their own way. The company with no immediate plans for expansion quoted the economic uncertainty in the current French building market. They will consider expansion when economic conditions improve further so that the market outlook can be reassessed.

The other two interviewees who mentioned growth plans for their companies in the coming future planned either adding a press (which is currently identified as the production bottleneck) or an entire new production line to their current facilities.

All interviewees noted that despite the public perception of sustainability and environmental benefits, price remains an important consideration for investors commissioning building projects. One interviewee noted that in 2016, the CLT demand in France had decreased and cooled down from the initial hype. Some investors realized that with all the green advantages it is still an expensive solution. The companies contemplate hybrid solutions with concrete and steel as potential alternative.

4 Discussion and Conclusions

French CLT industry, though geographically close to alpine Europe had experienced slow growth, especially with the lingering effects of the global economic recession. Modern mass-timber construction is still relatively new to France, and the forest products industry produces limited volumes of quality structural lumber. Thus, French CLT companies use lumber from both and foreign forests.

Compared to the global markets for CLT projects, France focuses heavily on both public recreational facilities and public-school buildings. However, French CLT production lines reflect many other characteristics of the global CLT industry including great diversity in terms of technology, production, and markets.

CLT industry in France is still facing the lingering effects of the 2008 economic recession, restrictive building codes, low-costs competition from traditional building industries, and low level of public education regarding the benefits of the new technology.

The tour of French CLT production sites provided us with a valuable feedback and allows revision of the methodology for future site visits and interviews planned for August 2018.

5 Future Work

This paper reflected partial and preliminary results of a pending research project. The research team is currently revising the interview protocols and questions based on the feedback and observations collected during the tour of French CLT production lines. Site visits to CLT companies in Japan, Australia, and New Zealand are planned for August 2018.

The site tours paired with second iteration of the global CLT industry survey first launched in 2016 [5] will allow for a greater insight into the state-of-the-art and global trends the industry is following.

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7 References