

# BUILDINGS THAT GIVE BACK



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AN EXAMINATION OF BUILDINGS THAT HAVE A NET-ZERO ENVIRONMENTAL IMPACT INDICATES THAT PROGRESS IS MUCH SLOWER, BUT MORE PROFOUND THAN WHAT ONE MIGHT HAVE EXPECTED.

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Since sustainable development was defined by the Brundtland Commission's report *Our Common Future* in 1987, tens if not hundreds of thousands of "green" buildings and communities—of various shades and types—have been built around the world. Green buildings and sustainable communities are not going away. In fact, many of the leaders in the industry appear to be narrowing their sights on a new set of goals: buildings and communities that aim for either no negative impact—or a positive impact—on planetary ecosystems.

It used to be that simply having a LEED-certified building or another of the certification systems in existence around the world was enough to claim the mantle of industry leadership. This is clearly no longer the case. With the GreenLife Business Centre, Canada's first net-energy-positive office building breaking ground in Milton, Ontario last February—no doubt spurred by Ontario's Feed-In Tariff program (FIT) that encourages onsite production of renewable energy—there is evidence that the bar of sustainable design is being raised. The trend includes:

- The roughly 100 residential net-zero-energy (NZE) projects and 20 commercial NZE projects built in North America (with perhaps the same number set to break ground over the next year).
- Four Living Buildings certified and at least 80 more registered in North America.<sup>1</sup>
- Numerous governments in Canada and the US are not only setting both

**ABOVE** DESIGNED BY CEI ARCHITECTURE PLANNING AND INTERIORS, THE RECENTLY OPENED OKANAGAN COLLEGE CENTRE OF EXCELLENCE IS SETTING ITS SIGHTS ON BECOMING A NET-ZERO-ENERGY BUILDING AND PART OF THE LIVING BUILDING CHALLENGE. THE NEW FACILITY IS EXPECTED TO USE 65 KILOWATT-HOURS OF ENERGY PER SQUARE METRE PER YEAR, POSITIONING THE BUILDING AS ONE OF THE MOST ENERGY-EFFICIENT IN NORTH AMERICA.

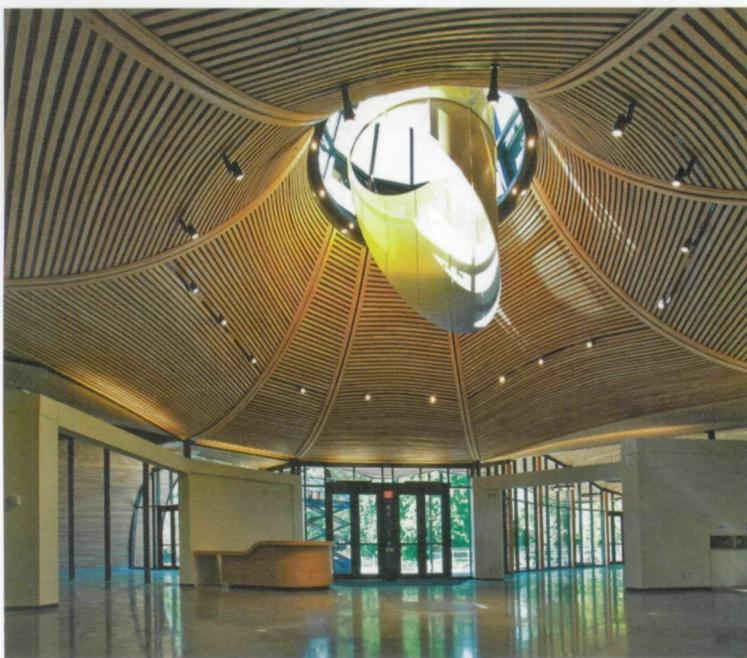
policy goals and regulatory requirements towards net-zero energy as a goal for buildings and communities but also net-zero water, waste and toxics, etc.

- Voluntary efforts such as Metro Vancouver's Zero Waste Challenge and Seattle's efforts to identify regulatory pathways for Seattle-area projects pursuing net-zero water strategies, which builds on Seattle City Council's 2009 Living Building Pilot Program Ordinance.
- Mandates such as California's upcoming requirements that all new residential construction be "zero-net energy" starting in 2020; commercial construction by 2030.

This article gives a very brief overview of this emerging industry direction, asking where did it come from, where is it now, and where is it going?

## Where Did This Come From?

The rise of net-zero or positive-impact buildings and communities over the last decade has been the result of many things. First, scientists and their allies are doing a better job of communicating an increasingly clear understanding of troubling human impacts on global ecosystems. Secondly, international standards and programs that move the construction of buildings and communities as close as possible to zero environmental impact are slowly having



**TOP** THE LARGEST ARRAY OF PHOTOVOLTAIC SOLAR PANELS IN WESTERN CANADA GENERATES ELECTRICITY FOR THE OKANAGAN COLLEGE CENTRE OF EXCELLENCE. **MIDDLE** DESIGNED BY PERKINS+WILL CANADA, THE RECENTLY OPENED VANDUSEN BOTANICAL GARDEN VISITOR CENTRE IN VANCOUVER IS DESIGNED TO BE NET-ZERO ENERGY, WITH ALL ENERGY NEEDS SUPPLIED BY ON-SITE RENEWABLE SOURCES, SUCH AS SOLAR PHOTOVOLTAIC PANELS. NATURAL VENTILATION IS ASSISTED BY A SOLAR "HEAT SINK" INTEGRATED WITH AN OPERABLE GLAZED OCULUM IN THE CENTRE OF THE FACILITY. **ABOVE** PHOTOVOLTAICS PLACED ATOP THE NET-ZERO-ENERGY BUILDING IN VANCOUVER'S OLYMPIC VILLAGE.

some influence on North America. These influences are too numerous to list but on the energy front, they include the German Feed-In Tariff (FIT) system that encourages the development of renewables by requiring utilities to pay increased prices for them. This tariff system inspired other FIT systems around the world. Secondly, other influences include the passive-house standard where tens of thousands of buildings have proven that massive energy efficiencies are both possible and affordable. Thirdly, a general movement towards low- and zero- or positive-energy building laws across the EU, including France, where all public buildings must be energy-positive by 2020.

Not just limited to Europe, net-zero buildings and communities are popping up throughout Asia and Africa. The developing world may in fact emerge as a leader in off-grid and low- or no-impact buildings and neighbourhoods for two simple reasons. Firstly, the existing infrastructure in most developing countries is completely inadequate and unreliable. Secondly, there is often neither the time nor investment capital to build large infrastructure projects to support the urban development that is in demand. "Just as many African and Asian nations have leaped right over the wired telephone phase and completely embraced the mobile phone, they may also skip right over central power, water and wastewater utilities and adopt decentralized models. This is a powerful incentive to develop small, incremental, self-reliant local utilities and zero-net buildings," says David Rousseau, a BC-based building design and community-sustainability consultant working internationally.

In terms of water use—in addition to the work going on with Washington and Oregon state authorities interested in enabling the Living Building Challenge discussed above—Australia, Asia and Africa are beginning to design and build projects aiming for net-zero water. Simon Fraser University Professor Meg Holden's research in Melbourne, Australia focuses on the sustainability plans for urban waterfront redevelopment projects: "Both Melbourne and Sydney compete for recognition as the hub of sustainable building excellence in the southern hemisphere." When asked about the differences between those Australian projects and leading projects in Canada, she notes: "The signature waterfront redevelopment projects in both cities—Melbourne's Docklands and Barangaroo in Sydney—have plans to go further in water conservation and recycling than Vancouver's Olympic Village. Ground has not yet been broken on Barangaroo but the commercial buildings in Melbourne's Docklands include technologies such as black-water recycling, whereas the Olympic Village doesn't even recycle their greywater. Barangaroo's goal is to be water-positive: the ability to process and return clean water to downtown Sydney. However, Holden warns that "the infrastructure for going beyond the precinct scale in this way, and who will pay for it and make it work remains unclear. We may be facing the same overall impulse toward sustainable neighbourhoods as the Australians, but the different political, cultural, and governance facets of managing the transition make comparing leading international performance difficult."

In understanding the reasons for the rise of net-zero or positive-impact buildings and communities over the last decade, another major impact is the coalitions between business, non-governmental organizations and others that have resulted in market-based standards such as LEED (in North America and around the world), BREAM (in the UK, parts of the EU and Asia), and Green Star (in Australia, New Zealand and South Africa). Policymakers and clients have been using these standards to require a higher standard, and are therefore eager to signal the next level of leadership. In this context, the Living Building Challenge (LBC) has emerged as the only standard that offers a way of pushing buildings not just to net-zero-environmental-impact design, but also performance, as the certification is not awarded until at least a year's worth of performance data proves the building is living up to its design goals. Given that the LBC was authored by Canadian-born Jason F. McLennan—who is also the CEO of the Cascadia Green Building Council, it seems appropriate to begin to answer the question of "where is it now" using a list of recent projects in British Columbia.

BC is a great example of how quickly this new industry focus is emerging: note that all of these projects were built in or after 2008.

### Where is it Now? Completed Net-Zero-Energy and Net-Zero-Impact Buildings and Communities In and Near British Columbia

The sidebar on the right provides an overview of some of the better-known projects aspiring for net zero—either in terms of energy, water or net-zero-energy impact (NZEI). The list of projects only includes those that are either built, nearly complete (such as the Simon Fraser University childcare project, and Burnaby's Harmony House—a Canada Mortgage and Housing Corporation (CMHC) Equilibrium project), or under construction (such as Seattle's Cascadia Center and the ongoing 2030 District). The chart doesn't include a number of recent projects such as the Whistler Passive House that was in fact not aiming for net-zero energy, or Seattle's 2030 District which is aiming for net-zero carbon by 2030. It also doesn't include: just off the map in Portland—but still definitely in Cascadia—many net-zero-energy projects, some of which are still in design, and several of which are occupied already, including the 15 involved in the Energy Trust of Oregon's Path to Net Zero pilot project, of which three to four will be complete this year. Also not included are many more projects in BC and surrounding areas that are in design and slated for construction—for instance, larger commercial renovation projects such as the Old Vancouver Stock Exchange Building Development (aiming for LEED Platinum and the LBC).

Probably the most critical caveat about many of the recently listed projects pertains to building performance. Only those projects listed on the chart that are aiming for the LBC are actually aiming for net-zero environmental impact. Many others are striving for multiple environmental goals—such as zHome—with rigorous performance in water and other areas, and all of CMHC's Equilibrium projects, but none set their sights on reaching zero impact in all areas. Second, the LBC remains the only way to actually ensure performance of a net-zero-impact building. Even then, there are exceptions for market realities that mean many of the projects built to this standard will not actually be neutral with respect to the environment; they will still have an impact. For example, the definition of net-zero energy now allowed by the LBC allows for some flexibility to accommodate market realities that will not exist in the future. Currently, a project is still allowed to take in grid-sourced electrical energy and balance the equation by returning heat. However, this exception and the many others within the LBC will be eliminated over time as market realities adjust.

Is it fair to focus on BC as a snapshot of this

new industry direction, or is this movement a regional trend that is destined to pass? BC is, of course, the province with a carbon tax, and where Rich Coleman, former Minister of Housing and Social Development in the province, stated in a talk to the building industry in May 2010 that “By 2020, my challenge to you is to be building housing that is net zero for greenhouse gas emissions with superior airtightness and insulation that will enable net-zero-energy performance through the addition of renewable energy generation such as solar panels.” BC is also the region where the LBC was born. For these reasons, it may seem an outlier in Canada, rather than a bellwether. However, some industry experts are predicting less of a rise in strict net-zero projects in BC than in Ontario, where the Feed-In Tariff and growing solar industry will potentially enable more financially sustainable net-zero-energy projects sooner. Due to BC's historic leadership in birthing the Canada Green Building Council and adopting LEED over a decade ago, it seems quite natural that BC will remain a leader in this emerging industry.

### Predicting the Future?

Jason McLennan is in a hurry to build the future that he wants. “We are thrilled with the uptake of the challenge and how it has changed the nature of the discussion about what's possible. There are projects popping up everywhere and it's really gratifying. I believe we are closing in on 100 projects worldwide. This does not count all the projects pursuing it that haven't registered, or projects that are using it as a framework or tool for thinking about the issues. And so, the actual number of projects we are affecting is much greater. Every time a project gets built, it has a huge ripple effect in terms of changing perceptions and other impacts.”

What about all those who claim that this is financially impossible? James S. Emery, a partner at Iredale Group Architecture in Vancouver, is working on the old Vancouver Stock Exchange Building development in downtown Vancouver: “We are pursuing partial LBC certification through the Water Petal and LEED Platinum certification processes. The LBC forces one in a high-density urban core to look beyond the property boundaries when pursuing the Energy Petal. Unfortunately, there are no non-combustible renewable district energy sources in Vancouver.<sup>2</sup> As such, it is currently impossible and will likely remain this way in the foreseeable future for a project such as ours to achieve full LBC certification.” While a downtown high-rise renovation may be impossible, other project types are not. Dale Mikkelsen, Director of Development at SFU Community Trust, speaks about their UniverCity Childcare Centre that is aiming for the LBC: “The project is currently tracking against locally

### Recent Net-Zero-Energy Projects

- Drake Landing Solar Community, Okotoks, Alberta (2007)
- Baird Residence, Vancouver Island, BC—Living Building Petal Certified (2008)
- Riverdale NetZero Project, Edmonton, Alberta (2008)
- Avalon's Discovery 3 House, Alberta (2008)
- Avalon's Discovery 4 House, Alberta (2010)
- Lopez Community Land Trust Workforce Homes, Lopez Island, Washington (2009)
- Green Dream House, Kamloops, BC—1 of 14 across Canada (2010)
- Net-Zero Residence, Smithers, BC (2009)
- West House, Vancouver, BC (2010)
- Net-Zero-Energy Building at Olympic Village, Vancouver, BC (2010)
- zHome, Issaquah, Washington—first net-zero-energy development and education centre (2011)
- CMHC Harmony House, Burnaby, BC (2011)

### Net-Zero-Energy Projects Aiming for Living Building Challenge

- CIRIS, University of British Columbia (2011)
- Okanagan College Centre of Excellence, Penticton, BC (2011)
- Bertschi School, Seattle, Washington (2010)
- Simon Fraser UniverCity's Childcare Project (2011)
- VanDusen Botanical Garden Visitor Centre, Vancouver, BC (2011)
- Cascadia Center, Seattle, Washington (2012)

available price benchmarks for stand-alone childcare facilities at 10 to 15 percent below delivery cost of a turnkey LEED Silver facility.”

Thomas Mueller, President and CEO of the Canada Green Building Council, says that “We need to look at buildings that perform at a much higher level. That is the future and we need to start it now. From the realities of the market perspective—net zero may not always make sense today but from the realities of climate change, net zero is our future, so it doesn't make sense to ignore it.”

Net-zero-environmental-impact buildings and communities are seen by some to be financial or physical impossibilities, and by others to be necessary if we are to sustain humanity on this small planet. Either way, it is worth keeping your eye on this trend, as I predict it will get a lot more attention in the years to come. **CA**

*With over a decade of experience in sustainable policy, planning and education, Jessica Woolliams has a passion for making change towards environmental and social sustainability at the level of buildings, institutions and communities. For more information, see [www.jessicawoolliams.com](http://www.jessicawoolliams.com).*

<sup>1</sup> The Living Building Challenge “defines the most advanced measure of sustainability in the built environment possible today and acts to diminish the gap between current limits and ideal solutions,” according to the International Living Future Institute within which the standard is housed. There are buildings aiming for net-zero energy, water, GHG, toxins, etc.

<sup>2</sup> The Living Building Challenge does not allow combustion of any kind.