

# Reducing Carbon Emissions by Using Wood Products

**FACTSHEET 2  
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## Framework: Life Cycle Analysis

Everything has a *carbon footprint*, including wood products and the trees from which they are made. Wood manufacturing processes use energy and materials, which also have a carbon footprint. No wonder the process of tracking carbon is so complex!

*Embodied carbon*, expressed as CO<sub>2</sub>e, refers to the sum of all greenhouse gas emissions released within the context of the LCA system boundary. Emissions may come from extraction, manufacturing, transportation, construction, and even disposal of building materials at the end of their useful lives.

LCA methodology can track the material inputs, outputs, and energy used for manufacturing many products, and their CO<sub>2</sub>e and environmental performance can then be measured.

## Background

***Sustainable forest management acts like a pump that transfers forest carbon to other uses and storage pools.***

Living trees store carbon. In the Pacific Northwest, US Forest Service inventory data show that forest reach their maximum carrying capacity for sequestering carbon at ~80 years. During the decades when trees are growing most rapidly, the carbon sequestration rate is fastest. Long-lived wood products store the carbon from trees after they are harvested.

## The Flow of Carbon from Forests to Products

***Harvesting trees transfers carbon from the forest to wood products***, while replanting after harvest and the fast growth of trees offsets the removals and keeps the average carbon stable across the whole forest. Continued investment in sustainably managed forests can stabilize forest carbon, while providing for our future needs for both wood and other benefits from forests.

***Wood products can store carbon for decades.*** Carbon is stored in long-lived products such as lumber, plywood and other engineered wood products commonly used in homes, buildings, flooring, furniture, and countless other products.

***Using wood products mitigates carbon emissions.*** A wood stud produced from PNW lumber can displace a steel stud at an efficiency of 193%. If this same wood stud displaced a concrete block the efficiency increases to 246%!

***Renewable woody biomass*** is used to produce nearly 100% of heat energy required to produce lumber in the PNW.

***At the end of its useful life, wood in products can often be recovered and recycled into other products.*** Recycled wood from forest products may be used as feedstock for other products or biofuel, or even landfilled, where gas from decomposition can be captured for use or flared to eliminate methane, a potent GHG.



“In the long term, a sustainable forest management strategy, aimed at maintaining or increasing forest carbon stocks, while providing an annual sustained yield of timber, fiber, or energy from the forest, will generate the largest sustained mitigation benefit.”

— IPCC Fourth Assessment Report

## Measuring Carbon with Life Cycle Analysis

Since 1998, CORRIM has maintained a comprehensive database on the impacts of forests, forest products, and biofuels on carbon mitigation. The database uses research from forest management and manufacturing industry surveys and USDA Forest Service inventories. This research can be used to characterize the carbon impacts and environmental performance of forest products throughout their life cycles.

**Life cycle inventories (LCI)** track all energy and material inputs and outputs for every stage of a product's life. For forest products, this starts from collecting seeds and continues through growing and planting seedlings, protecting the forest from pests, and finally harvesting, transporting, and processing trees into products for construction. At the end of their original lives, wood products can often be repurposed before disposal, extending their useful lives.

LCI is part of **life cycle analyses (LCA)** that show the fundamental differences in GHG impacts between using wood products compared with other building materials that have higher fossil fuel inputs. LCAs can also measure **net carbon stores**—the amount of sequestered or stored—in forests and in wood products, as well as the impacts of substituting wood products for equivalent non-renewable building products.

LCAs consistently show that using wood products, such as wood wall studs and floor joists instead of other building materials like steel and concrete, is beneficial in terms of lower GHG emissions.

### Net wood carbon stored and non-wood fossil carbon (emissions) displaced for common PNW building assemblies.

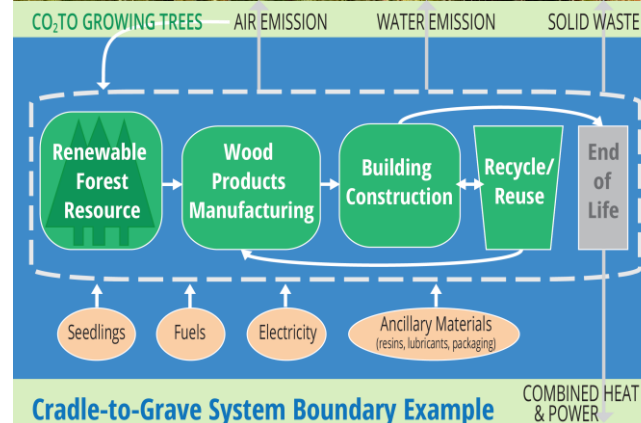
Wall assemblies	Total kg CO <sub>2</sub> reduced
Wood stud + plywood displacing steel stud + plywood	34.2
Wood stud + plywood displacing concrete block + gypsum	105.6
Floor assemblies	
Dimension (WOOD) joist + plywood displacing steel joist + plywood	70.9
Wood I-joist + plywood displacing steel joist + plywood	50.6

## Moving Forward: Mitigating Climate Change

Sustainably harvesting forest carbon not only provides significant opportunities for carbon storage, but also mitigation when wood products displace fossil fuels and fossil-fuels intensive products.

Using fossil fuels and products derived from fossil fuels generates a one-way flow of emissions to the atmosphere, which contributes to climate change. But using wood derived from solar energy (through plant photosynthesis) results in a two-way flow of emissions to and from the atmosphere.

- Leveraging the structural strength of wood products to displace carbon-intensive building materials is an implementable, near-term solution.
- The best uses of wood provide an advanced “carbon negative technology.”



Cradle-to-Grave System Boundary Example

COMBINED HEAT & POWER

## The Takeaway

- Both living trees and wood products offer opportunities for storing carbon.
- Continued investment in managed PNW forests stabilizes forest carbon and can maximize carbon storage.
- Harvesting and replanting transfers carbon stored in the forest to wood products, increasing carbon stores year after year.
- Sustainable manufacturing of wood products can displace emissions from fossil-fuel intensive manufacturing.
- Even at the end of a product's useful life, the wood in products can often be recycled to be used again, whether in new products or for energy.

This research on the uses of forest-derived products summarizes the impacts of forests, forest products, and biofuels on carbon mitigation based on 22 years of research by CORRIM. For more information, see [info@corrim.org](mailto:info@corrim.org) or visit [www.corrim.org](http://www.corrim.org).

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