Seeing Embodied Carbon

an emergent property of working forest landscapes

David Diaz
Ecotrust

Oct 28, 2021

00  Missing the forest
Where are the trees and forests in your LCA?

(You probably won’t find them!)

- LCAs usually forego “biogenic carbon” tracking, assuming all managed forests to be exactly “carbon neutral”
- Forestry practices that produce observable increases or decreases in forest carbon storage are left completely off the balance sheet

Where did we choose to ignore forests?

Product Category Rules governing LCA and EPDs for North American structural wood products allow (but don’t require) a simplifying assumption of carbon neutrality.

“...biogenic carbon neutrality of wood is valid for North American wood products as national-level inventory reporting shows overall increasing and/or neutral forest carbon stocks in recent years.”

In a nutshell, because national-scale carbon stocks are non-declining, wood products from any and every forest in North America can be (but don’t have to be) treated as if they were exactly carbon neutral.
We need to bring our values into our markets

Catalytic investments are ongoing to reduce GHG emissions and increase forest carbon sequestration.

Beyond offsets, globalized markets for forest products are blind to most forest values but have enormous untapped potential to shape forest management and conservation decisions.

We can do better than carbon neutral

A simple formula for recognizing non-zero carbon balance in LCA

1. **Determine carbon stock change in the forest**
   Cumulative carbon gain or loss from an area of interest over a specific timeframe.

2. **Determine timber (roundwood) output**
   Volume of logs entering market from same area and timeframe.

3. **Calculate “upstream” embodied carbon**
   Divide #1 by #2 to calculate “upstream” embodied carbon for the area of interest for the specified timeframe.

01  Seeing the forest

Eyes on forests
Nationwide time series of forest carbon stocks and timber outputs

Publicly available data funded by the NASA Carbon Monitoring System offers annual wall-to-wall estimates at 30 x 30 m resolution of aboveground forest biomass across contiguous USA from 1990 to 2017.
Eyes on forests

Nationwide time series of forest carbon stocks and timber outputs

Annual timber output records exist at the county-level by owner group for many western states. Periodic reporting is available for entire USA.

Forest ownership across the contiguous USA based on US Forest Service research.

Distinctions between private owner types aren’t exact, but do permit us to see emergent trends at regional scales.
How does a forest product EPD stack up?

Unpacking glulam’s embodied carbon from a sample of LCAs and EPDs

With 1 m³ of roundwood, we can make ~0.42 m³ of glulam (58% of the roundwood meets another short-lived fate)

For each cubic meter of industrial roundwood used for glulam, we get the following embodied carbon footprint:

+5 Forest Operations
+20 Lumber Production
+20–40 Glulam Production
-375–455 In Product

(kgCO₂e / m³ roundwood)

Data sources:
Forest biomass: Kennedy et al. (eMapR web application) http://emapr.ceoas.oregonstate.edu/pages/data/viz/index.html

How Oregon’s roundwood stacks up

Non-reserved forests from 2002–2016

<table>
<thead>
<tr>
<th>Owner Type</th>
<th>10th</th>
<th>20th</th>
<th>30th</th>
<th>40th</th>
<th>50th</th>
<th>60th</th>
<th>70th</th>
<th>80th</th>
<th>90th</th>
<th>%</th>
<th>2002-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>-676</td>
<td>-101</td>
<td>-85</td>
<td>+21</td>
<td>+128</td>
<td>+180</td>
<td>+228</td>
<td>+327</td>
<td>+520</td>
<td>6.9%</td>
<td>4.2</td>
</tr>
<tr>
<td>Local</td>
<td>-1,333</td>
<td>-827</td>
<td>-265</td>
<td>-57</td>
<td>+0</td>
<td>+84</td>
<td>+123</td>
<td>+240</td>
<td>+351</td>
<td>1.1%</td>
<td>0.6</td>
</tr>
<tr>
<td>Tribal</td>
<td>-598</td>
<td>-353</td>
<td>-167</td>
<td>-127</td>
<td>-119</td>
<td>-103</td>
<td>-61</td>
<td>+89</td>
<td>+680</td>
<td>1.6%</td>
<td>0.9</td>
</tr>
<tr>
<td>NIPF</td>
<td>-2,124</td>
<td>-1,319</td>
<td>-1,125</td>
<td>-936</td>
<td>-622</td>
<td>-365</td>
<td>-37</td>
<td>+110</td>
<td>+430</td>
<td>9.6%</td>
<td>5.6</td>
</tr>
<tr>
<td>Industry</td>
<td>-353</td>
<td>-257</td>
<td>-221</td>
<td>-159</td>
<td>-101</td>
<td>-42</td>
<td>+98</td>
<td>+183</td>
<td>+353</td>
<td>69.2%</td>
<td>40.0</td>
</tr>
<tr>
<td>Overall</td>
<td>-1,277</td>
<td>-390</td>
<td>-257</td>
<td>-190</td>
<td>-123</td>
<td>-43</td>
<td>+94</td>
<td>+185</td>
<td>+365</td>
<td>100%</td>
<td>57.7</td>
</tr>
</tbody>
</table>

Data sources:
Forest biomass: Kennedy et al. (eMapR web application) http://emapr.ceoas.oregonstate.edu/pages/data/viz/index.html
With opened eyes, we see huge variation
All of which was previously being treated as exactly zero

Timber from non-reserved western forests from 2002–2016.

03 Now what?
Learning to see forests
increasing actionable information flow from forests to builders

- Forest practices matter. Place matters.
  Keep asking questions and articulating what matters to you about forests.

- Every major timberland owner knows their inventory and output (it’s their business to know)
  ... but sawmills and product manufacturers usually won’t know many “upstream” impact details.

- We need actionable (place-based) EPDs for products and LCI data on forests
  Forest Carbon Disclosure could become a prerequisite for forest product suppliers to compete for market share among green builders.

- Clients are asking carbon-specific questions about wood
  We need a better answer about how much forestry choices matter than “Um... zero.”
  And continent-wide averages just won’t cut it anymore.

- Carbon is the tail, not the dog
  Reducing forest carbon stocks isn’t always a bad thing. Find out more what climate-smart forestry looks like.
  And what bringing an equity lens to your decisions might look like.

Carbon-friendly vs. Climate-smart
carbon is the tail, not the dog

CLIMATE-SMART FORESTRY
balances adaptation, resilience, and mitigation

CARBON-FRIENDLY FORESTRY
focused primarily on climate change mitigation

Note: Not drawn to scale :)}
Carbon-friendly vs. Climate-smart

carbon is the tail, not the dog

YOU SHOULD BUY MORE OF THIS WOOD

Climate-smart Forestry
balances adaptation, resilience, and mitigation

Carbon-friendly Forestry
focused primarily on climate change mitigation

Note: Not drawn to scale :)

BUT WHAT IS THIS?

Climate-smart Forestry
balances adaptation, resilience, and mitigation

Carbon-friendly Forestry
focused primarily on climate change mitigation

Note: Not drawn to scale :)

YOU SHOULD BUY MORE OF THIS WOOD

Climate-smart Forestry
balances adaptation, resilience, and mitigation

Carbon-friendly Forestry
focused primarily on climate change mitigation

Note: Not drawn to scale :)

17

18
Keep Going

“You take the red pill. You stay in wonderland, and I show you how deep the rabbit hole goes.”
- Morpheus (The Matrix)


Thank you.

David Diaz
Ecotrust
ddiaz@ecotrust.org