What Makes Wood Different: A Deep Dive into Biogenic Carbon Accounting

WOODWORKS

council

MOOD BRODUCI

Ashley Cagle, PE, SE March 29, 2023



Resources from WoodWorks

Whole Building Life Cycle Assessment (WBLCA)

» Introduction to Whole Building Life Cycle Assessment: The Basics

Biogenic Carbon and Carbon Storage

- » When to Include Biogenic Carbon in an LCA
- » How to Include Biogenic Carbon in an LCA
- » Biogenic Carbon Accounting in WBLCA Tools
- » Long-Term Biogenic Carbon Storage
- » Calculating the Carbon Stored in Wood Products

Environmental Product Declarations (EPDs)

- » Current EPDs for Wood Products
- » How to Use Environmental Product Declarations



Life Cycle Assessment (LCA)

"Evaluation of the inputs, outputs, and potential environmental impacts of a product system throughout its life cycle"

» Systematic, scientific quantification

Used for:

- » Single products or processes: e.g., a wood product
- » Complex, integrated systems: e.g., an entire building (WBLCA)

Life Cycle Assessment (LCA)

"Evaluation of the inputs, outputs, and <u>potential environmental</u> <u>impacts</u> of a product system throughout its life cycle"

Environmental Impacts:

- » Global Warming Potential (GWP)
- » Ozone depletion
- » Smog formation
- » Acidification
- » Eutrophication
- » Depletion of nonrenewable resources
- » Etc.

Life Cycle Assessment (LCA)

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- » Etc.

Life Cycle Stages:

- » Harvesting or mining
- » Manufacture
- » Transportation and installation
- » Maintenance, repair and replacement
- » Decommissioning and disposal/reuse

Life Cycle



Optional supplement information beyond system boundary					em boundary	nin the syste	rmation with	e cycle info	n works life	Constructio				
D		C1 - C4				B1 - B7					A4 -	A1 - A3		
	END-OF-LIFE Stage				USE Stage				UCTION	PRODUCTION Stage (Mandatory)				
	C4	C3	C2	C1	B5	B4 ⁹	B3	B2	B1	A5	A4	A3	A2	A1
Potential net benefit from reuse, recyclin and/or energy recove beyond the system boundary	Disposal of waste	Waste processing	Transport to waste processing or disposal	De-construction / Demolition	Refurbishment (incl. production, transport and disposal of necessary materials)	Replacement (incl. production, transport and disposal of necessary materials)	Repair (incl. production, transport and disposal of necessary materials)	Maintenance (incl. production, transport and disposal of necessary materials)	Use	Installation	Transport to site	Manufacturing	Transport to factory	Extraction and upstream production
Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario	Scenario			
					B6 Operational energy use									
		mario						Scenario						
						B7 Operational water use								
								Scenario						

^a Replacement information module (B4) not applicable at the product level.

Source: ISO 21930:2017(E), Figure 2

What makes wood different?

Biogenic Carbon

"Carbon derived from... material of biological origin

excluding material embedded in geological formations or transformed to fossilized material and excluding peat."

Photosynthesis:

 $6 \text{ CO}_2 + 6 \text{ H}_2 0 \rightarrow \text{C}_6 \text{H}_{12} \text{O}_6 \text{ (stored)} + 6 \text{ O}_2 \text{ (released)}$



Carbon Storage

Wood ≈ **50% Carbon** (dry weight)





Image: Lever Architecture

Biogenic Carbon

"Bio-based materials originating from renewable resources (such as wood...) <u>contain biogenic carbon</u>."

- » Biogenic carbon removals and emissions shall be reported as CO₂ in the LCI
- » When entering the product system (**removal**), characterized with a factor of **-1**
- » When converted to emissions (emission), characterized with a factor of +1
- » When leaving the product system (export), characterized with a factor of +1

Biogenic Carbon Accounting



Removal of carbon from the atmosphere



Emission or export of carbon from product system

Biogenic Carbon Accounting



Removal of carbon from the atmosphere



Biogenic Carbon

"For wood, biogenic carbon may be characterized with a -1... when entering the product system only when the wood originates from sustainably managed forests."

So...

What is a sustainably managed forest?

Sustainably Managed Forests

"... zero emissions associated with land use change"

Option 1:

Includes wood products *responsibly sourced and certified* to:

- » **Standards** globally endorsed by PEFC and FSC
- » FSC, SFI, CSA, ATFS, etc.

Option 2: (NOTE 2)

- "The concept of sustainably managed forests is linked but not limited to respective certification schemes"
- » Evidence such as national reporting under UNFCCC to identify forests with stable or increasing forest carbon stocks

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UNFCCC National Reporting

"... stable or increasing forest carbon stocks"



NATIONAL INVENTORY REPORT 1990–2020: GREENHOUSE GAS SOURCES AND SINKS IN CANADA

CANADA'S SUBMISSION TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE



See Table 6-10

See Table 6-1

Should I include biogenic carbon?

Yes! But how?



https://www.woodworks.org/resources/how-to-include-biogenic-carbon-in-an-lca/





















End-of-Life Fates for Wood Products

- **1.** Landfill
- 2. Incineration (for energy recovery)
- **3.** Recycle
- 4. Direct Reuse

End-of-Life Fates for Wood Products

- 1. Landfill
- 2. Incineration (for energy recovery)



<u>All</u> biogenic carbon <u>leaves</u> the product system as an *export* (+1).





End-of-Life Fates for Wood Products

- 1. Landfill
- 2. Incineration (for energy recovery) -
- 3. Recycle
- 4. Direct Reuse

<u>All</u> biogenic carbon <u>leaves</u> the product system as an *emission* (+1).

Does not include benefits

of using recovered energy





End-of-Life Fates for Wood Products

- 1. Landfill
- 2. Incineration (for energy recovery)
- 3. Recycle
- 4. Direct Reuse

Landfill operations

- Most does <u>not</u> decay
 - Decay releases landfill gases
 - Emitted directly to atmosphere, or
 - Landfill gas capture for energy recovery

Does <u>not</u> include benefits of using recovered energy

Most biogenic carbon is **permanently stored** in the landfill. The rest is released through decay as an **emission** (+1).





What end-of-life option should I use?





https://www.woodworks.org/resources/biogenic-carbon-accounting-in-wblca-tools/



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A Note About Tools:

In addition to differences in end-of-life scenarios:

- » Where end-of-life effects are reported (C3-C4 vs Module D)
- » Methodology (ISO compliance)
- » LCI Databases (background data)
- » User interface, workflow

https://www.woodworks.org/resources/biogenic-carbon-accounting-in-wblca-tools/ https://www.woodworks.org/resources/calculating-the-embodied-carbon-of-different-structural-systems/



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Thank You

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