



Creating forest sector solutions

[www.fpinnovations.ca](http://www.fpinnovations.ca)



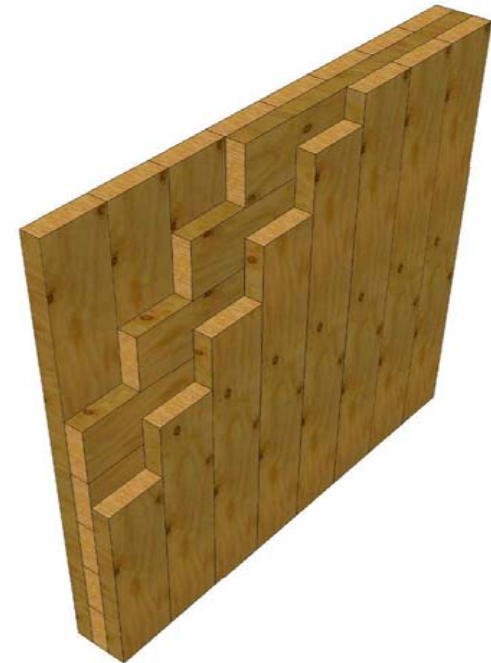
# Cross Laminated Timber

## The Market Opportunities in North America

May 12<sup>th</sup> 2011  
By : Ben Toosi

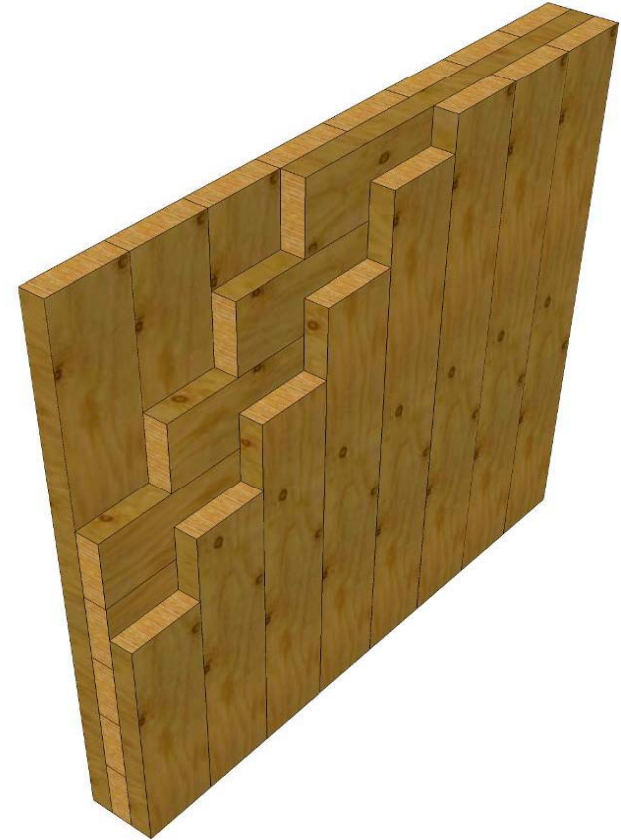
# Cross Laminated Timber (CLT)

- CLT is a wood alternative to concrete slab
- New flexible building system
- Marriage of Glulam and Plywood
- Can utilize material of various dimensions from 1"x1" to .....
- CLT has been successfully used in Europe
- Potential drivers are:
  - Lack of skilled labor for in-site construction
  - design flexibility
  - environmental advantages



# Outline

- Manufacturing costs
- Competitiveness
- Market opportunity
- Final remarks



# Manufacturing Costs

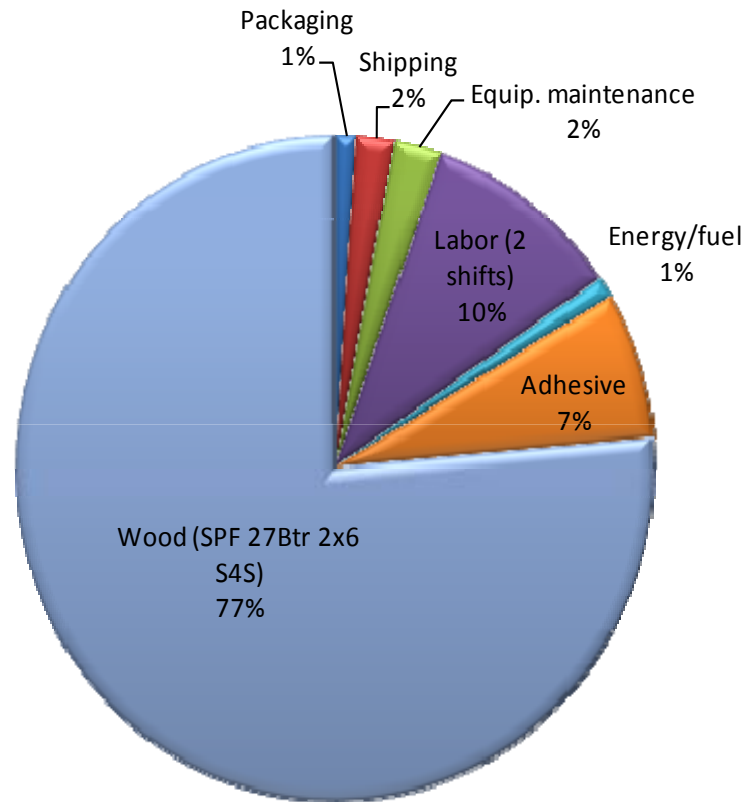


- Detailed Feasibility Analysis

- large CLT Plant
- Producing 2 panel types (3-ply 107mm/4.2in thick, 5-ply 178mm/7in thick, 3 x 8 m)
- Parameters:
  - Capital
  - Labor
  - Energy
  - Material (wood 2x6, adhesive)
  - Delivery
  - Others: yield, residues, packaging

# Manufacturing Costs

## Variable Cost of CLT (Simulated, September 2010)



- KD W SPF 2&Btr, 2x6: \$300/MBF
- Reman+Drying: \$100/MBF=> \$400/MBF
- Glue: PUR: \$8.8/kg(\$19.4/lb)
- Reman factor: 85% (yield)
- Plant Output: 1.4 million cubic feet
- Capital cost \$30 million

Total cost: 20 \$/ft<sup>3</sup>

All dollar values are in US currency

# Outline

- Manufacturing Costs
- **Competitiveness**
- Market Opportunity
- Final Remarks





# Savings in Construction Time



Minimum assembly time at the building site because of its prefabricated elements

# Savings in Construction Time

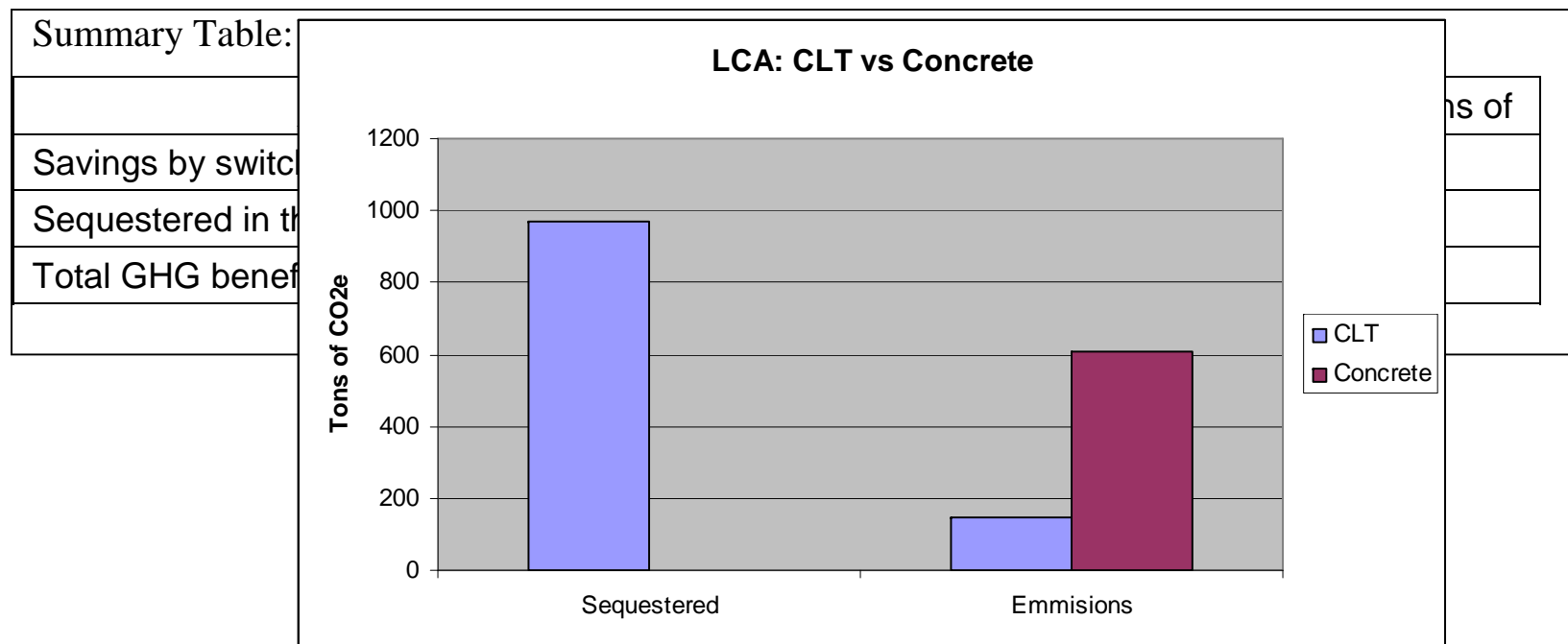
- Residential, 1st concrete + 8CLT floors
- London, England
- Crew: 4 Carpenters
- Construction of the shell: 3 days per floor
- 22 weeks time saving by choosing CLT over concrete





# Tremendous environmental virtues: Preliminary Side by Side CO<sub>2</sub> Comparison: CLT vs. Concrete

- Preliminary side by side comparison:
- 6-storey<sup>1</sup> apartment building: CLT vs. Concrete

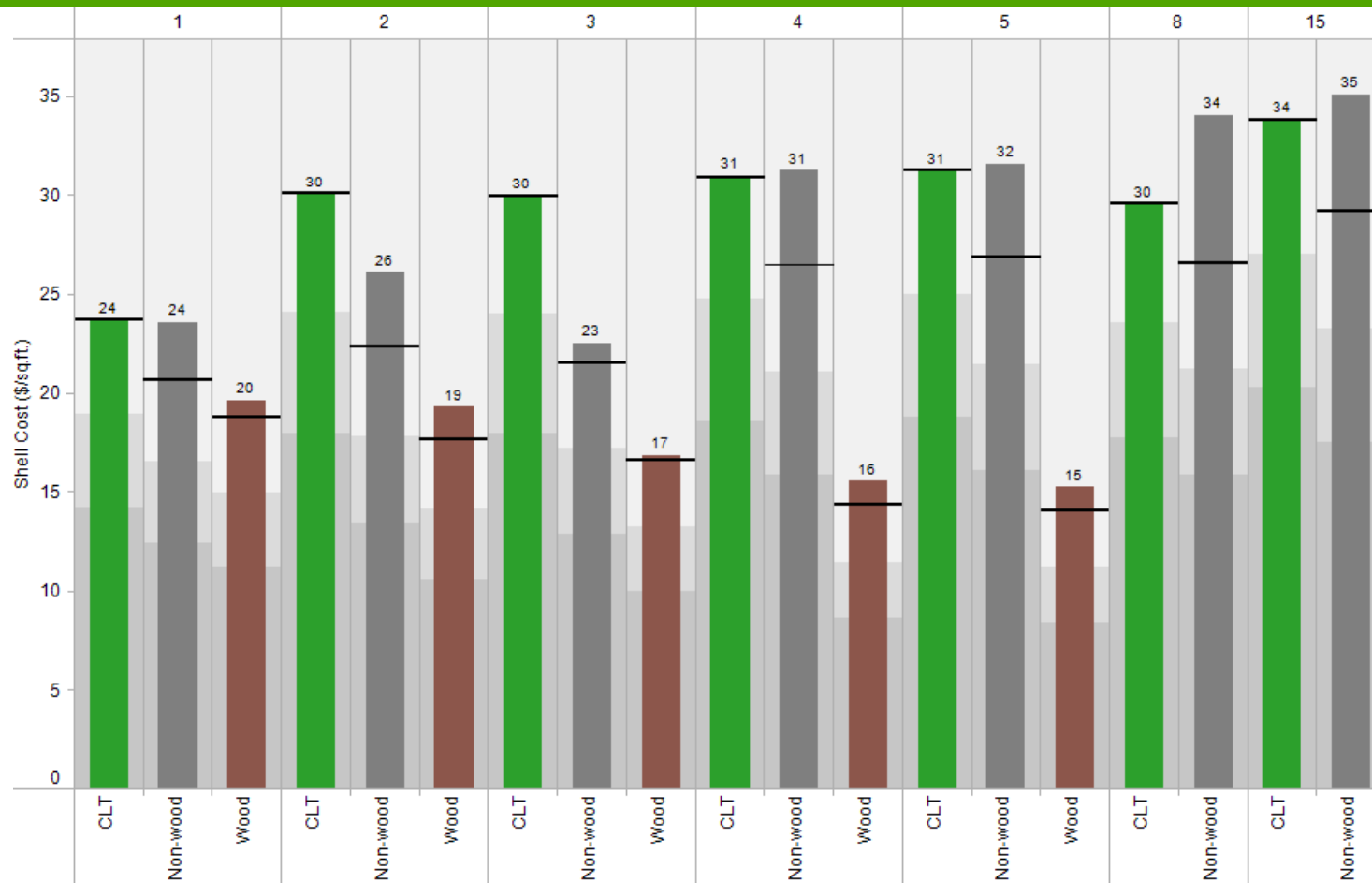


Source: Energy & Environment Program, FPInnovations, September 2009, based on glulam parameters

Sequestered: .75 ton/m<sup>3</sup>  
Displacement: .36 ton/m<sup>3</sup>

<sup>1</sup> 1,300 m<sup>3</sup> of CLT

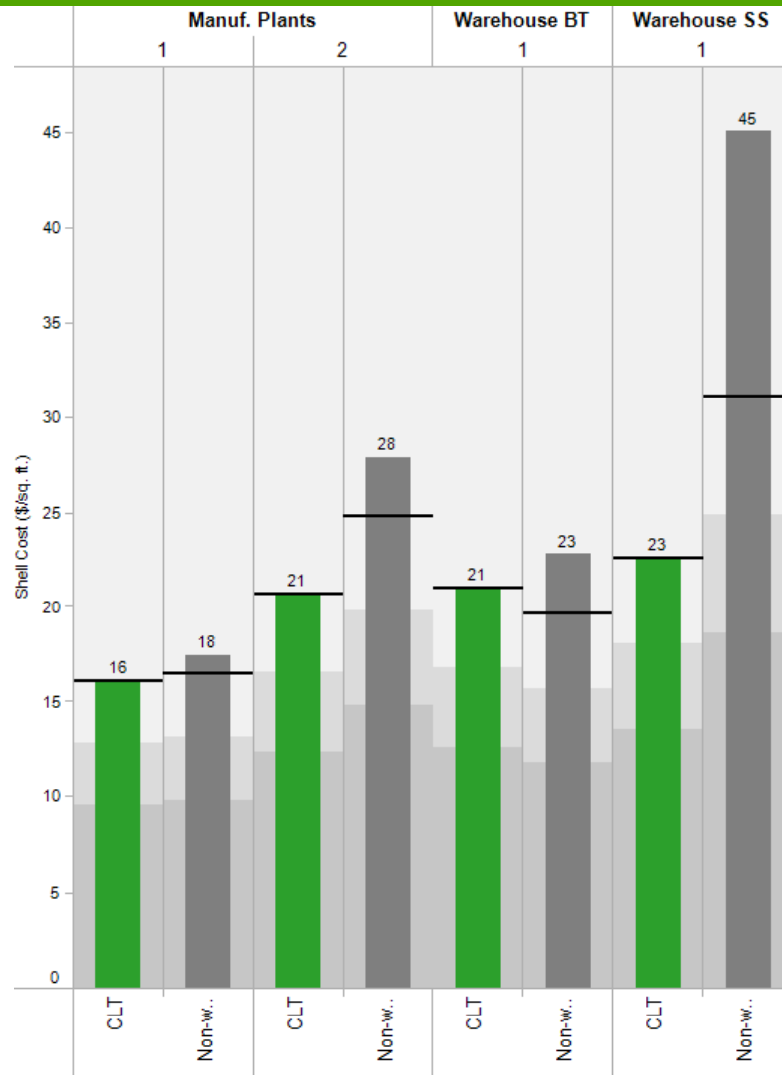
## 2. Competitiveness Analysis: Apartments



- Side by side cost appraisal: CLT vs. Non-wood & LWF

- Same footage by assembly (elevated floors, ext. walls, roof, partitions)
- Comparison at shell level (superstructure). Finishes assumed constant.
- CLT configuration based on best practices\* (thickness, finishes). Shafts incl.
- CLT delivered price: Cost+25%+connectors+erection

# Competitiveness Analysis: Industrial Structures



- Manufacturing plants
- Big box retail
- Self storage

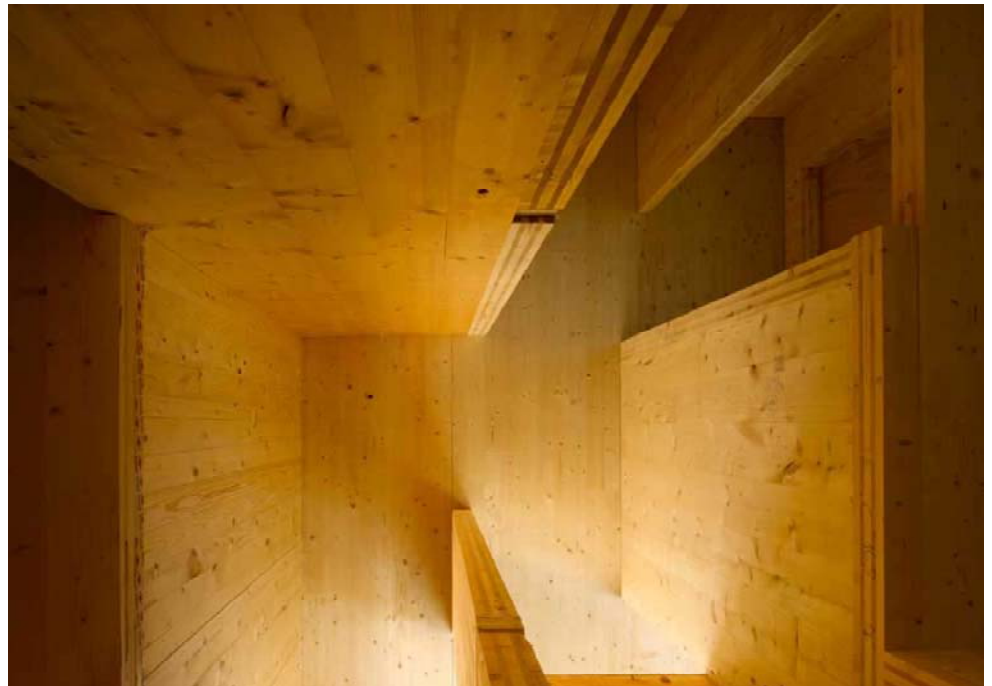
# Outline

- Manufacturing Costs
- Competitiveness
- **Market Opportunity**
- Final Remarks



# Market Opportunity

- Two market penetration scenarios (5%, 15%)
- Additions: 15% of floor area
- Canada demand was assumed at 7% of US demand





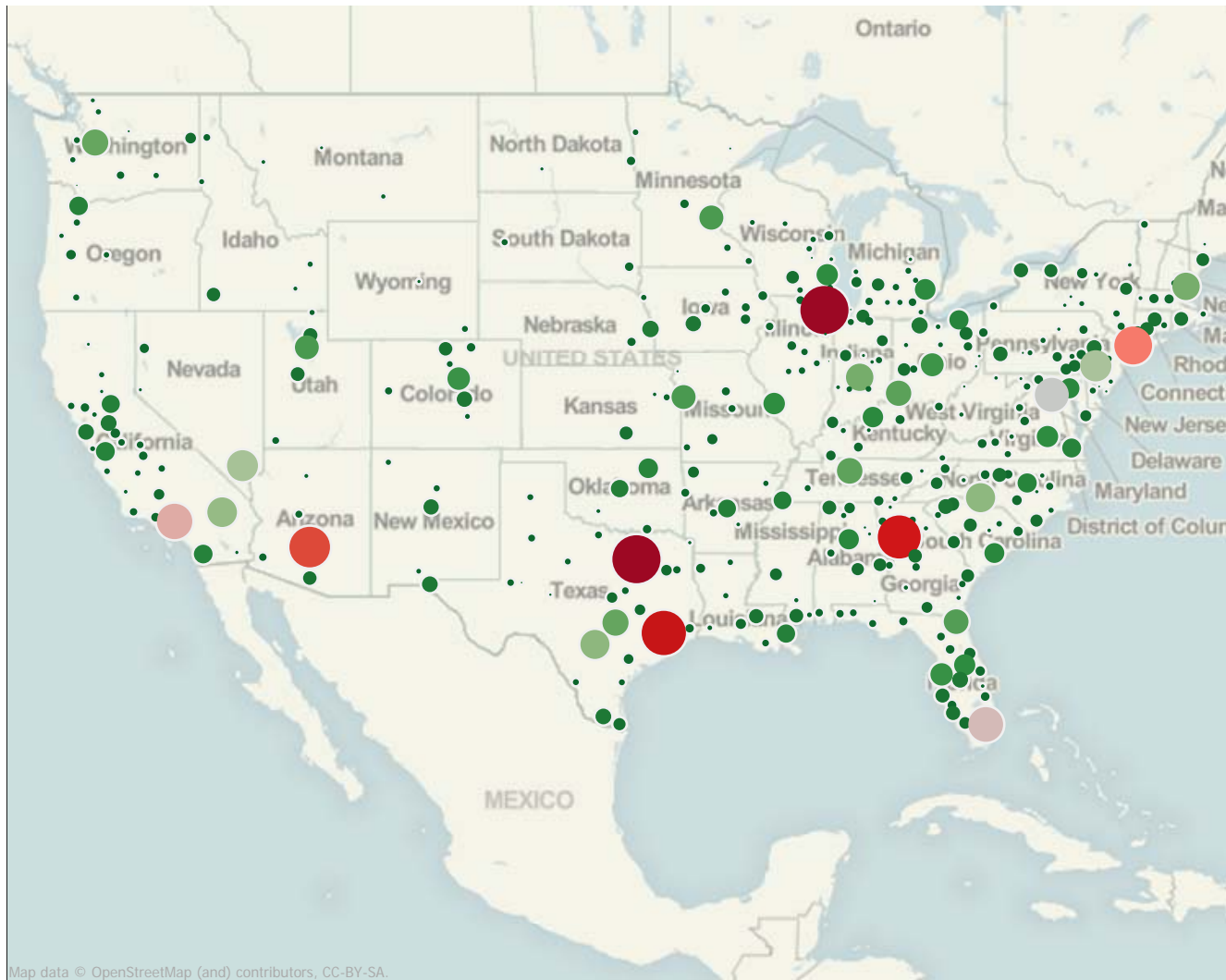
# Market Opportunity

	Floor area (Million ft <sup>2</sup> )		CLT (Million m <sup>3</sup> )		Lumber (BBF)		Shell Value (\$ Billion)	
Storey class	5%	15%	5%	15%	5%	15%	5%	15%
Low-rise (1 to 4)	52	156	0.9	2.7	0.6	1.8	1.1	3.3
Mid-rise (5 to 10)	16	48	0.3	0.9	0.2	0.6	0.4	1.2
Total	68	204	1.2	3.6	0.8	2.4	1.5	4.5

Note: The Canadian market can be estimated at 5 to 10% of the US market on a floor area basis.

- Up to 2x Lumber (Nonres)
- 1+ million metric tons avoided CO<sub>2</sub>
- At 15% penetration, \$4.5 billion CLT sales
- 3+ million metric tons stored CO<sub>2</sub> = annual emissions of 800,000+ cars
- 20-60 large manufacturing plants

# Market Opportunity at 5% Penetration (000 ft<sup>3</sup>) by Metro Area



# Outline









- Manufacturing Costs
- Competitiveness
- Market Opportunity
- **Final Remarks**



# Final Remarks

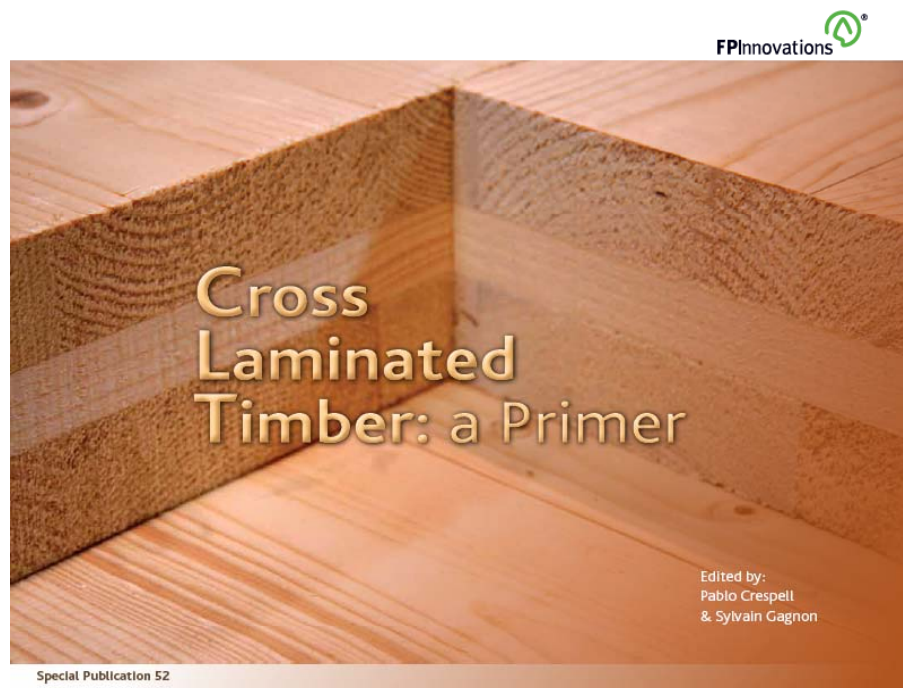
- Savings in Construction Time
  - Faster capital turnaround
- Other benefits
  - Safe construction
  - Less errors
  - Quiet construction
  - Less waste
  - Carbon economy
- Exciting Wood building system contender for concrete
- Creating new opportunities to use wood systems in areas dominated by other non wood materials

# Summary Scorecard

<b>Market Size</b>		<i>0.8 to 2.4 billion bf market (5%-15% market penetration)</i>
<b>Cost Competitive</b>		<i>+/- 5-10% compared to steel/concrete</i>
<b>Structural Capacity</b>		<i>Examples up to 9 storeys. Need to confirm seismic test results</i>
<b>Fire Performance</b>		<i>European products rated up to 1.5 hrs. Expect 2hrs possible. Fire testing required</i>
<b>Thermal Performance</b>		<i>Better than concrete.</i>
<b>Acoustic Performance</b>		<i>Equivalent to concrete</i>
<b>Environmental Impact</b>		<i>Better than concrete.</i>
<b>Fits with NLGA lumber</b>		



# CLT Literature



**THANK YOU!**  
**Questions?**