

# Why Wood?

## Life Cycle Assessment (LCA)

Life cycle assessment (LCA) studies consistently show that wood outperforms other materials in terms of embodied energy, air and water pollution, and carbon footprint.

LCA is an internationally recognized method for measuring the environmental impacts of materials, assemblies or buildings over their entire lives—from extraction or harvest of raw materials through manufacturing, transportation, installation, use, maintenance and disposal or recycling. It allows design professionals to compare different building designs based on their environmental impacts and make informed choices about the materials they use.

LCA is replacing the prescriptive approach to material selection, which assumes that certain prescribed practices (such as specifying products with recycled content) are better for the environment regardless of the product's manufacturing process or disposal.

## Green Building Rating Systems

Wood can help to earn points in categories typically found in green building rating systems—including certified wood, recycled/reused/salvaged materials, local sourcing of materials, waste minimization, indoor air quality, advanced building techniques and skills, and life cycle impacts.

Light commercial, multi-family and single-family residential projects with extensive use of wood have achieved top-level certification under the Leadership in Energy and Environmental Design (LEED) system, Green Globes and other green building certification systems.

## Carbon Footprint

Using wood reduces the carbon footprint of buildings in two key ways—through carbon storage and avoided greenhouse gas emissions.

As trees grow, they absorb carbon dioxide (CO<sub>2</sub>) from the atmosphere, release the oxygen (O<sub>2</sub>), and incorporate the carbon into their wood, leaves or needles, roots and surrounding soil. One of three things then happens:

- When the trees get older, they start to decay and slowly release the stored carbon.
- The forest succumbs to wildfire, insects or disease and releases the carbon quickly.
- The trees are harvested and manufactured into products, which continue to store much of the carbon. (Wood is 50 percent carbon by dry weight.<sup>1</sup>) In the case of buildings, the carbon is kept out of the atmosphere for the lifetime of the structure—longer if the wood is reclaimed at the end of the building's service life and re-used or manufactured into other products.

In all of these cases, the cycle begins again as the forest regenerates and young seedlings once again begin absorbing CO<sub>2</sub>. The other aspect to wood's light carbon footprint is the fact that wood products typically require less energy to manufacture than other building materials, and most of that comes from renewable biomass (e.g., bark and other residual fiber) instead of fossil fuels.

Substituting wood for fossil fuel-intensive materials is a way of avoiding greenhouse gas emissions.

## Energy Efficiency

In terms of **operating energy**, wood has the advantage of low thermal conductivity compared to steel and concrete.<sup>1</sup> As a result, wood buildings are easy to insulate to high standards.

However, while any wood structural system can be designed to achieve a tight building envelope, the precise manufacturing of new systems such as cross laminated timber (CLT) result in exceptional air tightness. (The added aspect of dimensional stability also ensures that the building remains airtight over time.) Wood is also proving to be a good choice for designers who want to meet the Passive House (Passivhaus) standard or create a net zero energy or net zero carbon building.

Because many factors have a greater influence on energy efficiency than the choice of structural material, a more relevant point for many designers is that wood building systems have low **embodied energy**. Embodied energy is the energy needed to extract, process, manufacture, transport, construct and maintain a material or product. LCA studies consistently show that wood outperforms other materials in this area.

## Environmental Product Declarations (EPDs)

The wood industry has been an early adopter of Environmental Product Declarations (EPDs), which are a user-friendly way to communicate information gathered through life cycle assessments.

EPDs are concise, standardized, independently-verified reports on environmental performance. They offer an immediate, reliable way to evaluate a product's lifetime environmental impacts—in terms of embodied energy and global warming potential, and by measures such as use of natural resources, emissions to air, soil and water, and waste generation.

EPDs on wood products are available from the [American Wood Council](#) website along with transparency briefs summarizing the most critical data presented in each.

## Occupant Environment

The term biophilia describes the instinctive connection and attraction people have to natural materials, and many building designers cite the warm and natural attributes of wood as a reason for its use. Evidence also suggests that the use of natural materials can contribute to an individual's sense of well-being, productivity and even health.

For example, a study at the University of British Columbia and FPInnovations found that the presence of visual wood surfaces in a room lowered activation of the sympathetic nervous system (SNS). The SNS is responsible for physiological stress responses in humans such as increased blood pressure and heart rate while inhibiting the parasympathetic system responsible for digestion, recovery and repair functions in the body. The study immersed 119 university students in one of four different office environments, some with wood surfaces and others without. Stress as measured by SNS activation was lower in the wood rooms in all periods of the study. The study concluded that wood is one way to create a healthier built environment.

## Sustainable Forestry

Wood grows naturally and is renewable. Responsible forest management is achieved through adherence to federal, state and provincial laws, best management practices and third-party forest certification systems. This helps to ensure that forests are legally harvested and managed to meet society's long-term demand for forest products.

Until the early 1900s, settlers coming to North America cleared an average of 2.1 acres of forest per person to survive and grow food. Since then, the establishment of industrial agriculture and other changes in land use have mitigated the need for forest clearing and forest acreage has been stable for close to a century. Responsible forest management has resulted in more than 50 consecutive years of net forest growth that exceeds annual forest harvests.

According to the *National Report on Sustainable Forests – 2010*, the U.S. has approximately 751 million acres of forest area, which is about one third of the country's total land area. "This stability is in spite of a nearly three-fold increase in population over the same period and is in marked contrast with many countries where wide-scale deforestation remains a pressing concern." More than half of U.S. forests are owned by private landowners, including more than 22 million family forest owners. The rest are owned by public entities such as national, state and local governments. The fact that net forest growth has outpaced the amount of wood harvested for decades supports the idea that landowners who depend economically on the resource have a strong incentive for sustainable management.

### **Sustainable Forest Certification**

While forestry is practiced in keeping with regulations and guidelines that consider environmental, economic and social values for that particular country, voluntary forest certification allows forest companies to demonstrate the effectiveness of their practices by having them independently assessed against sustainability standards.

Wood is the only structural building material with third-party certification programs in place to verify that products being sold have come from a responsibly managed resource. As of August 2013, more than 500 million acres of forest in Canada and the U.S. were certified under one of the four internationally recognized programs used in North America: the Sustainable Forestry Initiative (SFI), Forest Stewardship Council (FSC), American Tree Farm System (ATFS) and Canadian Standards Association's Sustainable Forest Management Standard.