



**Canadian Wood.** Renewable by Nature. Sustainable by Design.





“ Wood is universally beautiful to man,  
and the most humanly intimate of all  
[building] materials.”

Frank Lloyd Wright

**Cover: Kwantlen Polytechnic University, Cloverdale, British Columbia**  
Bunting Coady Architects

*The Trades & Technology Centre at Kwantlen Polytechnic University was designed to a LEED® Gold level and features glue-laminated beams and wood products from British Columbia's sustainably managed forests.*

**Craig Thomas Discovery and Visitor Center,  
Grand Teton National Park, Jackson, Wyoming**  
Bohlin Cywinski Jackson

*Set against Wyoming's majestic Teton Range, the Craig Thomas Discovery and Visitor Center is a stunning example of how wood's innate qualities lend well to a natural yet modern aesthetic. Rustic columns of Douglas-fir create a perimeter colonnade. Glue-laminated beams and western red cedar siding give the facility contemporary lines. The wood for the facility comes from certified Canadian forests.*







## END NOTES

- i United Nations Environment Programme, Sustainable Consumption and Production Branch. <http://www.unep.fr/scp/bc/>
- ii Wood and Climate Change. FPInnovations, 2008.
- iii Summary for Policymakers. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (B. Metz et al. eds), Cambridge University Press, 2007.
- iv Forests in the Global Carbon Cycle: Implications of Climate Change. Apps, M. et al. In: Climate Change and Managed Ecosystems (Bhatti et al). CRC Press, 2005.
- v Tech Note: Updated Environmental Profiles of Canadian Softwood Plywood and OSB. FPInnovations, 2008.
- vi Canadian Sustainable Forestry Certification Coalition.
- vii The State of Canada's Forests, Annual Report, 2007. Natural Resources Canada.
- viii FAO Advisory Committee on Paper and Wood Products. Forty-Fourth Session. May 2003. [www.fao.org/docrep/006/Y4829E/y4829e25.htm](http://www.fao.org/docrep/006/Y4829E/y4829e25.htm)
- ix Navigating the numbers: Greenhouse gas data and international climate policy - Part II. K. Baumert, T. Herzog and J. Persing, World Resources Institute, 2005; and Carbon dioxide emissions by source 2005, World Resources Institute.
- x Canadian Sustainable Forestry Certification Coalition. [www.certificationcanada.org](http://www.certificationcanada.org)
- xi Sustainability Report. Forest Products Association of Canada. 2007.
- xii Comparing the Environmental Effects of Building Systems. Canadian Wood Council, 1997.
- xiii A Synthesis of Research on Wood Products and Greenhouse Gas Impacts. FPInnovations, 2008.
- xiv Wood Products and Carbon Protocols. Bowyer, J. et al. Dovetail Partners, Inc., 2008.

## PHOTO CREDITS

Ballard Branch of the Seattle Public Library; Craig Thomas Discovery and Visitor Center, Grand Teton National Park - Nic Lehoux; Kwantlen University College - Bunting Coady Architects; Olympic College, Nicola Valley Institute of Technology, Nk'Mip Desert Cultural Centre - Nic Lehoux; Norview Lodge - Tom Arban; Richmond City Hall, Richmond Oval, Salt Spring Island Residence - Martin Tessler; Squamish Adventure Centre - Ka Kei Law; Surrey Central City - Nic Lehoux; Thunder Bay Regional Health Sciences Centre - Peter Sellar; Whistler Public Library - Ka Kei Law; selected forestry images - Moresby Creative

## Back Cover:

**Richmond City Hall, Richmond, British Columbia**  
KPMB Architects / Hotson Bakker Boniface Haden architects + urbanistes

*This landmark civic building showcases sustainable design and offers the warmth of an exposed wood structure and rich interior wood finishes throughout.*



## FOREWORD

Constructing and operating buildings have an immense environmental impact. Globally, buildings are responsible for 20 per cent of all water consumption, 25 to 40 per cent of all energy use, 30 to 40 per cent of greenhouse gas emissions and 30 to 40 per cent of solid waste generation.<sup>1</sup>

There are tremendous opportunities to reduce this impact through building design and construction—and wood is a natural part of the solution.

Wood has been part of our culture throughout time, and for good reason. It is plentiful in North America, it adds beauty and warmth to our lives, we know how to work with it—and it is the only major building material that is truly renewable.

We are learning that the shift from wood to newer building materials has resulted in structures that may have a much heavier environmental footprint.

As concern about climate change grows, more building and design professionals are solving a new problem with an old favourite. When wood replaces other materials, greenhouse gas emissions and other impacts are typically reduced.

Wood is an ingenious invention of nature. It is beautiful, light and strong to build with, and warm and welcoming to live with.

In Canada, we appreciate and value our vast forests, and manage them sustainably. Canadian wood products offer outstanding versatility and value both as a building material and as an environmental choice.

Canadian Wood. Renewable by Nature. Sustainable by Design.

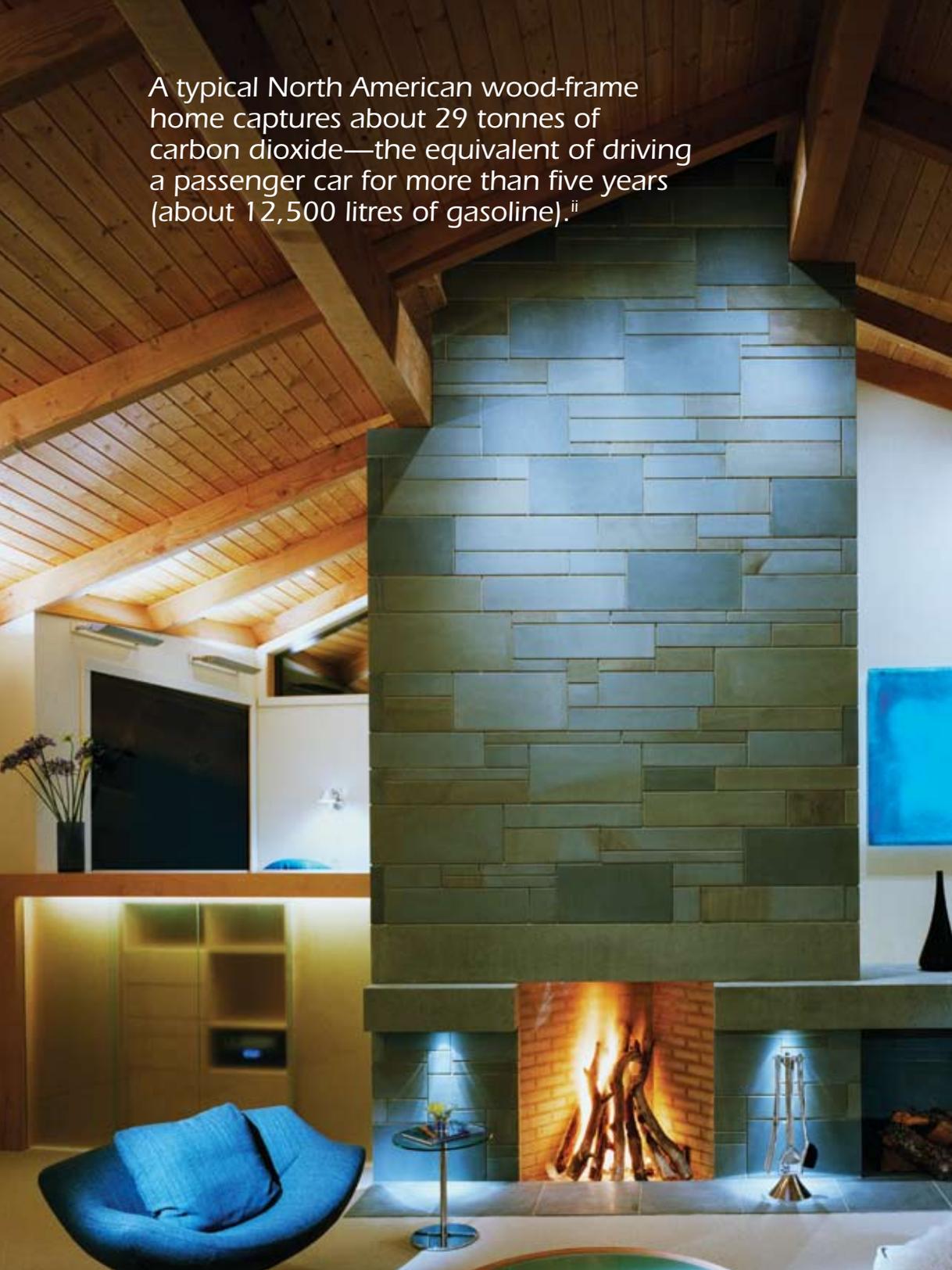
## WOOD AND CLIMATE CHANGE

“Specifying wood in public procurement can help fulfil national and local climate change programmes. Encouraging the use of wood products can act as a greener alternative to more fossil-fuel intensive materials. Substituting a cubic metre of wood for other construction materials (concrete, blocks or bricks) results in the significant average of 0.75 to 1 t CO<sub>2</sub> savings.”

International Institute for Environment and Development,  
Using Wood Products to Mitigate Climate Change, 2004



A typical North American wood-frame home captures about 29 tonnes of carbon dioxide—the equivalent of driving a passenger car for more than five years (about 12,500 litres of gasoline).<sup>ii</sup>



The United Nations' Intergovernmental Panel on Climate Change said buildings could represent the greatest opportunity for making considerable reductions in carbon dioxide emissions. About 30 per cent of the projected global greenhouse gas emissions in the building sector could be avoided by 2030 through green building choices.<sup>iii</sup>

Using sustainably harvested wood as a construction material is a simple and cost-effective way to help fight climate change. Carbon dioxide is a key driver of global warming and it also happens to be an important ingredient in wood. As trees grow, they draw carbon dioxide from the atmosphere and, using solar energy, convert it into the raw material for long-lived wood construction products.

Managed forests can redirect more carbon away from the atmosphere than natural forests. Trees remove the most carbon dioxide when they are young and growing. Carbon absorption slows down as trees mature and eventually they release carbon when they die. If the trees are harvested before they burn or decay, the carbon is stored indefinitely in the wood products, and new trees are planted to begin the cycle again.<sup>iv</sup>

Wood products sequester more carbon dioxide than is emitted during harvesting, transportation and manufacturing, which means they actually have a negative greenhouse gas footprint. Every thousand square feet of oriented strand board represents a net greenhouse gas removal equal to almost two barrels of oil.<sup>v</sup>



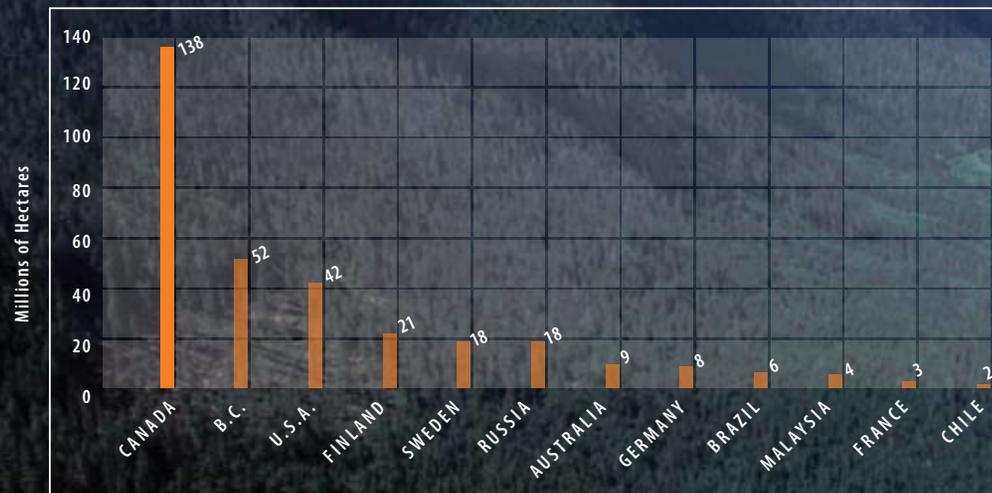
**Olympic College, Bremerton, Washington**  
*MillerHull Partnership*

*Olympic College was conceived as a "college in the forest" and features western red cedar siding, glue-laminated beams and interior wood finishing throughout. The building was sited in such a way as to save a buffer of second-and third-growth coniferous forest around the entire perimeter of the campus.*



Only 10 per cent of the world's forests are independently certified, and 40 per cent of these certified lands are in Canada—more than any other country.<sup>vi</sup>

AREA CERTIFIED IN CANADA COMPARED WITH THE WORLD



The three certification programs used in Canada all promote principles, criteria and objectives that are viewed as the basis of sustainable forest management around the world. The best way to improve forest management globally is to focus on the 90 per cent of global forests that are not certified at all.

## SUSTAINABLE FOREST MANAGEMENT

Canada's resource managers practise sustainable forest management to maintain and enhance the long-term health of natural forest ecosystems while providing environmental, economic, social and cultural opportunities for present and future generations.

Canada has more than 400 million hectares of forest and other wooded land, representing 10 per cent of the world's forest cover and 30 per cent of the world's boreal forest. Less than one half of one per cent of Canada's managed forest is harvested each year, and by law all public lands that are harvested must be successfully regenerated.<sup>vii</sup>

Canada has 91 per cent of its original forest cover, more than any other country, and its rate of deforestation has been virtually zero for more than 20 years. Deforestation is the permanent conversion of forests to non-forest uses such as agriculture or urban development.<sup>viii</sup>

Deforestation in developing countries accounts for about 18 per cent of annual global greenhouse gas emissions, or almost eight billion tonnes of carbon dioxide a year. For some developing countries, conserving tropical forests is seen as an obstacle to development rather than an ecological necessity.<sup>ix</sup>

Canada's forests are 94 per cent publicly owned and managed by government on behalf of all Canadians. As a result, the Canadian forest industry operates under some of the toughest environmental laws anywhere in the world, and these laws are strictly enforced.

In countries lacking effective forestry laws and enforcement, illegal logging and unsustainable harvesting are not uncommon. Canada is a global model for how to do it right. Its forest management practices allow it to maintain its vast forests and remain one of the world's largest suppliers of forest products.

## FOREST CERTIFICATION

Forest certification is an important tool used by forest companies, governments and buyers around the globe to ensure that forest products come from sustainable and legal sources. In third-party certification, independent auditors review forest operations for compliance with a standard that addresses environmental, social and economic concerns. No other construction material has the same rigorous review of its extractive processes as wood.

As of January 2008, Canada has 138 million hectares (341 million acres) of lands certified to one of three credible third-party programs—the Canadian Standards Association, the Forest Stewardship Council and the Sustainable Forestry Initiative.<sup>x</sup>

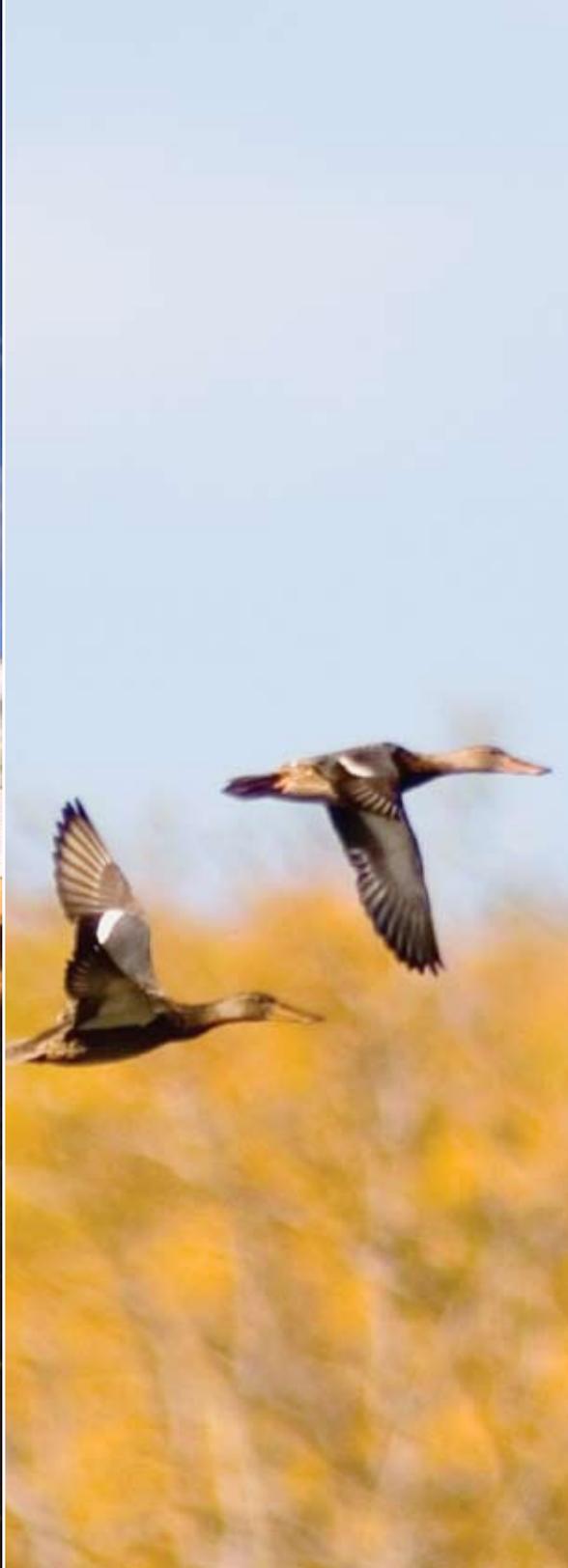
Canada's forest products industry has reduced its carbon footprint substantially over the last 15 years, surpassing its Kyoto targets by seven times. The sector aims to be carbon neutral by 2015 without buying carbon offset credits.<sup>xi</sup>

The Forest Products Association of Canada is working with WWF-Canada, which is involved in groundbreaking research into the global potential of sustainable forestry for bioenergy supply and climate change mitigation. WWF-Canada's Climate Savers program has established a high standard of emission reductions among leaders in many business sectors.

Since 1990, members of the Forest Products Association of Canada, who have responsibility for 75 per cent of the working forest in Canada, have increased their production by 20 per cent yet have reduced their greenhouse gas emissions by 44 per cent through facility upgrades and innovative processes. They have reduced their use of fossil fuels by 45 per cent, improved their greenhouse gas emissions intensity by 54 per cent and reduced their landfill waste by 40 per cent.

**Nicola Valley Institute of Technology, Merritt, British Columbia**  
Busby Perkins + Will / Alfred Waugh Architect

*The Nicola Valley Institute of Technology is British Columbia's Aboriginal public post-secondary institute and was designed to reflect the cultural characteristics of First Nations students. The facility features a wood column structural system and a wood-frame, rain-screen wall clad with yellow-cedar. Yellow-cedar was chosen for its durability and natural (chemical-free) resistance to insects.*



## GREEN BUILDING TOOLS

Green building tools help building professionals and consumers identify sustainable strategies for new buildings and renovations. The best tools offer a consistent, scientific basis for comparison, evaluate relevant technical aspects of sustainable design, can be implemented and communicated effectively and reward performance.

Some rating systems—including Green Globes in North America and BREEAM (Building Research Establishment's Environmental Assessment Method) in the United Kingdom—are incorporating performance criteria such as life cycle assessment to evaluate product or design options. The U.S. Green Building Council has pledged to integrate life cycle assessment into future LEED® (Leadership in Energy and Environmental Design) rating tools.

A sample of green building tools:

**BREEAM**, in the United Kingdom, covers many building types, with methods and tools available for different stages of construction. [www.breeam.org](http://www.breeam.org)

**Built Green™** uses buyer demand, market education and builder training to encourage builders across Canada to build homes that improve energy efficiency, indoor air quality, resource use and overall environmental impact. [www.builtgreencanada.ca](http://www.builtgreencanada.ca)

**Equilibrium** helps develop homes across Canada that combine resource and energy-efficient technologies. [www.cmhc-schl.gc.ca/en/inpr/su/eqho/index.cfm](http://www.cmhc-schl.gc.ca/en/inpr/su/eqho/index.cfm)

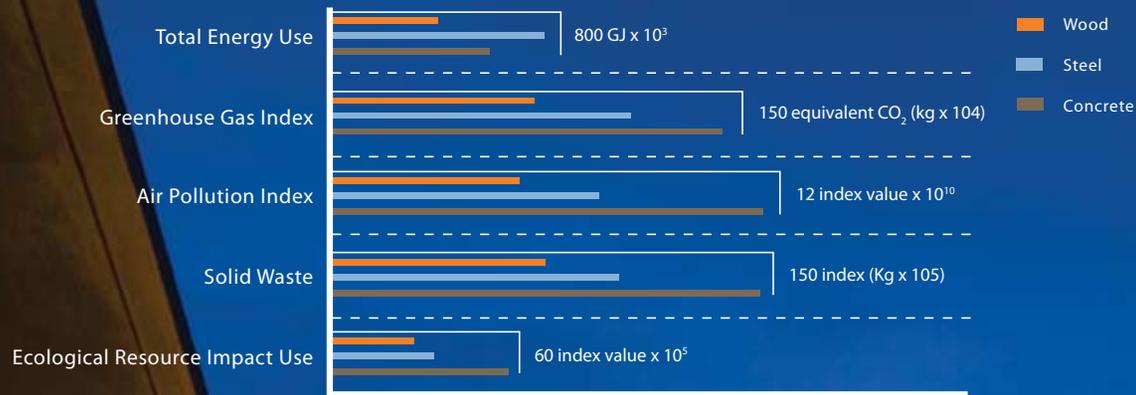
**Green Globes** is a web-based green management tool that includes an assessment protocol, rating system and guide for integrating environmentally friendly design into commercial buildings. [www.greenglobes.com](http://www.greenglobes.com)

**LEED®** offers a benchmark for the design, construction and operation of high-performance green buildings. [www.usgbc.org/leed/](http://www.usgbc.org/leed/) (U.S.) [www.cagbc.org/leed/what/index.php](http://www.cagbc.org/leed/what/index.php) (Canada)

**NAHB National Green Building Standard (U.S.)** provides a common benchmark for recognizing and rewarding green residential design, development and construction practices. [www.nahbgreen.org](http://www.nahbgreen.org)

**The R-2000 Program** is a collaboration between the Canadian Home Builders' Association and the Office of Energy Efficiency (Natural Resources Canada) that addresses energy efficiency, indoor air quality and environmental responsibility. <http://r2000.chba.ca>

## COMPARATIVE LIFE CYCLE ASSESSMENT: THREE CONSTRUCTION SYSTEMS



*In this graph, embodied life cycle assessment results are given for three versions of the same typical office building, each designed with a different structural system.<sup>xii</sup>*

Life cycle assessment is a rigorous and systematic approach to thoroughly quantifying environmental impacts. It is currently the best method to determine the “greenness” of a product.





## WOOD AND LIFE CYCLE ASSESSMENT

As climate change fuels a growing interest in sustainable development, more products come with impressive environmental claims that are, at times, hard to substantiate.

Life cycle assessment delivers a scientific measure of the environmental impact of a product throughout its entire life—from resource extraction through to product manufacturing, on-site building construction, occupancy, and eventual demolition, as well as disposal, reuse, or recycling.

Numerous life cycle assessment studies worldwide have shown that wood products yield clear environmental advantages over other building materials at every stage.<sup>xiii</sup>

Prescriptive approaches to green design often focus on a single characteristic, such as recycled content, with an assumption that some positive environmental performance comes with those properties. Life cycle assessment takes away much of the guesswork by calculating actual outcomes based on quantifiable indicators of environmental impact, such as global warming potential, resource use, embodied energy, air pollution, water pollution and solid waste.

Deciding on the building assemblies that contribute the most to sustainable development is a complex undertaking. Life cycle assessment tools can provide the designer with invaluable information to help narrow down the choices.

The ATHENA® EcoCalculator for Assemblies is a tool based on life cycle assessment that allows architects, engineers and others to quickly assess and compare environmental impacts of hundreds of building assemblies that are commonly used in construction.

The ATHENA EcoCalculator is available free at [www.athenasmi.ca](http://www.athenasmi.ca)

**Nk'Mip Desert Cultural Centre, Osoyoos, British Columbia**  
Hotson Bakker Boniface Haden architects + urbanistes (left and right)

**Ballard Branch, Seattle Public Library, Washington**  
Bohlin Cywinski Jackson (centre)

## WOOD AND WELLNESS

Wood is a warm and comforting material that provides a tangible connection to nature and the outdoors. For many architects and builders, wood offers an added aesthetic appeal that no other material can provide.

Toronto architect Tye Farrow was after a warmer look than steel and concrete could provide when he designed the Thunder Bay Regional Health Sciences Centre: "There's something as a result of the wood that resonates as an aesthetic element but is probably comforting as well."

The 60,000-square-metre (640,000-square-foot), 315-bed acute care centre was the first hospital in Canada to gain approval for the use of wood as a primary structural element in its main public area. Wood was chosen for its warmth and non-institutional character, and to evoke optimism and cheerfulness.

*Thunder Bay Regional Health Sciences Centre, Thunder Bay, Ontario*  
Salter Farrow Pilon Architects

*The dramatic three-storey wood and glass walkway references the old wooden trestle bridges that once carried rail traffic through the region. The structure incorporates over 1,100 glue-laminated members, some more than 20 metres (65 feet) long.*

"Wood is the form inspiring,  
[a] deeply human material".

Alvar Aalto





## WOOD AND ENERGY

One-third of the energy consumed in North America is used to heat, cool and ventilate buildings; to light them; and to keep appliances running. Energy efficiency in building operations is critical to sustainable building. Wood is far more resistant to heat flow than other materials, which means it is easier to insulate.

Wood is 400 times better than steel and 10 times better than concrete in resisting the flow of heat. This means more insulation is needed for steel and concrete to achieve the same thermal performance as with wood framing.

While operating energy is typically of greater interest, embodied energy is important—and in a highly energy-efficient building, it may actually be the larger of the two. The manufacturing of wood products typically requires far less energy, and in particular, less fossil fuel energy, than alternate materials.<sup>xix</sup>

## DURABILITY AND FLEXIBILITY

Green design often focuses on durability, for the purpose of conserving resources. This means ensuring that a structure will last or that it can be renovated if necessary. One way to achieve longevity is to design for adaptability. Perhaps wood buildings last so long in North America because they can be adjusted to accommodate changing needs.

Recovering materials at the end of a building's life rather than sending them to landfill is another way to extend material longevity—and wood is well suited to deconstruction.

When longevity is a challenge, then resource conservation typically involves the three Rs (reduce, reuse, recycle). These are especially important for finite non-renewable resources. There is a fourth R that is worth considering—a shift to renewable resources like forest products.

### **Norview Lodge, Simcoe, Ontario** *Montgomery Sisam Architects*

*At its heart, Norview Lodge is a simple cabin in the woods. Set on a cultivated site at the edge of a natural Carolinian forest, the building's wood structure and cladding allow it to fit easily into its rustic setting. Abundant with natural light and warm interior wood finishes, the facility provides a home-like atmosphere while still meeting the health care needs of its residents.*

**Whistler Public Library, Whistler, British Columbia**  
Hughes Condon Marler : Architects

*The Whistler Public Library was designed to a LEED® Gold level and features an innovative roof design made from western hemlock, an abundant and underutilized wood species in British Columbia.*





## INNOVATION AND TECHNOLOGY

The Canadian forest products sector has been quick to realize the benefits of continual environmental improvement through research and development. From rapid uptake of sustainable forest management principles to development of advanced manufacturing techniques to soften its industrial carbon footprint, the forest products sector is addressing environmental issues along its full value chain.

Innovation and technology have helped the industry to reduce fibre losses during harvesting and manufacturing processes, and to replace fossil fuels with energy derived from residuals and waste biomass. Waste in forest products manufacturing is quickly approaching zero—fully 97 per cent of all the wood fibre harvested in Canada is turned into wood, pulp, paper or other products, or used as fuel.

The industry has also made significant inroads in reducing energy consumption in harvesting and transportation through more efficient material handling and fuel reduction measures.

As an early innovator in the development and use of life cycle assessment for its products and processes, the Canadian forest industry has been able to scientifically measure its environmental impact, implement and monitor improvements, and compare itself with other industries.

### *Roof structure of the Richmond Oval, Richmond, British Columbia Fast + Epp structural engineers*

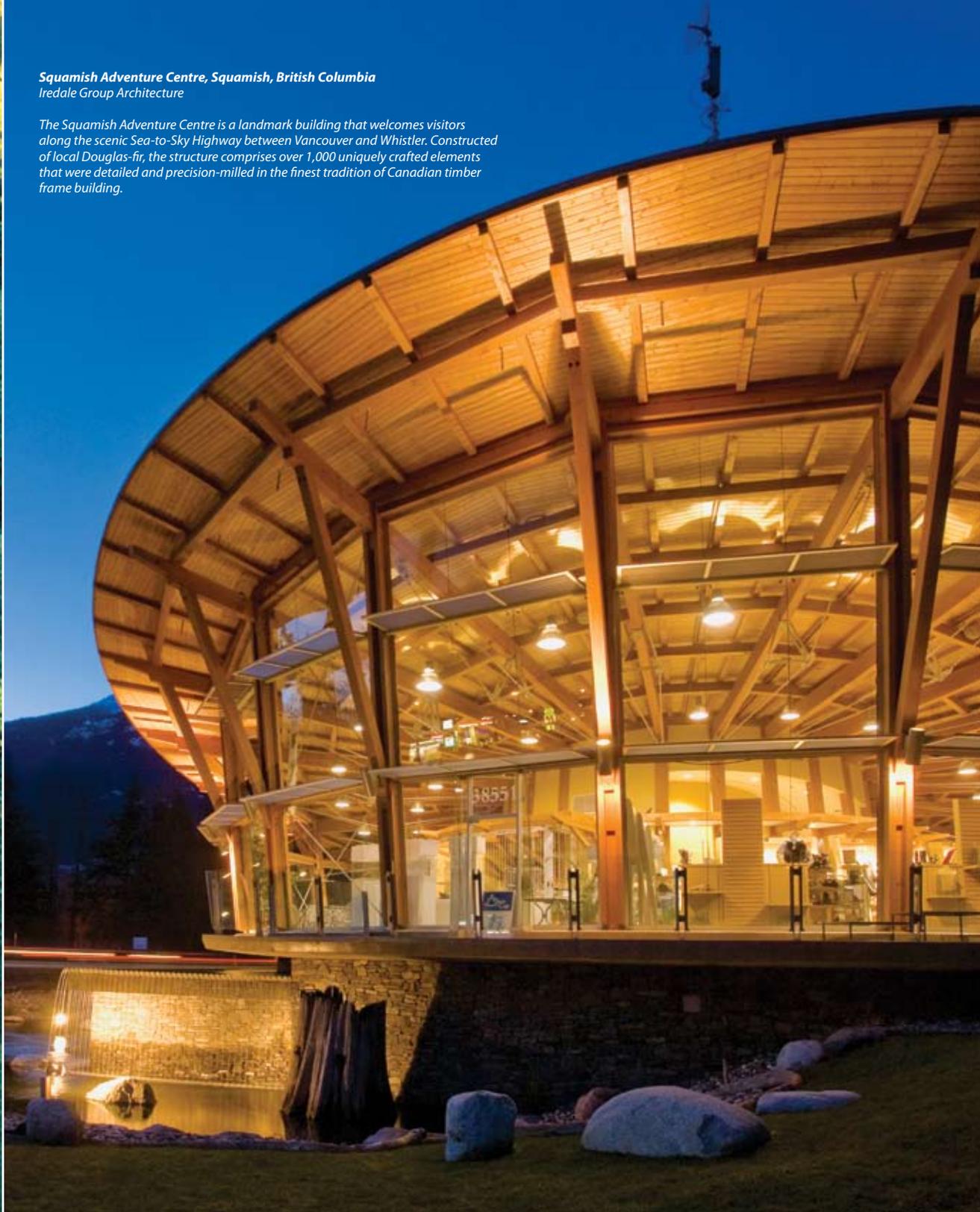
*The Richmond Oval was designed as a first-class speed skating facility for the 2010 Olympic Games, to be converted for community multi-sport and wellness activities afterwards. It was designed to LEED® Silver level. The wood-framed roof is 2.6 hectares (6.5 acres) in area and features some of the longest clear spans in North America—nearly 100 metres. The innovative roof design uses glue-laminated assemblies and a unique curved panel system which gives the roof a rippled appearance.*

“Wood is the most humanly sympathetic of all building materials because it affects so many of our senses. . . . it may even be that our appreciation of proportion comes from the natural dimensions of trees.”

Peter Davey, Editor, The Architectural Review

**Squamish Adventure Centre, Squamish, British Columbia**  
Iredale Group Architecture

*The Squamish Adventure Centre is a landmark building that welcomes visitors along the scenic Sea-to-Sky Highway between Vancouver and Whistler. Constructed of local Douglas-fir, the structure comprises over 1,000 uniquely crafted elements that were detailed and precision-milled in the finest tradition of Canadian timber frame building.*





## WOOD. A NATURAL SOLUTION.

The demand for resources will continue to escalate as populations grow and the standard of living climbs in many regions of the world. We can lighten this environmental load by relying more on renewable resources we can grow.

Wood makes sense for so many reasons. Growing trees fight climate change by absorbing carbon dioxide. Wood structures require less energy to build and to operate, which reduces our reliance on fossil fuels. Wood can be recycled, reused and renewed, again and again.

Wood from Canada is an excellent choice for the environment today, and for the future. We harvest our vast forests sustainably, and regenerate them quickly. We back this with stringent forest laws and more third-party forest certification than any other country worldwide.

Canadian Wood. Renewable by Nature. Sustainable by Design.

**Central City, Surrey, British Columbia**  
Fast + Epp structural engineers

*Central City is a unique, multi-use public building that brings the outdoors inside with open spaces and daylight. The engineers developed innovative, long-span, wood roof systems with a variety of techniques, including composite trusses, space frames and wide use of peeler cores, a byproduct of the plywood industry.*

## DEFINITIONS

**Carbon cycle:** A process related to the constant exchange of carbon between different sources. Carbon sinks are elements in the carbon cycle that are able to capture carbon dioxide and reduce its concentration in the atmosphere. Forests are a carbon sink—they take in carbon dioxide and convert it to wood, leaves and roots. They are also a carbon source—they release stored carbon into the atmosphere when they decompose or burn.

**Carbon sequestration:** The ability of forests or other natural systems to “sink” or store carbon, thereby preventing it from collecting in the atmosphere as carbon dioxide. Forests absorb carbon when they break down carbon dioxide during photosynthesis.

**Deforestation:** Permanent conversion to non-forest uses such as agriculture or urban development.

**Embodied energy:** All of the energy, direct and indirect, required through the life of a product, from extraction to disposal.

**Green building:** Choosing products and building designs that make structures more resource efficient and reduce their impact on human health and the environment through location, construction, operation, repair and maintenance, and renovation, and final deconstruction, demolition, or removal.

**Life cycle assessment (LCA):** A science-based process that examines the potential environmental impact throughout the life of a given product or service—from resource extraction through to product manufacturing, operation and use, and eventual reuse or disposal. It is frequently used to assess building products and assemblies.

**Sustainable forest management:** Management that maintains and enhances the long-term health of forest ecosystems for the benefit of all living things while providing environmental, economic, social and cultural opportunities for present and future generations.

## RESOURCES

**bcforestinformation.com** compiled by Forestry Innovation Investment, a Crown corporation of the Province of British Columbia  
[www.bcforestinformation.com](http://www.bcforestinformation.com)

**Canadian Wood Council**  
[www.cwc.ca](http://www.cwc.ca)

**Wood WORKS!**  
[www.wood-works.org](http://www.wood-works.org)

**Canadian Forest Service**  
<http://cfs.nrcan.gc.ca>

**CEI-Bois (European Confederation of woodworking industries)**  
[www.cei-bois.org](http://www.cei-bois.org)

**Tackle Climate Change, Use Wood**  
[www.roadmap2010.eu/wisd/publication.html](http://www.roadmap2010.eu/wisd/publication.html)

**Dovetail Partners, Inc.**  
[www.dovetailinc.org](http://www.dovetailinc.org)

**Forest Products Association of Canada**  
[www.fpac.ca](http://www.fpac.ca)

**FPIInnovations-Forintek Division**  
[www.fpinnovations.ca](http://www.fpinnovations.ca)

**Sustainable Procurement of Wood and Paper-Based Products (World Resources Institute/ World Business Council for Sustainable Development joint publication)**  
[www.wri.org/publication/sustainable-procurement-wood-and-paper-based-products#](http://www.wri.org/publication/sustainable-procurement-wood-and-paper-based-products#)

## FOREST CERTIFICATION

**Canadian Standards Association**  
<http://certifiedwood.csa.ca>

**Forest Stewardship Council—Canada**  
[www.fsccanada.org](http://www.fsccanada.org)

**Metafore (non-profit that works with business, government and other leaders to advance environmental goals)**  
[www.metafore.org](http://www.metafore.org)

**The Metafore website has a search tool to help buyers find certified forests and certified wood products**  
[www.metafore.org/index.php?p=Forest\\_Certification\\_Resource\\_Center&s=147](http://www.metafore.org/index.php?p=Forest_Certification_Resource_Center&s=147)

**Programme for the Endorsement of Forest Certification**  
[www.pefc.org](http://www.pefc.org)

**Sustainable Forestry Initiative**  
[www.sfiprogram.org](http://www.sfiprogram.org)





[bcforestinformation.com](http://bcforestinformation.com)

Forest Products  
Association of Canada  
fpac.ca

Association des produits  
forestiers du Canada  
fpac.ca

Canadian  
Wood  
Council

Conseil  
canadien  
du bois

