The Opportunity for Oregon

[ Panel 2 ]

Tricia Clemans
VertueLab
2017 CLT manufacturing study for Oregon & SW Washington
Mass timber from small-diameter trees and underutilized species

Matt Craigie
EcoNorthwest
Economic & environmental benefits of mass timber for urban redevelopment

Judith Sheine
University of Oregon
School construction & retrofits
Modular construction opportunities for mass timber

Lori Stephens
Broadleaf Architecture
Seismic retrofit of URMS using mass timber

Moderator
2017 CLT Manufacturing Study for Oregon & SW Washington

Tricia Clemans

VertueLab
Green Technologies for Good
2015-2017
Manufacture Study for Cross Laminated Timber Acceleration in Oregon & SW Washington

$120,885 FEDERAL SHARE EDA FUNDS
$82,606 NON-FEDERAL MATCHING SHARE
MARKET POTENTIAL for Mass Timber Panels

RESIDENTIAL BUILDINGS
1 TO 4 STORIES

MEDIUM RESIDENTIAL BUILDINGS
4 TO 8 STORIES

HIGH DENSITY RESIDENTIAL BUILDINGS
8 TO 12 STORIES

TALL COMMERCIAL BUILDINGS
12+ STORIES

LOW/HIGH RISE COMMERCIAL BUILDINGS
5 TO 12 STORIES

SMALL COMMERCIAL BUILDINGS
1 TO 5 STORIES

MANUFACTURE STUDY FOR CROSS-LAMINATED TIMBER ACCELERATION IN OREGON & SW WASHINGTON, 2015-2017
5,800-17,300
Total jobs

$338 M to $1 B
Labor income /yr

$11.3-$33.8 M
State income tax /yr
SUPPORT INNOVATION & DESIGN

INCENTIVIZE BUILDING

INVEST IN MANUFACTURING

SHAPE POLICY
Thank you!

Tricia Clemans
tricia.clemans@vertuelab.org
Economic Considerations for Mass Timber Development in Oregon

Matt Craigie

ECONorthwest
Project Sponsors
Key Questions

• How does the use of mass timber change real estate development revenues, costs, and construction processes?
• What are the current and potential future impacts of mass timber products on real estate development projects?
Mass Timber Specialists

- William Silva, Swinerton
- Erica Spiritos, Swinerton
- Ben Kaiser, Kaiser Group/Path Architecture
- Alex Zelaya, Hacker Architects
- Brad Nile, Andersen Construction
- Bryce Paine, Homestreet Bank
- Kevin Johnson, GBD Architects
- Iain MacDonald, Tallwood Design Institute
- Anyeley Hallova, Project^ 
- Ethan Martin, Wood Works
- Todd Duwe, Andersen Construction
- Noel Johnson, Cairn Pacific LLC
- Scott Barton-Smith, Hacker Architects
Real Estate Development Perspectives

- Development projects respond to market forces.
- Market-rate development projects are realized because they demonstrate a financial return.
- Costs relative to revenue is the key driver.
- There are other drivers: project aesthetics, neighborhood impact, environmental concerns/regulations, the construction timeline, etc.
The Development Budget - Simplified

Construction Sources
- Investors + Developer Equity 40-50%
- Construction Loan 50-60%

Construction Uses
- Hard Costs 60%
- Soft Costs 25%
- Land 15%
The Development Budget - Simplified

Construction Uses

- Hard Costs: 60%
- Soft Costs: 25%
- Land: 15%

How does Mass Timber impact the Development Budget?
# The Development Budget - Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Cost</td>
<td>Land</td>
</tr>
<tr>
<td>Pre-Development</td>
<td>Due diligence</td>
</tr>
<tr>
<td></td>
<td>Site Preparation</td>
</tr>
<tr>
<td>Hard Costs</td>
<td>Materials</td>
</tr>
<tr>
<td></td>
<td>Labor</td>
</tr>
<tr>
<td>Soft Costs</td>
<td>Architecture and Engineering</td>
</tr>
<tr>
<td></td>
<td>Legal Fees</td>
</tr>
<tr>
<td></td>
<td>Permits and Design</td>
</tr>
<tr>
<td></td>
<td>Contingency</td>
</tr>
<tr>
<td></td>
<td>Developer Fee</td>
</tr>
<tr>
<td>Financing Costs</td>
<td>Acquisition, construction, and permanent loans</td>
</tr>
<tr>
<td></td>
<td>Carrying Costs</td>
</tr>
<tr>
<td>Assumption or Input</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Land Cost</strong></td>
<td>The cost to secure the land (usually through purchase or ground lease) for development. Land costs are unlikely to be affected by the use of mass timber.²⁰</td>
</tr>
<tr>
<td><strong>Pre-Development</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Due Diligence</strong></td>
<td>Investigative work to assess a site’s suitability for a project, and to determine the likely risks to construction. Typically, geo-technical and other engineering services are employed to determine suitability and to obtain environmental permits.</td>
</tr>
<tr>
<td><strong>Site Preparation</strong></td>
<td>Costs to physically ready the site for construction. This includes digging out, leveling ground, pouring foundation, and inserting pilings.</td>
</tr>
<tr>
<td><strong>Hard Costs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>Costs of the physical materials used to construct a building. These materials include all building systems—structural,</td>
</tr>
</tbody>
</table>
What did we find?

• Mass timber holds long-term promise for cost and efficiency improvements
• Mass timber products are evolving and improving quickly
• Rethinking the design and construction process is key to leveraging mass timber products
The Development Budget
Where is there potential?
Hard Costs: 60%
Soft Costs: 25%
Land: 15%

Construction Uses:

Materials: 35%
Labor: 25%
Traditional Steel & Concrete

- Materials: 35%
- Labor: 25%
- Soft Costs: 25%
- Land: 15%

Mass Timber Building Long Term

- Materials
- Labor
- Soft Costs: 25%
- Land: 15%

$$$$ Savings
Steel & Concrete
- Pre-Development
- Construction

Mass Timber
- Pre-Development
- Construction

Land Option
- Execute Option/Initiate Loan Package

$$$$ Savings

Project Delivery
Best Practices

• Identify the values of your project and how these values inform the use of mass timber
• Commit to using mass timber early in the pre-planning phase
• Bring a mass timber supplier into the pre-development conversation
• Use an integrated development team (with an experienced design team)
• Use mass timber products where it is advantageous
Thank you!

Matt Craigie
craigie@econw.com
How growing the domestic production and use of mass timber can create opportunities for Oregon's urban, rural, and small communities.
Limnologen Place, Växjö, Sweden, Arkitektbolaget, 2009 – CLT panels  Photo credit: Midroc

Waugh Thistleton's Watts Grove, 2018 project – CLT units
Construction period: 8 weeks
Manufacturers: Stora Enso factory, Stugeba Mobile Raumsysteme GmbH
Architect: DI Robert Kriebaum, Maurer und Partner
Photo: © Stugeba
Modular Mass Timber School
Payton Narancic and Simone O’Halloran

University of Oregon, Department of Architecture
Faculty Advisor: Judith Sheine
Why Mass Plywood?

Eugene's wastewater is treated and the solids are used to fertilize a poplar farm. Poplar is a fast growing and cheap wood to use as a field for plywood.

In Lyons, Oregon, Frerer’s lumber is making the world’s fastest mass plywood panels. Mass plywood is strong enough to serve as structural panels instead of high energy materials like concrete or steel. This classroom can be cut from 8 panels minimizing waste.

Each classroom is made from 3 modules. Each module is 10’x30’x12’. A truck can transport two modules at a time.

Modular classrooms are fast to assemble, reducing construction time and cost.

Why Mass Plywood?

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Modular classrooms are fast to assemble, reducing construction time and cost.

Nick McGuire and Molly Winter
Faculty Advisor: Judith Sheine
Survey - Participants

The map shows the location of the school districts that participated in the survey we sent out. Of the possible 198 Oregon school districts that we distributed the survey to, 23 responded. As you can see on the map, we had a balanced sample size with representation across the state.

- Central Curry
- Central
- Corvallis
- Diamond
- Dresvey
- Eagle Point
- Eugene
- Grants Pass
- Hermiston
- Imbler
- Butte Falls
- Jewell
- Joseph
- Knappa
- McKenzie
- North Marion
- Pleasant Hill
- Powers
- Santiam Canyon
- Silver Falls
- Umatilla
- Warrenton-Hammond
- Willamina
Breakdown of Project Types
Please select the types of projects your district plans on completing.

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additions</td>
<td>11</td>
</tr>
<tr>
<td>Seismic Retrofit</td>
<td>11</td>
</tr>
<tr>
<td>None</td>
<td>6</td>
</tr>
<tr>
<td>New School Construction</td>
<td>6</td>
</tr>
</tbody>
</table>

Project Considerations
Please rank your top considerations when selecting a proposal for a capital project.

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Cost</td>
<td>4.8</td>
</tr>
<tr>
<td>Structural Safety/Resilience</td>
<td>4.4</td>
</tr>
<tr>
<td>Long-Term Durability</td>
<td>3.9</td>
</tr>
<tr>
<td>Public Opinion</td>
<td>3.4</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>3.4</td>
</tr>
<tr>
<td>Project Duration</td>
<td>3.4</td>
</tr>
<tr>
<td>Other</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Insights
- Besides construction cost, many of superintendents' top considerations align with mass timber's value proposition.

Cost is unsurprisingly the top concern among all school districts. However, the other top concerns are resolved with using mass timber. These qualities can be highlighted when pitching to school districts to convert them to using mass timber.
Market Sizing Analysis to Find Potential Demand and Actual Demand

Deriving Potential and Actual Demand from Total Spend

Based on the knowledge that 20% of total capital construction spend is contributable to structural materials and assuming, based on quantitative results from our survey and qualitative responses from interviews, 25% of schools could be converted, we were able to derive Actual Demand for Mass Timber in Oregon equal to about $20M.

Potential (20% of CC Spend)

~ $80 M

Actual (5% of CC Spend)

~ $20 M
Process for Choosing Building Materials

Public awareness of mass timber
- Superintendents are unaware of the benefits of mass timber
- Architects are reluctant to recommend a costly material
- Public awareness affects mass timber adoption more indirectly than directly

Initial Assumptions
- Have to influence the decision makers for the school
- Adoption by schools could lead to broader expansion of use of mass timber

What We Learned
- Decision makers vary by school district size
- Difficult to pitch long-term savings to someone who won't be there long-term
- Cost is the biggest barrier but could be a big opportunity

What We Need to Know
- Identify specific decision-makers
- Look more deeply into the schools proposed to identify where mass timber can be cost competitive
### Persona Matrix

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Budget of Capital Improvements</td>
<td>$424,462</td>
<td>$3,424,088</td>
<td>$24,128,655</td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Resilience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-term Durability</td>
<td></td>
<td></td>
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</table>

### Critical Components

1. Acquired a Bond
2. High Growth
3. Potential to Maximize Benefits (Particularly Cost) of Mass Timber

**Optimal School District for TDI to Target**

- Critical Decision Maker: Architect
- Influencer: Superintendent, Construction Manager
# Identify Cost Competitive School Districts

<table>
<thead>
<tr>
<th><strong>Known</strong></th>
<th><strong>Unknown</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Growth School Districts</strong></td>
<td><strong>Cost Competitive School Districts</strong></td>
</tr>
<tr>
<td>▶ We know the school districts that are undergoing the most growth and have acquired bonds</td>
<td>▶ We do not know which target school districts are best equipped to capitalize on the benefits of mass timber</td>
</tr>
<tr>
<td></td>
<td>▶ We do not know for sure that there are school districts where mass timber may be cost competitive</td>
</tr>
</tbody>
</table>

**Next Step(s)**

- Identify circumstances where school districts can capitalize on the benefits of mass timber (i.e. poor soil conditions, proximity to mass timber plants etc.)
- Analyze the high growth school districts that have acquired bonds based on cost savings potential
- Approach school districts with the greatest cost savings potential leading with the cost benefits of mass timber
  - Present the auxiliary benefits of mass timber based on their alignment with cultural values
Freres Lumber, Mass Plywood Plant, Lyons, OR
Modular Mass Plywood Classroom

Judith Sheine, Mark Donofrio
with David Moreno

Note: This work is supported by AFRI ELI grant no. 2018-67032-27704, from the USDA National Institute of Food and Agriculture.
Thank you!

Judith Sheine
jesheine@uoregon.edu
Seismic Retrofit of an Unreinforced Masonry (URM) Building

Lori Stephens
The Harding Building
Corvallis, Oregon

- Seismic Safety
- Preserving the integrity of a historical building - URM
Project Goals

• $98,000 Grant - Oregon Main Street/Downtown Corvallis Association
• Team - Engineers, architects, contractors, preservationists and Oregon State University faculty and students
• First major objective - a mock-up for how the project goals can be accomplished
• Record the twists and turns of the project so that others can benefit from a replicable process
Thank you!

Lori Stephens
info@broadleafarchitecture.com
Small Diameter Timber and Underutilized Species

Tricia Clemans
SMALL DIAMETER TIMBER

UNDER-UTILIZED SPECIES
Demonstrating use and performance of a CLT modular building utilizing low-value pine lumber from logs harvested in Pacific NW forest restoration programs

Mariapaola Riggio
MArch Msc, Ph.D.
Assistant Professor, Wood Design and Architecture
Wood Science and Engineering | Oregon State University
mariapaola.riggio@oregonstate.edu
“Demonstrating use and performance of a CLT modular building utilizing low-value pine lumber from logs harvested in Pacific NW forest restoration programs”

A project funded by the USDA Wood Innovation Grant Program 2018

Scope of this project is to design, build, deploy, monitor and publicize a demonstration modular unit made from cross-laminated timber using lower-value ponderosa pine.

The demonstration unit will show the technical and economic viability of large-volume production of robust modular units designed for rapid deployment and deconstruction, and with potential for utilization in low- and mid-rise buildings.
National Forest System restoration programs in the Western US generate large volumes of low-value pine logs. A substantial portion of the material contains blue stain, which lowers its value even further. There is a pressing need to find a value-added market for this material in order to help offset a portion of the cost of these operations. One of the barriers is the perception of ponderosa pine as an inferior material not fit for engineered structural composites. Custom CLT grades optimized for designs that can be executed in large numbers will create an opportunity to utilize substantial volumes of lumber that otherwise might not be accepted for standard CLT grades.

Target Market Segment
Low-rise construction
Temporary construction
Emergency shelter, disaster relief
Related projects and research activities

This project builds upon results of two previous research projects:

1. Muszynski et al. 2015: Utilization of low-value lumber from small-diameter logs harvested in Pacific Northwest forest restoration programs in hybrid cross laminated timber (CLT) core layers

Project team and partners

Mariapaola Riggio

Lech Muszynski

Oregon State University

Katerra
Vaagen Timbers
SMT

rothoblaas
Andersen Construction
Tallwood Design Institute

Oregon Forest Resources Institute
WoodWorks
Thank you!

Tricia Clemans
tricia.clemans@vertuelab.org
Break Time

Hurry Back!