Biobased Materials for Sustainable Temporary Disaster-Relief Housing

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\textit{3\textsuperscript{rd} International Conference on Urban Disaster Reduction}
September 29\textsuperscript{th}, 2014

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Motivation & Background

- Transitional structures can be expensive and employ materials that have a much longer lifespan than their period of intended use.

- Environmentally-friendly materials and structural systems can increase the sustainability & effectiveness of transitional housing:
  1. Decreasing reliance on nonrenewable resources (e.g., polyolefin-based plastics)
  2. Satisfying multiple design criteria (e.g., structural, thermal)
  3. Rapidly transforming into another functional product after their useful life
Biobased materials & closed-loop lifecycles

- Biobased materials may facilitate a transition from traditional cradle-to-grave construction to a novel closed-loop lifecycle.
- Biobased composites derived from plant byproducts or synthesized microbially may meet design requirements of conventional.
• **Mechanical properties:** Similar to wood and engineered wood, but more dense, motivating efficient structural assemblies (e.g., sandwich panels)

• **Thermal properties:** Equivalent or superior to conventional temporary housing materials

• Sustainable biobased materials, constructed using locally available resources, may be suitable as the primary structural and insulating systems of temporary structures
Thank you

Poster Space #18

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# Research Motivation

## Proposed biomaterial application matrix:

<table>
<thead>
<tr>
<th></th>
<th><strong>Permanent</strong></th>
<th><strong>Temporary</strong></th>
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<tbody>
<tr>
<td><strong>Structural</strong></td>
<td>Beams</td>
<td>Formwork</td>
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<td>Columns</td>
<td>Shoring</td>
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<td>Framing</td>
<td>Lagging</td>
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<td>Wall panels</td>
<td>Safety rigging</td>
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<td></td>
<td>Roof beams</td>
<td>Scaffolding</td>
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<td>Floor joists</td>
<td>Disaster relief structures</td>
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<td><strong>Non-Structural</strong></td>
<td>Partitions</td>
<td>Packaging</td>
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<td>Doors</td>
<td>Pallets</td>
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<td>Roofing</td>
<td>Storage containers</td>
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<td>Window frames</td>
<td>Disposable supplies</td>
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<td>Flooring</td>
<td>Toys</td>
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<td>Cabinetry</td>
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Images References: G-I
Research Motivation

- Temporary/Disposable Structures:

Images References: J-L
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