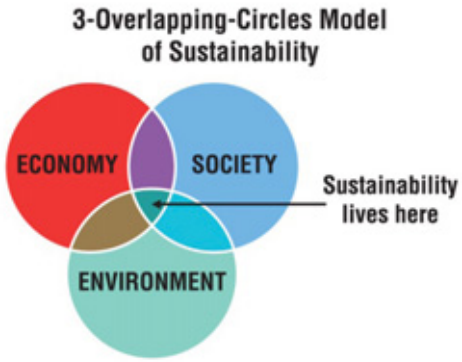
BACKGROUND

WHAT IS SUSTAINABILITY

Sustainability is the ”*property whereby a process can be continued indefinitely without depleting the energy or material resources on which it depends. Sustainability is the practical goal toward which our interactions with the natural world should be working.“ (Wright, 2008).*

Sustainable Development is the best means of obtaining sustainability in everyday activity. Development is sustainable if it provides people with a better life without sacrificing or depleting resources or causing environmental impacts that will undercut the ability of future generations to meet their needs. Its decision making takes into consideration not only environmental problems and benefits but also economic and social priorities. The illustration below shows the circles model that demonstrates sustainability.



SUSTAINABILITY OF THE FOREST AND WOOD PRODUCT INDUSTRIES

Forests are very important to slowing the process of climate change. Over the past four decades, forests have moderated climate change by absorbing approximately one-quarter of the carbon emitted by human activities.

Statistics compiled by the Forest Products Association of Canada (FPAC) show that more than 650 Canadian communities rely on the forest industry. Revenues from the forest sector in 2011 totalled $57.1 billion. Only in British Colombia is the industry considered to be the backbone of the economy. However, it accounts for 7% of employment and 15% of all economic activity in Canada. For more information on economic activity of the forest industry in Canada, consult the Forest Products Association of Canada website (www.fpac.com). FPAC Members are Committed to sustainable forest management, fighting climate change, conserving water, reducing air pollution and reusing fibre.

CANADIAN FORESTRY CERTIFICATION PROGRAMS

To prolong the benefits of this renewable resource, the Canadian forestry industry has committed itself to sustainable forest management so that the future generations can also use the resource. Canada is recognized as a world leader when it comes to Sustainable Forest Management, having the largest area of third-party independently certified forests (CSA, FSC, SFI) in the world. This sustainable resource management is a balance of ecological, social and economic values of forests and encompasses a wide range of considerations including biodiversity, cultural values, wildlife habitat, water, soil conservation, visual aesthetics, recreation, economic values, wood products, science and research, wetlands, air quality and fisheries. Three major forest certification programs have been adopted in Canada. All three certification programs promote sustainability by requiring that:

- harvested areas are reforested;
- laws are obeyed;
- biological biodiversity is conserved;
- wildlife habitat is conserved;
- soils and water resources are maintained;
- timber harvesting is sustainable.

Canadian Standards Association (CSA) Z809 and Z804

The CSA Z809 Sustainable Forest Management (SFM) Standard has both performance and management system requirements. All certifications to CSA SFM require, among other things:

- recognition of environmental, economic, social and cultural values
- conservation of biological diversity
- ongoing public participation.

The CSA Z804 SFM Standard for Woodlots and Other Small Areas was published in 2008 and approved as a second national standard for sustainable forest management in Canada.

For more information on the CSA Forest Certification Program, visit http://www.csasfmforests.ca/foreststandards.htm

Forest Stewardship Council (FSC) Canada

The Forest Stewardship Council (FSC) was founded in 1993, in Toronto, Canada as a market-based mechanism for ensuring that forests are managed in an environmentally appropriate, socially beneficial, and economically viable manner. The certification tracks products from the forest to the shelf. The FSC products are verified by third-party certifiers to meet the FSC's requirements through the FSC Forest Management (FM) and Chain of Custody (CoC) certification systems. The FSC Forest Management (FM) standards are based on the FSC's International principles and criteria, but also address the environmental and social requirements of different regions. Four Regional Forest Management (FM) Standards in Canada are accredited by FSC International: the National Boreal Standard, Maritimes Standard, BC Standard and the Great Lakes, St-Lawrence Standard.

For more information on the Forest Stewardship Council (FSC) Certification Program, visit http://www.fsccanada.org/becomefmcertified.htm.

Sustainable Forestry Initiative (SFI Inc.)

The SFI program is based on the premise that responsible environmental behaviour and sound business decisions can coexist to the benefit of communities, landowners, manufacturers, shareholders, customers and the environment, today and for future generations. It was launched in 1994 as one of the forest sector's contributions to the vision of sustainable development established by the 1992 United Nations Conference on Environment and Development (UNCED). The SFI program was developed with multi-stakeholder input, including environmental non-government organizations, industry, scientists, academics, government agencies and professional organizations.

For more information on the program, visit
http://www.sfiprogram.org/sustainable_forestry_initiative_standard.php

SUSTAINABILITY OF WOOD IN THE CONSTRUCTION INDUSTRY

As energy prices and atmospheric temperatures continue to rise, energy efficiencies and sustainable buildings can help reduce humanity's environmental footprint and decrease greenhouse gases and other emissions.

In today's world, everything we do has an impact on the environment. Architects, engineers, designers and builders are becoming more aware that the selection of proper materials can reduce the effect of construction on the environment. Wood has many environmental advantages compared to other major building materials. In a sustainable view, **wood is the ideal building material**:

1) Energy Efficient and Cost Effective

One-third of the energy consumed in North America comes from buildings. Energy efficiency in buildings operations has become critical. The advantage of building with wood products is that wood is more resistant to heat flow than any other material. Wood is 400 times better than steel and 10 times better than concrete in resisting the flow of heat. For this reason, wood buildings are easier to insulate, which makes then more energy efficient. Wood products also require less energy to extract, process and transport than do other major building materials. In conclusion, wood-framed buildings cost less to construct, maintain and operate. (FPAC,2012)

2) Reusable, Recyclable and Biodegradable

By trying to reduce the amount of waste that is sent to landfills, more and more construction professionals are using the concept of 3R's (Reduce new construction waste; Reuse; and Recycle). Wood is the perfect material because it is reusable and recyclable. It is also naturally biodegradable, which means that with time, wood will return to the earth with minimal environmental impact.

4) Strong, Durable and Flexible

Wood is a strong and flexible material. When it comes to green designs, architects, engineers, designers and builders often focus on the durability of materials in order to save natural resources. To obtain durability, they have to make sure that a building structure will last and that it can be renovated over time.

5) Slows Down the Process of Global Warming

As trees grow, they absorb carbon dioxide and store it, preventing it from being released back into the atmosphere. Carbon dioxide emissions are one of the main causes of climate change. When a tree is cut down, approximately half of its carbon remains in the forest; the remaining carbon remains in the logs and is stored in the resulting wood products. A timber-framed home captures approximately 28 tonnes of carbon dioxide, which is about the equivalent of driving a car for six years or about 12,500 litres of gasoline (BC Forestry Innovation Investment, 2009)

6) Renewable Resource

Wood is the only major building material that grows naturally and is renewable. In addition, all of the forest certification programs available in Canada are recognized globally. The certification programs ensure that Canadian forests are managed in an environmentally, socially and economically viable manner.

For more information on the use of wood in construction projects, visit the Canadian Wood Council website http://www.cwc.ca/ and the Feel Good About Canadian Pulp, Paper and Wood website http://feel-good.ca/.

LIFE-CYCLE ASSESSMENT (LCA)

Until recently, no method existed to mathematically calculate the sustainability of one material over another. As the technology evolves, Life-Cycle Assessment is gaining more acceptance. The process involves evaluating all the environmental effects of decisions and processes over the life of the product, from resource extraction to disposal.

Figure 1 below represents the attributes to be considered to calculate the environmental impacts of a material in a Life-Cycle Assessment.

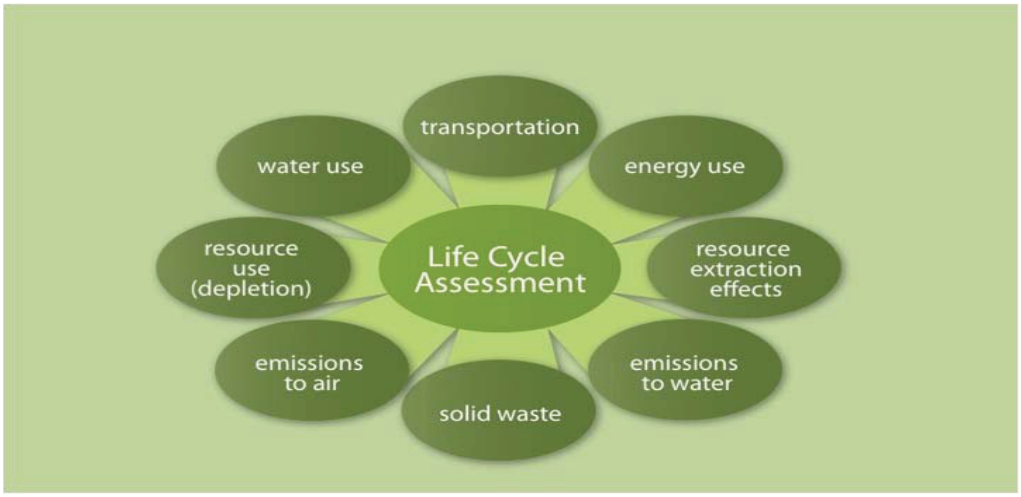


Figure 1: Building Green with Wood Toolkit, Forestry Innovation Investment, www.naturallywood.com

Figure 2 below illustrates the general concept of life-cycle assessment, where all of the environmental inputs and outputs are measured at each stage of a product's life. Life-cycle assessment looks at energy consumption, emissions, waste and other environmental effects at every step, from the initial extraction of raw resources from the earth through manufacturing, product use and eventual disposal or recycling.

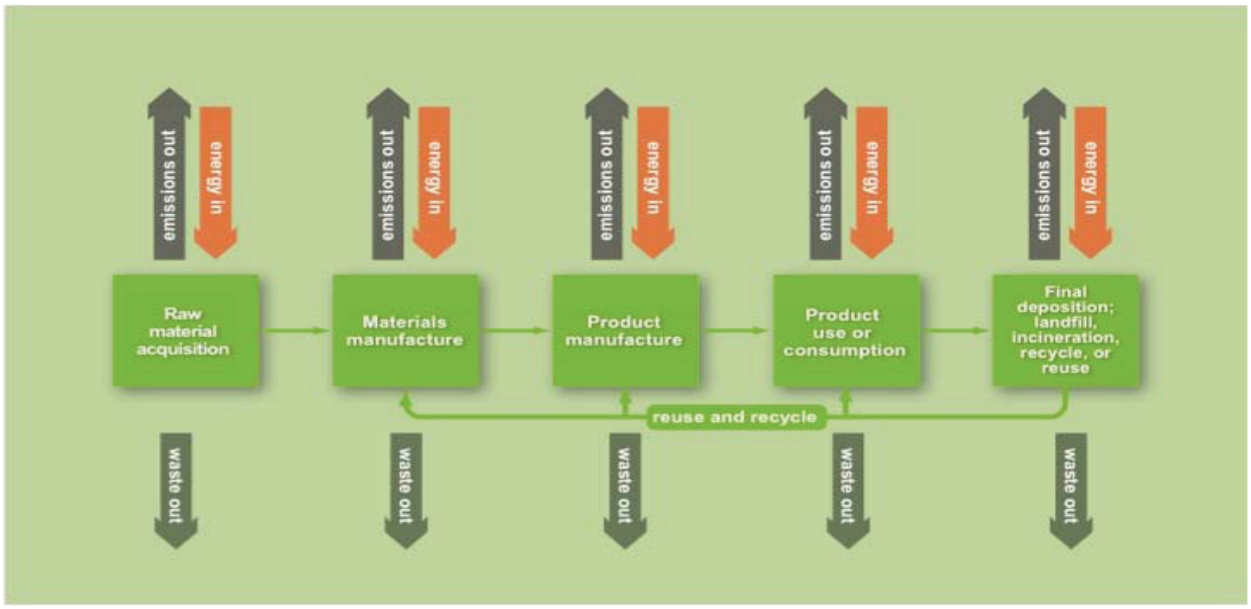


Figure 2: Building Green with Wood Toolkit, Forestry Innovation Investment, www.naturallywood.com

Figure 3 below shows the environmental performance of six different wall systems in terms of energy consumption, climate change impact, and air pollution. This is a benchmark graph, showing five walls as they compare to wood. In this situation, a lower value is better. Wood (the orange bar) clearly has a lighter footprint than materials such as steel and concrete. The data were generated using the simplified Life-Cycle Analysis (LCA) software tool. (The Athena calculator is available for free online at www.athenasmi.ca.) The graph sets the standard North American wood-frame wall as the benchmark (at 100%), and then shows the other wall systems as a percentage in relation. For example, the Insulated Concrete Forms (ICF) wall creates about 2.75 times more greenhouse gas emissions (climate change) than the wood wall. The results shown in the figure below are for embodied effects only (i.e., operating energy of the building with these wall is not included) and the data are specific to the region of Vancouver.

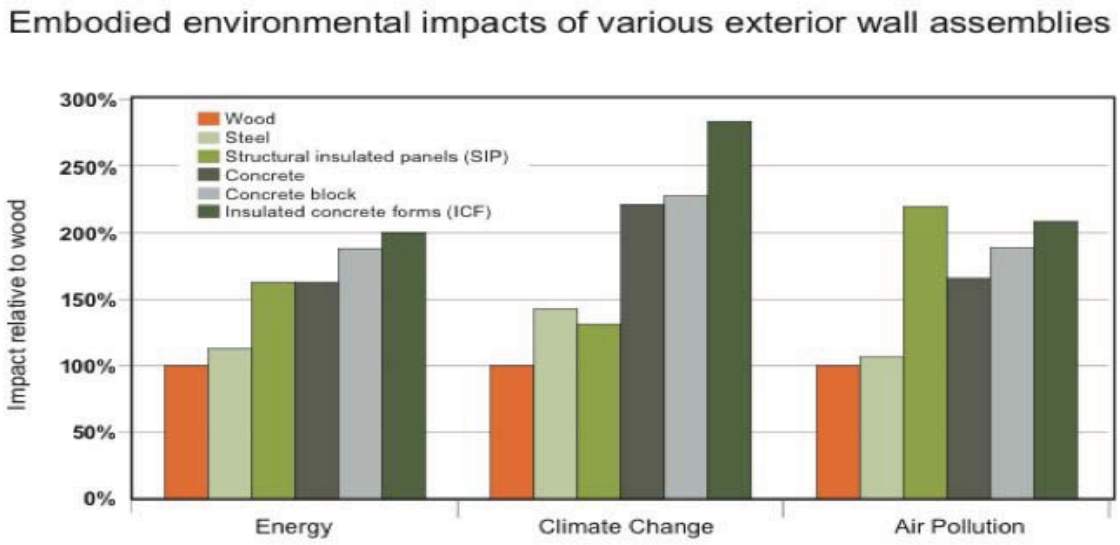


Figure 3: Building Green with Wood Toolkit, Forestry Innovation Investment, www.naturallywood.com

SUSTAINABILITY AND THE WOOD PRESERVATION INDUSTRY

Wood products are subject to degradation when left untreated in weather-exposed or wet environments subject to microbial or insect attack. The treated wood industry started in the 1800's with the production of railway ties. Today, the industry is still very present in the industrial, commercial and residential sectors.

Pressure treated wood is used primarily outdoors and has dozens of industrial applications, from docks and marinas to railway ties, utility poles, piling, bridges and highway guardrail. It is also a product widely used by landscape architects in numerous landscaping projects. Around the home, treated wood is used mainly for decks, fences, gazebos and playground equipment. It can also be used for certain indoor applications where building codes require treated wood, for example, fire retardant treated plywood.

Promoting the use of treated wood products indirectly reduces the consumption of forests by extending the life of wood products. Treated wood is a sustainable product and there are a lot of environmental and economic benefits of using it. The process of pressure treating wood simply protects it from natural destructive elements while extending its service life. By extending the life cycle of the material, we remove pressure on natural resource ecosystems by saving trees and limiting the amount of waste sent to landfills. The use of treated wood in

Canada saves a forest approximately the size of Prince Edward Island every year. Treated wood is also reusable, as utility poles can be cut and reused in the transportation systems for components in a guardrail system, for sign posts, fence posts or in bridge decks.

What is the wood preservation Industry doing to improve the sustainability of the industry and limit its environmental impact?

All preservatives used in the processing of treated wood, are subject to strict ongoing registration and reviews by the Pest Management Regulatory Agency (PMRA) and other agencies responsible for evaluating environmental and human health risks.

Members of Wood Preservation Canada make a commitment to protecting the environment as a condition of their membership when they receive certification by the Wood Preservation Certification Authority (CWPCA).

CWPCA
ENVIRONMENTAL
PLANT CERTIFICATION

The CWPCA ensures that certified plants respect and fulfill the demands and requirements outlined in the Environment Canada Technical Recommendation Document for the Design and Operation of Wood Preservation Facilities. It ensures that all Canadian wood preservation plants maintain design and operating practices to minimize environmental impact and to protect workers from exposures to preservatives. The CWPCA certification program and Wood Preservation Canada continue to work within industry to maintain and improve the program (WPC, 2012).

LIFE-CYCLE ASSESSMENTS OF TREATED WOOD

In recent years, the US Treated Wood Council has undertaken life cycle assessment of treated wood compared to other materials used in the same project category.

Pentachlorophenol-treated wood utility poles in comparison to steel and concrete utility poles

In 2011, a life cycle assessment comparing pentachlorophenol-treated wooden utility poles with steel and concrete utility poles was published in the Renewable and Sustainable Energy Reviews Journal. (Bolin, Smith, 2011). Impact indicator values such as greenhouse gas (GHG) emissions, fossil fuel and water use, and emissions with the potential to cause acidification, smog, ecological toxicity, and eutrophication were calculated for all of the pole products. The values were calculated during the stages of pole production, treating, service life and disposal.

The LCA concluded that the use of penta-treated wood has lower fossil fuel consumption, water use and environmental impact than concrete and steel utility poles. (Bolin, Smith, 2011)

The Conclusions and Summary Report on an Environmental Life Cycle Assessment of Utility Poles can be found in Appendix 1.

ACQ-treated lumber in comparison to wood plastic composite decking

A study published in the Journal of Cleaner Production evaluated the environmental impacts of alkaline copper quaternary (ACQ) treated lumber used for decking compared to wood plastic composite decking. Again, impact indicator values such as greenhouse gas (GHG) emissions, fossil fuel and water use, acidification, smog forming potential, ecological toxicity, and eutrophication were calculated for the two products. The values were calculated during the stages of lumber production, treating, use and disposal.

The study concluded that the use of ACQ-treated lumber for decking has lower fossil fuel use and environmental impact than wood plastic decking. (Bolin, Smith, 2010)

The Conclusions and Summary Report on an Environmental Life Cycle Assessment of ACQ-Treated Lumber Decking with Comparisons to Wood Plastic Composite Decking can be found in Appendix 2.

Borate-treated lumber in comparison to galvanized steel framing

An additional life-cycle assessment was completed to identify the environmental impacts of borate-treated lumber used as structural framing compared with the primary alternative product, galvanized steel framing. The study, published in the Journal of Cleaner Production

(Bolin, Smith, 2010), again calculated impact indicator values such as greenhouse gas (GHG) emissions, fossil fuel and water use, acidification, smog forming potential, ecological toxicity, and eutrophication for the two products. The values were calculated during the stages of production, use and disposal.

The study concluded that the use of borate-treated framing lumber had a lower environmental impact than galvanized steel framing. Galvanized steel framing used four times more fossil fuel and resulted in emissions with potential to create 1.8 times more GHG. The ecological impacts were also 2.5 times higher than for borate-treated wood structural framing. (Bolin, Smith, 2010)

The Conclusions and Summary Report on an Environmental Life Cycle Assessment of Borate-Treated Framing with Comparisons to Steel Framing can be found in Appendix 3.

Copper azole-treated lumber in comparison to wood plastic composite decking

In conjunction with earlier LCAs, AquAeTer was commissioned by a preservative supplier to complete a limited LCA of the copper azole treated wood decking. The document *Life Cycle Assessment of Copper Azole-Treated Lumber Compared to Wood Plastic Composite Decking* indicates that lumber treated with CA-C and µCA-C preservatives for above ground exterior exposure have, on a life cycle cradle-to-grave basis, lower environmental impact indicators than wood plastic composite (WPC) decking.

The study concluded that compared to CA-C-treated lumber, WPC requires approximately 15 times more fossil fuel and 2.4 times more water, and results in emissions with potential to cause 2.9 times more GHG, five times more acid rain, 2.6 times more smog, 1.7 times more ecological toxicity, and 1.5 times more eutrophication impact than CA-C treated lumber. In addition, 8.8 times more total energy is required during the life of WPC compared to CA-C-treated lumber.

The Executive Summary of the Life Cycle Assessment of Copper Azole-Treated Lumber Compared to Wood Plastic Composite Decking can be found in Appendix 4.

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APPENDICES

1. Conclusions and Summary Report on an Environmental Life Cycle Assessment of Utility Poles
2. Conclusions and Summary Report on an Environmental Life Cycle Assessment of ACQ-Treated Lumber Decking with Comparisons to Wood Plastic Composite Decking
3. Conclusions and Summary Report on an Environmental Life Cycle Assessment of Borate-Treated Lumber Structural Framing with Comparisons to Galvanized Steel Framing
4. Executive Summary of the Life Cycle Assessment of Copper Azole-Treated Lumber Compared to Wood Plastic Composite Decking