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**URBAN**  
Institute



# Sustainable Building

## Canada on the Move

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MELBOURNE

WORLD  
SUSTAINABLE  
BUILDING  
CONFERENCE

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*Submitted to:*  
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Page 8, 19, 36, 46, 51, 54 Terri Meyer Boake.

Page 3. Glen Murray.



*Sustainable Building: Canada on the Move has been prepared for the Organizers of SB08 and Co-Hosts by the Secretariat of SB07Toronto the Canadian Urban Institute.*



Dear Colleagues,

As president and CEO of the Canadian Urban Institute it is my pleasure to commend to you this comprehensive review of Canada's progress towards transforming the market for sustainable buildings. The report has been prepared by our staff with the help of many contributors representing every sector of the economy and from practitioners across the country.

The scope, breadth and depth of the information contained in this report is, in my view, unprecedented. It provides in a single source an up to the minute assessment of the rapid progress made in Canada in this increasingly important field.



Equally important, this report acknowledges many years of dedication and innovation from key individuals in departments and agencies seeking to move the marketplace for sustainability forward, a prerequisite for building consensus and seeding market transformation.

The CUI believes strongly that conferences such as SB08 combined with insights such as those contained in this report represent an important tool for sparking change, which is inherent in our mandate.

Sincerely,

A handwritten signature in black ink, which appears to read 'Glen R. Murray'.

Glen R. Murray  
President and CEO  
Canadian Urban Institute



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## PREFACE

As Canada's leading applied urban policy institute dedicated to identifying, developing and delivery policy and planning solutions to enable urban regions to thrive and prosper, the Canadian Urban Institute is engaged in Canada's movement to advance market transformation for sustainable communities, technology and buildings. The Institute believes that the development of buildings and communities provides a tangible way to have a productive conversation about sustainability issues impacting urban regions across Canada.

In 2005, the Canadian Urban Institute, Sustainable Buildings Canada, the Canada Green Buildings Council (Toronto Chapter) and the Toronto and Region Conservation Authority partnered to form the Green Building Alliance.<sup>1</sup> The Alliance is recognized as a principal supporter for sustainable development in the Toronto region and has developed a reputation for the delivery of outstanding events including the popular annual Toronto Region Green Building Festival and the publication of a seminal book entitled *Canada Innovates: Sustainable Building*.<sup>2</sup>



Manitoba Hydro Building (Winnipeg, Manitoba)

<sup>1</sup> For more information on the Alliance visit [www.greenbuildingalliance.org](http://www.greenbuildingalliance.org) and for information on the Canadian Urban Institute visit [www.canurb.com](http://www.canurb.com)

<sup>2</sup> For information on the Green Building Festival see [www.greenbuildingfest.com](http://www.greenbuildingfest.com)

## EXECUTIVE SUMMARY

Approaching the end of the first decade of a new century, North America is beginning to respond to the challenges of climate change. Inspired by dramatic interventions like “An Inconvenient Truth,” and stung by the realization that the era of cheap oil has come and gone, all sectors of the economy are gearing up to find a way to build cities and communities in a more sustainable way.

Perhaps surprisingly, the impetus has come from the somewhat narrow focus on creating more efficient buildings. Only recently has the scale of the endeavor broadened to encompass development at the neighbourhood and community scale. This transition bodes well for the cause of sustainable development.

In Canada, although it has taken nearly 50 years to effectively translate the warnings sounded by Rachel Carson in her seminal book, “Silent Spring,” into action, there are indications that the market for sustainable building is finally reaching critical mass.

This report concludes that decades of effort on the part of government policy makers and academia to establish new benchmarks for efficient building systems and codes are paying off. Having found willing partners within industry and the design community to devise and implement whole building rating systems, the public sector is now beginning to focus on creating capacity within the education system – both post-secondary and continuous professional learning – to ensure that there is proper follow through over the long term as well as an ability to translate theory into practice.

With active support from urban planners, and a willingness on the part of leaders within the development community to take on the risky business of trying something different, municipalities across Canada are moving quickly to establish innovative land use policies by adapting lessons learned in designing sustainable “green” buildings for application to entire neighbourhoods. As with the experience of changing the paradigm for sustainable buildings, progress is made on a sector-by-sector basis and at different rates in different markets.

The current high level of interest in building sustainably in Canada is in part the result of a rich combination of catalytic conferences, government-sponsored competitions and long-term, multi-disciplinary collaboration on a variety of complex issues. The impact of rising energy costs and the prospect of dwindling resources must also be acknowledged as a key stimulus, however.

An important element in this regard, described in detail in this report, is a breakthrough in the thinking and planning that precedes investment in new development. The realization that embracing the integrated design process not only results in better buildings but also saves money is moving from the domain of a few innovators to accepted industry practice. A similar change is occurring at the municipal level, where administrators are seeking to reduce their capital and



operating costs for necessary infrastructure. They are, as a result, more open to encouraging compact development and demonstrating a willingness to invest in energy reduction through initiatives such as district energy and support for renewal energy.

What does the future hold? The acceptance of whole building rating systems is proceeding at an unprecedented rate. Municipal plans are increasingly requiring higher performance for both individual buildings and at the neighbourhood scale. While there is a need to standardize energy efficiency codes across the country, as the cost of energy increases, the need to prepare for carbon pricing and trading will also be felt. This is an essential condition in order to effectively redistribute the financial challenges inherent in developing – and living – sustainably.

Another exciting prospect is to realize the opportunity to translate the capacity for sustainable development into an exportable commodity, both in terms of products and professional know-how. Finally, although it is vitally important that new development be designed and developed to exacting environmental standards, the need to retrofit the country's existing stock of buildings cannot be ignored.

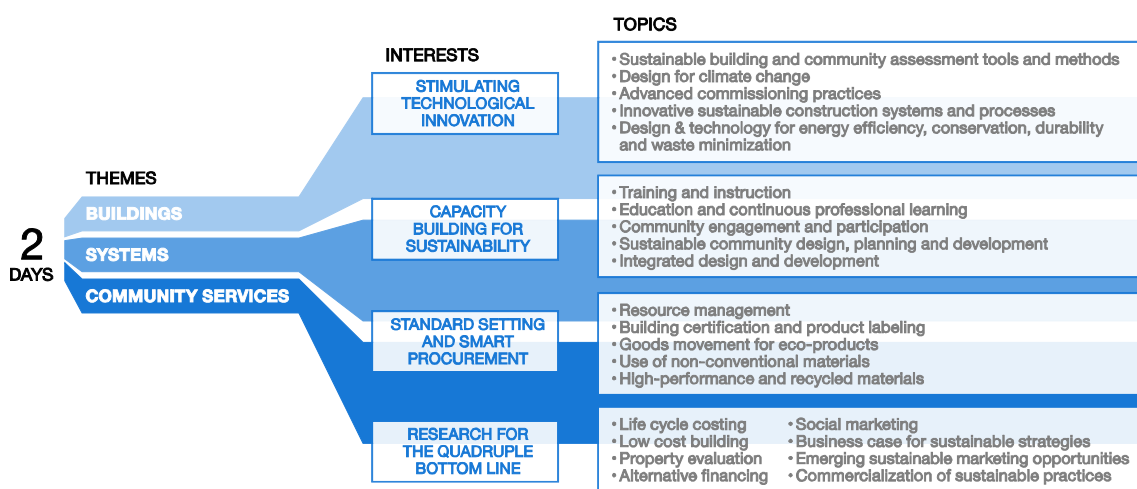
Conferences such as the ones organized by the International Initiative for Sustainable Built Environment (iISBE) are a proven stimulus to much needed innovation because they encourage research and the review of progress as documented in this report. The shift to sustainable building has been a long time coming, but Canada is finally on the move.

# 1 INTRODUCTION

In 2007, the Canadian Urban Institute (CUI) in association with the Green Building Alliance (GBA) and Ryerson University hosted the Toronto Sustainable Building 07 (SB07Toronto) regional conference. More than 285 people attended the conference from organizations representing the development, construction, academia, general science, engineering, technology and energy sectors across Canada, North America and around the world.

Nearly 90 speakers and commentators examined the latest advancements and experiences in sustainable building design and development. Over a two day period, delegates explored the three interlinked themes of buildings, systems and community services through a mix of plenary, workshops, and technical sessions (see Figure 1). Four broad-based interests including stimulating technological innovation, capacity building, standard setting and smart procurement, and research for the quadruple bottom line provided the framework for presenting a range of technical, practical and educational content.<sup>3</sup>

FIGURE 1 SB07 TORONTO CONFERENCE PROGRAM OVERVIEW



As part of the World Sustainable Building (SB) Conference series, held every three years, SB07Toronto was the first of the 11 regional conferences (see Table 1) organized around the world and coordinated in cooperation with the International Institute for a Sustainable Environment (iiSBE), the International Council for Research and Innovation in Building and Construction (CIB) and the Division of Technology, Industry and Economics (DTIE) of the United Nations Environment Programme (UNEP).

This report provides a nationwide overview for some of Canada's outstanding achievements in sustainable building and development activities. It is intended to

<sup>3</sup> Full details of the conference are available on-line at [www.sb07toronto.org](http://www.sb07toronto.org).

encourage information sharing and to contribute to the transfer of knowledge for the benefit of participants at the 2008 Global Conference on Sustainable Building (SB08) in Melbourne, Australia.<sup>4</sup>

**TABLE 1 LIST OF 2007 REGIONAL CONFERENCES**

<b>Country</b>	<b>City</b>
<b>Canada</b>	Toronto
<b>Italy</b>	Torino
<b>Korea</b>	Seoul
<b>Portugal</b>	Lisbon
<b>Sweden</b>	Malmo
<b>Czech Republic</b>	Prague
<b>Malaysia</b>	Kuala Lumpur
<b>Taiwan</b>	Taipei
<b>New Zealand</b>	Auckland
<b>China</b>	Hong Kong SAR
<b>Greece</b>	Athens

This report:

- Provides a brief overview of the history of sustainability in Canada;
- Examines the factors driving sustainable development today;
- Explores how communities are embracing sustainability;
- Reviews select policy and program initiatives at the federal, provincial and municipal level;
- Identifies the current whole building rating systems in use across the country;
- Looks at new leading technology developments for sustainable building;
- Includes information on education and training for sustainable building; and,
- Offers insights from leading experts on where sustainable building is headed in Canada.

As a result of resource and time constraints, this report focuses largely on energy related advances in Canada associated with sustainable “green” building. The report does not begin to address the wealth of advancements for topics such as water use and wastewater generation, waste reduction and recycling, environmentally-preferred materials and rating systems for environmental products, or the capacity for sustainable building to improve building occupant health and productivity, as well as impact the social performance of a community.

It is also worth noting that advances in sustainable building theory, practice, application and technology are moving faster than can be documented in Canada and readers are encouraged to visit the resources and links provided at the end of the report to find the most current and relevant information.

<sup>4</sup> Full details of the World Sustainable Building Conference in Melbourne, Australia is available on-line at: <http://www.sb08.org>.

## 1.1 WHAT IS SUSTAINABLE BUILDING?

For the purpose of this report, sustainable building is defined as building and development practices that use an integrated approach to the design, construction, and operation of a residential, commercial, industrial or institutional building in an attempt to optimize energy and water efficiency, to maximize conservation by integrating systems, to minimize waste produced during construction, to improve in-door air quality, to use environmental preferred products, and to encourages the application of alternative energy supply practices.<sup>5</sup>



St. John Ambulance (Edmonton, Alberta)

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<sup>5</sup> Canadian Urban Institute. 2006. Framework for Advancing High Performance Building Development in Markham.

## 2 SUSTAINABILITY IN CANADA: A SHORT HISTORY

The evolution of sustainable building, from its inception in the early 1960s through to today is the result of thought provoking designs, key events, and national initiatives (see Figure 2). This section reviews the progression of sustainable building in Canada.

### 2.1 BUILDING THE CONCEPT

The idea of sustainable building for Canada is rooted closely in concerns for energy efficiency and broader environmental awareness. In the early 1960s, Canadians as well as Americans became actively aware of the adverse environmental impact caused by human activity. Rachel Carson's *Silent Spring* helped establish how manufacturing and development were impacting nature and human health, while other seminal publications such as Victor Olgay's *Design with Climate* and Ian McHarg's *Design with Nature* opened the discussion on redesigning buildings and communities to fit the climate in which they reside.<sup>6</sup>

The 1970's oil crisis resulted in energy prices soaring in Canada and across North America. During this period, a concerted effort was made to introduce demand side management practices and promote energy efficient buildings. One trend that developed in North America in response to rising energy costs was the need for more tight buildings as a means of conserving energy. This led both Canada and the U.S. to develop new energy efficient building codes. Canada introduced a model code, *Measures for Energy Efficiency in New Buildings*, in 1978. As window designs began to maximize passive heating, insulation levels increased and buildings sealed for air leaks, it was not long before people began to suffer from what is commonly referred to today as Sick Building Syndrome and from other modern building design implications, including exposure to PCBs, asbestos and mold.<sup>7</sup>

Another trend in the 1970s saw the rapid growth and application of solar (photovoltaics) technologies for heating and electricity in buildings to reduce energy consumption.

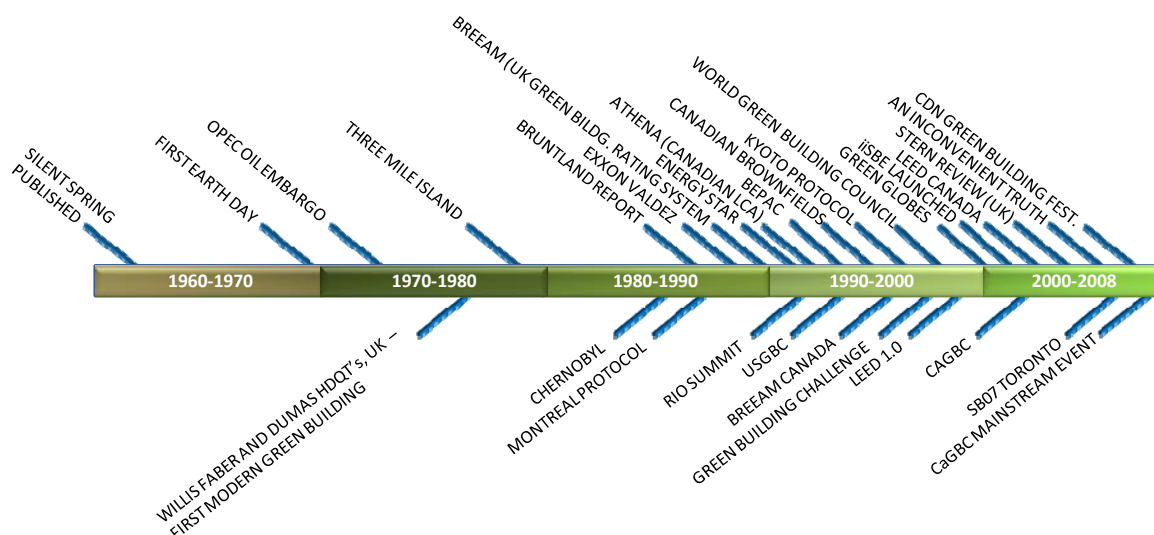
Throughout the 1970s, concerns over energy efficiency, in-door air quality and other progressive design considerations were largely left out of the design considerations for most buildings, with only a handful of residential and institutional developments incorporating advanced features from recycled materials to cisterns to geothermal heating technology.

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<sup>6</sup> Terri Meyer Boake. 2006 "Moving Towards Green" in Luigi Ferrara & Emily Visser. Eds. Canada Innovates: Sustainable Building.

<sup>7</sup> Mark Lucuik. 2005. A Business Case for Green Buildings in Canada. Available On-line: [www.cagbc.org](http://www.cagbc.org).

FIGURE 2 THE PROGRESSION OF SUSTAINABILITY IN CANADA



Source: Mark Lucuik. 2005. A Business Case for Green Building in Canada.

The late 1970's marked the introduction of the Natural Resources Canada (NRCan), Office of Energy Efficiency with the development of an advanced home building program – R-2000. The program, supported by the Canada Home Builders Association, was introduced largely to aid home builders across Canada and to promote the use of energy-efficient and cost-effective building practices and technologies, as well as avoid the health implications of tight buildings.<sup>8</sup>

Another important early milestone for the progression of sustainable building was the launch of the Healthy Housing Design Competition held in 1991 by the Canada Mortgage and Housing Corporation (CMHC). The competition, which was developed to encourage the design of healthy and environmentally sensitive dwellings, had over 700 entries from across the country.

In 1993, NRCan launched a whole building design and rating program called C-2000 Program for Advanced Commercial Buildings. The program set out to demonstrate the feasibility of achieving a high level of energy and environmental performance through the application of modern technologies in large-scale office buildings.

<sup>8</sup> Since being introduced over 20 years ago, the R-2000 standard is still effective today and has set the benchmark for home building in Canada. This program is continually upgraded to include new technologies for high-performance buildings and whole rating systems in North America and has helped to establish a marketplace for sustainable building in Canada.



### Winner of the 1991 Healthy Housing Design Competition



The winner, architect Martin Liefhebber, designed the "Toronto Healthy House." The Healthy House has solar passive, active heating and solar electric systems. The house receives a significant portion of its electrical power from sunlight through these systems. It also contributes excess energy back to the grid and has no connection to the municipal water and sewer infrastructure. The house relies entirely on the capture of rain water and the reuse of greywater for general water use purposes in the house.

Source:  
<http://healthyhousesystem.com/toronto.html>

The program proved successful with over 13 buildings being developed with high performance standards and introduced the building and design world to the applied use of an Integrated Design Approach (IDP).<sup>9</sup>

The C-2000 program also led to the successful launch of two other sustainable building initiatives. First, using the concepts developed and tested by C-2000, the Commercial Building Incentive Program (CBIP) was introduced to encourage financial investments in the form of grants to help offset the extra cost of energy efficient building design and construction. Second, C-2000 contributed to the development of the Green Building Tool (GBT), an environmental assessment and rating system for commercial buildings, which served partially as a precursor for the United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED®) rating program and continues to support the pre-eminent Green Building Challenge (GBC) held with each of the World Sustainable Building conferences.

During the mid to late 1990's, the momentum for sustainable building began to grow quickly as a host of best practices, incentives and government programs were introduced including the launch of a new Model National Energy Code for Canada (MNECB), the introduction of the Energy Innovators Initiative (EII), the Federal Building Initiative and other programs at the municipal level, such as the City of Toronto world renowned Better Building Partnership (BBP).

In 1996, Canada Standards Association introduced the first whole building rating system for North America, BREEAM Canada for Existing Buildings. The BREEAM family of building tools (BREEAM Canada, BREEAM/GreenLeaf, and the Green Building Challenge Tool) was designed to help construction professionals understand and mitigate the environmental impacts of the developments they designed and built.<sup>10</sup> Along with the Green Building Tool (GBT), BREEAM Canada also influenced the development of the USGBC LEED® program.

The Kyoto Protocol, adopted in 1997, was also influential in advancing the concept of building sustainable structures. By bringing the issue of climate change to the forefront and setting targets for reducing greenhouse gas (GHG) emissions in industrialized countries, the sustainable building industry in Canada gained needed support and recognition. The first World Conference on Sustainable Building and Construction held in Vancouver, British Columbia in 1998 was important for incorporating sustainable building into the national agenda. The event provided government officials, building experts and Canadians with an opportunity to learn

<sup>9</sup> IDP is now an internationally recognized approach that focuses on assessing every phase of construction collectively, from site selection of a building to the selection of the HVAC systems, to ensure the maximum environmental potential off a building is achieved. The C-2000 program led to the recognition that early design intervention was critical for achieving true change in building performance with minimal cost. IDP encourages project team members to work together from the project outset to identify project goals in the planning and programming phase to ensure important decision and cost implications are made from day one of the development process.

<sup>10</sup> For more information on BREEAM Canada and Green Globes rating systems, see Chapter Five and <http://www.greenglobes.com>.

about international green building performance assessments and best practices. National teams from fourteen countries, mostly in northern Europe, participated in the first Green Building Challenge by assessing a total of 100 buildings.

By the turn of the century, sustainable building was firmly entrenched as a concept, but was not considered mainstream in Canada. In 2000, BREEAM Canada for Existing Buildings was released as a new online tool called Green Globes (an environmental assessment, education and rating system). The Green Globes rating system is in use across North America and serves as the basis for the Building Owners and Manufacturer's Association of Canada (BOMA Canada) Go Green Plus Program.<sup>11</sup>

In 2002, the Leadership in Energy and Environmental Design (LEED®) Canada Green Building Rating System was introduced with the launch of the Canada Green Building Council (CaGBC). LEED® Canada was an adaptation of the USGBC LEED® Green Building Rating System, but tailored for Canadian climates, construction practices and regulations. In the same year, the University of British Columbia completed construction of the eco-friendly C.K. CHOI building, which set new standards across Canada for sustainable building.

Between 2002 and 2005, several major policies and programs were initiated that contributed to raising awareness and driving the market place for sustainable building. This included the launch of the BuildSmart and Green Building program by Metro Vancouver, the introduction of the Built Green™ evaluation system in Alberta and British Columbia for low-rise housing, and the development of the Equilibrium Housing Initiative (EHI) by CMHC.<sup>12</sup>

In late 2005, the Green Building Alliance (GBA) was established to present a bid to host the Global Conference on Sustainable Building and Construction in the Toronto region. In the same year, the Alliance launched the Annual Green Building Festival, a two day event that showcases the latest in design, technologies and approaches for sustainable building with over 100 exhibitors demonstrating ready-to-market green building solutions. In 2008, the CaGBC hosted the first national green building summit focused on advancements to the LEED® Canada Rating System. Over 1200 delegates attended the event from every level of government, financial service, utilities, education and industry. At the summit, the next generation of LEED® tool was presented to promote the reduction of Canada's overall GHG emissions by 50% by 2015 and is expected to influence other LEED® rating systems around the world.

### The Earth Rangers Centre



The Earth Rangers Centre, just North of Toronto, is LEED Gold certified. The building incorporates leading edge environmental technologies and is recognized as being highly energy efficient and a showpiece for sustainable building.

Source: <http://cusotmer.gewater.com>

### C.K. CHOI Building



The C.K. CHOI building at the University of British Columbia is among the first demonstration buildings for sustainable building in Canada.

Source: <https://www.usgbc.org/chapters/cascadia/cchoi.pdf>

<sup>11</sup> For information on the BOMA Canada's Go Green program see <http://www.bomagogreen.com>.

<sup>12</sup> Equilibrium Housing Initiative (EHI) is a national housing initiative that builds on the initial idea of the Healthy Housing Competition and focuses on bringing together the private and public sectors to develop homes that combine resource and energy-efficient technologies in order to reduce their environmental impact to an absolute minimum. The goal of the program is to demonstrate the feasibility of building a near "net-zero" home.



### 3 WHAT IS DRIVING SUSTAINABILITY TODAY?

Canada is at the forefront of a growing worldwide movement to transform the marketplace to sustainable practices. There are a variety of reasons for this, including a response to climate change, the growth of energy consumption, a commitment to corporate social responsibility, and the development of healthy communities using the principles of sustainable building are all contributing to a Canadian marketplace that encourages a built environment, which is energy efficient, cost effective and ecologically sensitive.

#### *Response to Climate Change*

There is now broad consensus among scientists and politicians that to avoid the full effects of climate change, including floods, droughts, extreme heat and other problems, greenhouse gas emissions (GHGs) need to be reduced (see Impact of Climate Change in Canada at the end of the report). On average, buildings emit 35% of GHGs into the atmosphere, generate 10% of airborne particulate matter, utilize 33% of Canada's total energy production, consume 50% of Canada's natural resources, use 12% of non-industrial water consumption, and produce 25% of Canada's landfill waste.<sup>13</sup> According to the Commission for Environmental Cooperation (CEC), Canada's residential building sector is also responsible for approximately 80 megatons of CO<sub>2</sub> emissions annually, and the commercial building sector for approximately 69 megatons of CO<sub>2</sub>.<sup>14</sup> The awareness and growing concern in Canada about climate change is helping to shift the building industry and the public sector towards sustainable development.

#### *Growth in Energy Consumption*

The demand for energy across Canada is continuing to grow. Canada's energy consumption has risen by nearly 10% between 1990 and 2007. This is related to the widespread use of electronic equipment for businesses and residential applications, and the growth of energy intensive industries such as the oil and gas sectors. The total Canadian demand for electricity is projected to grow to 593 terawatt-hours (TWh) by 2020.<sup>15</sup> As energy demand is increasing, the development of new centralized generation and transmission networks has slowed partly as a result of an increase in localized generation, but also from a lack of public support for large scale systems dependent on fossil fuel. At the same time, a dependable supply of fuel and electricity is seen as critical for the safe operation for Canadian communities and is leading to an increased focus on reducing energy demand in the

<sup>13</sup> Canadian Urban Institute. 2005. Mapping the Sustainability Supply Chain for Sustainable Building Practices in Canada.

<sup>14</sup> Secretariat of the Commission for Environmental Cooperation (CEC). 2008. Green Building in North America: Opportunities and Challenges. Available Online: [http://www.cec.org/files/PDF//GB\\_Report\\_EN.pdf](http://www.cec.org/files/PDF//GB_Report_EN.pdf). For Canadian highlights see: [http://www.eurekalert.org/pub\\_releases/2008-03/cfec-pgb031108.php](http://www.eurekalert.org/pub_releases/2008-03/cfec-pgb031108.php)

<sup>15</sup> Brent Gilmour & John Warren. 2007. The New District Energy: Building Blocks for Sustainable Building. Canadian District Energy Association. Available online: <http://cdea.ca/resources/highlights-guidelines-and-manuals>.

built environment through improved performance standards for building and the incorporation of renewable technologies.

### *Corporate Social Responsibility*

Canadian companies are under increasing public scrutiny to be accountable not only to shareholders, but also to stakeholders such as employees, consumers, suppliers, local communities, policymakers, and society at large in how they integrate environmental, cultural, economic and societal issues into their activities.<sup>16</sup> For Canadian corporations that have been actively rebuilding their supply chains or creating new products to reposition their companies in the eyes of the public, the quest for sustainability represents far more than a short-term marketing advantage. The basis for a “green” transformation is a commitment that puts the goal of reducing the company’s carbon footprint and creating a healthy work environment for employees on an equal footing. For example, Vancouver City Savings Credit Union (VanCity) is the first North American-based financial institution to be carbon neutral. In recent years, socially responsible investments have grown to nearly half a trillion dollars in Canada.<sup>17</sup> The interest for investing in sustainable technologies is redefining the way business operates and the products available for sustainable building.

### *Healthy Communities*

Where we work, live, and play is vitally important to the quality of our lives. There is a growing body of research that indicates healthy communities are liveable, complete communities based on the principles of sustainability.<sup>18</sup> This is inclusive of sustainable buildings that offer healthier interiors (indoor air quality and natural light) and include measures to reduce a building’s ecological footprint.<sup>19</sup> The Ontario Professional Planners Institute (OPPI) recently prepared a report that outlined the importance of urban design, active transportation and green infrastructure as central principles of sustainable building to create healthy communities. The Canadian Heart and Stroke Foundation of Canada is also leading the charge in Canada to connect the importance of health with the built environment, including how buildings are designed and constructed through leading research. There is now greater appreciation amongst planners, developers and building owners of linking health and social considerations to sustainable building.

<sup>16</sup> For information on Corporate Social Responsibility see the Harvard Kennedy School at <http://www.hks.harvard.edu/m-rcbg/CSRI/> and Industry Canada at <http://www.ic.gc.ca/epic/site/csr-rse.nsf/en/Home>

<sup>17</sup> Jane Garthson. 2008. Presentation. *Moving a Greener World* at Canadian Urban Institute, Urban Leadership Series - *The Business Case for Sustainability Begins with a Commitment To CSR* (May, 2008). Available online: [http://www.canurb.com/events/event\\_details.php?id=217](http://www.canurb.com/events/event_details.php?id=217).

<sup>18</sup> Ontario Professional Planners Institute (OPPI). 2007. *Healthy Communities Sustainable Communities: The 21<sup>st</sup> Century Planning Challenge*. 2007. Available online: [http://www.ontarioplanners.on.ca/pdf/Healthy\\_Sustainable\\_Communities\\_2007.pdf](http://www.ontarioplanners.on.ca/pdf/Healthy_Sustainable_Communities_2007.pdf).

<sup>19</sup> For more information please refer to the report on York Region Sustainability Strategy – *Towards a Sustainable Region*. 2007; and Canada Mortgage and Housing Corporation. 2007. *Changing Values, Changing Communities: A Guide to the Development of Healthy, Sustainable Communities*.

## 4 ADVANCEMENT IN SUSTAINABLE COMMUNITY PLANNING

The creation of a healthy, sustainable community goes beyond the design of the built environment. It requires strategic community plans and complementary programs for the long-term management of a community's infrastructure.<sup>20</sup> This section explores how Canada is transferring the experience and knowledge of integrated design and energy efficiency in the built environment to addressing sustainable development at the community level through holistic and system based approaches.

### 4.1 CONNECTING LAND-USE PRACTICES TO SUSTAINABLE DEVELOPMENT

In Canada, sustainable community planning is an emerging process that encourages neighbourhood design and land use planning approaches that reduce environmental impacts and costs while maintaining community liveability. Across Canada, communities have used innovative land use planning techniques, such as smart growth and new urbanism, to reduce urban sprawl, traffic congestion, disconnected neighbourhoods and urban decay. These schools of urban thought have generally addressed issues related to emissions related to travel and have focused on creating communities that support public transportation, capitalize on the use of existing infrastructure, encourage a healthier and more balanced lifestyle in terms of walking, air quality and activities, and support the life cycle by offering a range of housing.

Today, long-term planning for municipal growth and economic vitality is taking an approach that looks beyond traditional areas of concern. For municipalities, planning for population growth no longer just includes potential increases in revenue from property taxes or the requirement to adjust development charges to cover investments in new infrastructure. It also requires an understanding of how a community can plan to reduce GHGs and energy use, improve the operating performance of a building, effectively turn community "wastes" (biomass, sewer heat or landfill gas) into energy assets and reduce the reliance on fresh water using a comprehensive and integrated planning process.

Applying an integrated planning approach to develop communities has resulted in the launch of several planning guidelines for achieving sustainable development at the community level and are reviewed below.

#### *Integrated Community Sustainability Planning (ICSP)*

In 2005, the federal government created the "New Deal for Cities and Communities," a program to aid municipalities in achieving real, measurable

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<sup>20</sup> Canada Mortgage and Housing Corporation. 1997. Changing Values, Changing Communities. A Guide to the Development of Healthy, Sustainable Communities.

progress towards sustainability. This deal provides gas tax revenue to fund community sustainability infrastructure projects that reduce GHG emissions and promote cleaner water and air. A portion of this gas tax is available for communities to develop Integrated Community Sustainability Plans (ICSP).<sup>21</sup> ICSPs are holistic and system-based and involve integrating land use planning with urban design and infrastructure planning. In the provinces of British Columbia and Ontario, municipalities are required to prepare or demonstrate how existing community planning meets the requirement of an ICSP in order to receive gas tax funding. Other provinces, such as Alberta, have developed comprehensive guidelines for communities to develop sustainable community plans.

Common to all ICSPs is the emphases placed on taking a systems approach that involves inventorying the resources of a community (capital projects, social, health and cultural services, environmental issues etc.) and engaging the community to rate and prioritize key actions in terms of sustainability initiatives. For most ICSPs, the Melbourne Principles<sup>22</sup> of sustainable community development serve to guide infrastructure and planning considerations or CMHC's sustainable community indicators are referenced to guide the development of an ICSP.<sup>23</sup>

### *Community Energy Plans*

In Canada, Community Energy Planning (CEP) has been formalized at the federal level through NRCan and organizations, such as the Community Energy Association of British Columbia, which developed comprehensive toolkits and guidelines for municipalities to follow.<sup>24</sup> CEPs are premised on the principles that a community should be designed to reduce energy needs first and that money spent on energy is money not being invested within the community. Central to the success of CEPs, is the integration of renewable and local energy sources as a means of reducing the dependence on fossil fuels and engaging the community to manage its own energy use and delivery more effectively.<sup>25</sup>

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<sup>21</sup> Ministry of Community Services. British Columbia. 2007. The Integrated Sustainability Initiative. Available On-line:

[http://www.cserv.gov.bc.ca/LGD/intergov\\_relations/library/ICSP\\_Backgrounder.pdf](http://www.cserv.gov.bc.ca/LGD/intergov_relations/library/ICSP_Backgrounder.pdf).

<sup>22</sup> The Melbourne Principles for Sustainable Cities were developed in Melbourne (Australia) by the United Nations Environment Programme and the International Council for Local Environmental Initiatives. The Melbourne Principles consist of ten short statements on how cities can become more sustainable.

<sup>23</sup> Canada Mortgage and Housing Corporation. 2008. Would You Know One if You Saw One? Retrieved April 7, 2008. Available On-line: <http://www.cmhc-schl.gc.ca/en/inpr/su/sucopl/wykoisyso/index.cfm>. The Canada Mortgage and Housing Corporation (CMHC) developed the following 12 elements as indicators of a successful sustainable community: incorporates ecological protection, high density planning, urban infill, neighbourhood centres, encourages development of local economy, availability of alternative transportation methods, affordable housing, elements of a liveable community, alternative approaches to sewage and storm-water management, water efficiency, energy efficiency and encouraging reduction, and re-use and recycling.

<sup>24</sup> Natural Resources Canada. 2007. CANMET Energy Technology Centre Natural Resources Canada Community Energy Planning.

<sup>25</sup> Community Energy Association. 2006. A Toolkit for Community Energy Planning in British Columbia.

Applying CEPs using an integrated approach is providing communities with an entirely different way of examining how to achieve energy needs by assessing opportunities to lower energy use, improve energy efficiency and operating performance of a building, and to reduce the reliance on single automobile trips. Across Canada, nearly 20 communities have developed CEPs and municipalities such as the City of Calgary in Alberta, are integrating energy decision making into the official planning processes by developing energy land use maps to help improve the energy performance of the built environment.

### *LEED-Neighbourhood Development*

LEED for Neighbourhood Development (LEED-ND) is a new rating system within the family of LEED® categories, currently being piloted in North America through the USGBC.<sup>26</sup> LEED-ND integrates the concepts of smart growth, new urbanism and green building principles to encourage sustainable land use planning at the neighbourhood level.<sup>27</sup> This includes rating elements such as proximity to existing infrastructure, brownfield remediation and reduction of automobile dependency. LEED-ND seeks to benefit communities by reducing urban sprawl, encouraging healthy living, protecting threatened species, increasing transportation choice and decreasing automobile dependence.<sup>28</sup>

The application of LEED-ND aligns available technologies for green building with community planning and increases public participation as well as awareness. Currently, there are 23 pilot locations across Canada that are implementing draft Canadian standards for LEED-ND to assess the experience and issues through practical application. It is expected that the LEED-ND for Canada will be launched in 2009-2010. Unlike the CaGBC's other rating systems, LEED-NC, which is applied to commercial, high-rise residential and institutional buildings, it is expected that LEED-ND will result in a more rigorous and beneficial process for evaluating sustainability as a result of some municipalities or Canadian Crown Corporations requiring developers to obtain LEED® certification for neighbourhoods.<sup>29</sup>

### *Vancouver EcoDensity*

EcoDensity is a concept currently being discussed with the City of Vancouver community in an effort to reduce the City's ecological footprint without disrupting the character or altering the scale of the City's neighbourhoods.

EcoDensity or ecological density, recognizes that high quality and strategically located built density can reduce a city's ecological footprint and make it more sustainable, liveable and affordable and can allow the components of a sustainable

<sup>26</sup> The Olympic and Paralympic Village Whistler in BC (being developed by the Resort Municipality of Whistler) and the Olympic and Paralympic Village Vancouver in southeast False Creek (being developed by the City of Vancouver) are serving as pilot projects to test the new LEED for Neighbourhood Development Rating System with the Canada Green Building Council.

<sup>27</sup> United States Green Building Council. 2008. LEED for Neighbourhood Development. Available On-line: <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=148>.

<sup>28</sup> Ibid.

<sup>29</sup> Dan Leeming & Diane Riley. 2008. *Sustainable Communities: Part 2 LEED ND: From the Margins to the Mainstream*. *The Ontario Planning Journal*. (Vol. 23, No. 4)

community to fall into place, such as accessible transit, alternative transportation and walkability, resource sharing and reduced impact of the built form on the environment.<sup>30</sup> For EcoDensity to work, the right infrastructure (or EcoStructure) comprised of transportation, community amenities and green systems must be in place to support environmentally friendly, higher density living.<sup>31</sup>

The Vancouver EcoDensity strategy explores increasing density in a variety of contexts across the City including low-density areas, along transit routes and nodes, and in neighbourhood centres. While the concept of EcoDensity has been embraced by a broad range of stakeholders, it has also raised concerns from having to heavily rely on the private sector to meet sustainable building within the existing core and for not demonstrating how increased density in the downtown core could slow or limit continued sprawl in Vancouver's suburbs.<sup>32</sup> As of June 2008, the Vancouver EcoDensity Charter was passed and will lead to changes in City policies, bylaws, incentives and zoning to reduce barriers and promote the development of communities across the City that are sustainable, liveable and affordable.

### *Sustainable Urban Neighbourhood (SUN)*

The Sustainable Urban Neighbourhood (SUN) is a process developed by NRCan's CANMET Energy Technology Centre to advance neighbourhood-scale sustainability.<sup>33</sup> SUN is intended to assist communities by demonstrating that demand-side approaches to municipal services and infrastructures result in smaller scale processes and lower costs than current development patterns. Specifically, SUN helps communities facilitate a clearer understanding of how to incorporate sustainability into the planning, design and implementation of urban neighbourhood developments.<sup>34</sup>

SUN is currently being piloted in Strathcona County, Alberta. The County is partnering with the Emerald Hills Urban Village (EHUV) planning project and using the SUN process to incorporate sustainability at the planning, design and implementation phase.<sup>35</sup> During the design charrette process for EHUV, the Natural Step's sustainability principles were incorporated into the design and

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<sup>30</sup> City of Vancouver. 2007. EcoDensity: An Introduction to Building Communities that are Green, Liveable and Affordable in Vancouver.

<sup>31</sup> City of Vancouver. 2007. EcoDensity: What is it All About? Available On-line: <http://www.vancouver-ecodensity.ca/content.php?id=19>.

<sup>32</sup> CBC News. November 14, 2006. *Ecodensity plan could change Vancouver neighbourhoods*. Available On-line: <http://www.cbc.ca/canada/british-columbia/story/2006/11/14/bc-ecodensity.html>.

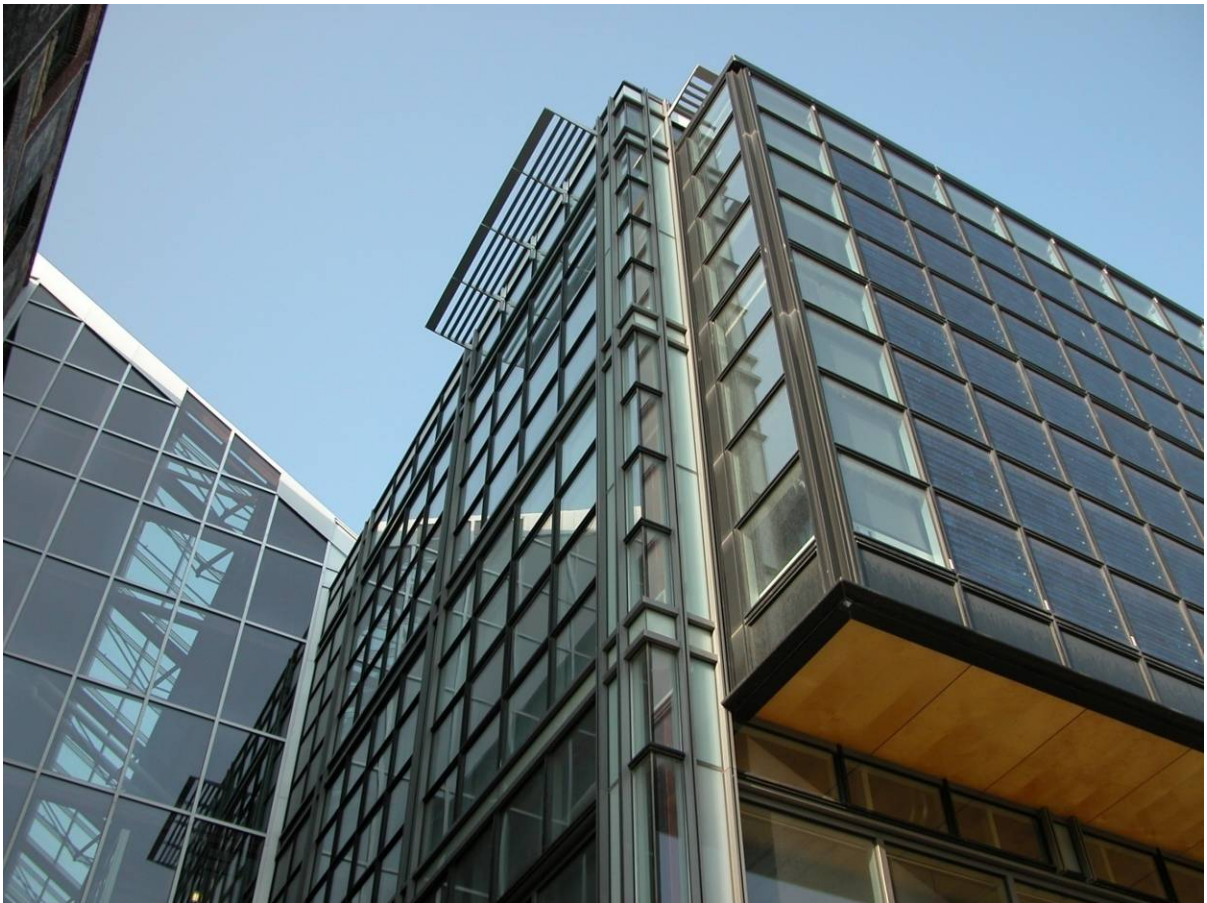
<sup>33</sup> Kellett, R et al. 2008. Decision Support Tools in a Sustainable Urban Neighbourhood (SUN) Pilot Project. Available On-line: <http://webpub3.strathcona.ab.ca>.

<sup>34</sup> Ibid

<sup>35</sup> Federation of Canadian Municipalities. August 31, 2007. Strathcona County and Christenson Developments Ltd receive \$839,000 to pilot test the Sustainable Urban Neighbourhood (SUN) Process at Emerald Hills Urban Village. Available On-line: <http://www.newswire.ca/en/releases/archive/August2007/31/c4442.html?view=print>.



implementation emphasize the importance of community engagement to the design of the community.<sup>36</sup>



Red River College, Princess Street Campus (Winnipeg, Manitoba)

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<sup>36</sup> Design Centre for Sustainability at the University of British Columbia. December 2006. Emerald Hills Urban Village Sharrette Brief. Available On-line: <http://webpub3.strathcona.ab.ca>.

## 5 STATUS OF WHOLE BUILDING RATING SYSTEMS

### LEED In Industry



The first LEED Canada certified industrial building was the OMRON manufacturing facility in Oakville, Ontario. The facility which sits on a 4.5 acre site provided a significant reduction in resource consumption and environmental impacts.

Source:  
<http://www.coopercon.com/news/cooper-omron-leed.html>

There are many different voluntary standards and rating systems that exist for buildings and energy using equipment in Canada. Standards generally set a specific single target for efficiency, while building assessment and rating systems provide a broader approach to evaluate the environmental impact of construction and building operation. Whole building rating systems (WBRS) can serve as both a guideline and as a certification for sustainable building requirements. WBRS are generally delivered by a reputable third-party provider who can undertake to offer a developer, owner or operator with an independent verification of the sustainable approach and features used in a building.<sup>37</sup> This section reviews five WBRS for commercial/institutional, and high-rise residential buildings, and low-residential buildings that are in use across Canada. An overview of the programs is provided in Table 2.

**TABLE 2 WHOLE BUILDING RATING SYSTEMS**

Whole Building Rating Systems	Certification Process	Rating Levels
Leader in Energy & Environmental Design (LEED)	LEED Canada for new construction and major renovations contains prerequisites and credits in five categories: sustainable sites, water efficiency, energy and atmosphere, material and resources and indoor environmental quality and innovation and design. Points are earned, out of 70, to fulfilling each credit.	LEED Platinum 52-70 LEED Gold 39-51 LEED Silver 33 – 38 LEED Certified 26-32
Green Globes	Green Globes identifies building environmental strengths and weaknesses in seven areas: project management, site, energy, water, resources, emissions and effluents, and indoor environment.	Properties receiving a score above 35 percent receive certification of one to four Globes.
BOMA Go Green	BOMA GO Green improves environmental performance in 10 areas: energy use, water use, construction waste, recycling, hazardous waste, material selection, ozone depletion, indoor air quality, HVAC maintenance and tenant awareness.	Properties meeting all requirements receive Go Green Certification.
Built Green™	Built Green™ evaluates the following sustainable features: energy efficiency, indoor air quality, resource use(including waste management) and overall environmental impact. Total point score is out of 120 and all building are rated using the EnerGuide for houses program.	Platinum 120 points Gold 77 points Silver 75 points Bronze 72 points
ENERGY STAR®	Improve energy efficiency in homes in the area of heating and cooling systems, ducts, windows, walls, ceilings and ventilation.	Homes built to 30 percent builder then provincial code.

<sup>37</sup> Lighthouse Sustainable Building Centre. 2008. "Rating Systems" Available On-line: [http://www.sustainablebuildingcentre.com/energy/rating\\_systems](http://www.sustainablebuildingcentre.com/energy/rating_systems).



### Integrated Learning Centre



The Integrated Learning Centre in Kingston, Ontario is Green Globes certified due to its energy efficiency systems, water conservation, proximity to public transportation, healthy indoor environments and use of recycled materials.

Source:

[http://www.thegbi.org/assets/case\\_study/integrated\\_learning\\_centre.pdf](http://www.thegbi.org/assets/case_study/integrated_learning_centre.pdf)

### LEED Canada Green Building Rating System

The LEED® Canada Green Building Rating System is operated by the CaGBC, a national not-for-profit corporation with the license to administer and implement the LEED Building Rating System in Canada. The LEED® Canada Building Rating System is a comprehensive system that derives from nationally acknowledged codes and environmentally sensitive practices. As an open and transparent process, LEED® evolved from one standard for new construction to a comprehensive system of six interrelated standards covering all aspects of the development and construction process. The six major areas include: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design process.<sup>38</sup>

The current rating system is LEED® Canada-NC 1.0 Green Building Rating System for New Construction and Major Renovations and is adapted from the USGBC LEED-NC 2.1, but tailored specifically for Canadian climates, construction practices and regulation. A rapidly growing number of governments and private sector organizations are adopting LEED® certification in their policies, programming and operations as a means of achieving and demonstrating sustainability (see Table 3).

**TABLE 3 APPLICATION OF LEED ACROSS CANADA**

Number of LEED Registered Buildings (since 2002)	Number of LEED Certified Buildings (since 2002)	Number of LEED Accredited Professionals
800	100	2000+ Avg; Growth 10 percent/ month

Source: Canada Green Building Council. 2008. Registered Listing.

In response to market demand, the CaGBC is updating the LEED® Canada Green Building Rating System to address existing as well as new buildings, including all building types, and streamlining the application process to lower costs and minimize the amount of time required for certification. The next generation of LEED® is expected to be web-based, and incorporate actual performance-based energy and water efficiency credits.<sup>39</sup>

### Green Globes (ECD Energy and Environment Canada)

Green Globes is based on the long-standing building evaluation system – Building Research Establishment Environmental Assessment Method (BREEAM) developed and used extensively in the United Kingdom. ECD Energy and Environment Canada Ltd adopted the program and used it as the basis for a Canadian assessment method called BREEAM Green Leaf. BREEAM Green Leaf was initially created to allow building owners and managers to self-assess the performance of their existing

<sup>38</sup> Canada Green Building Council. 2004. LEED Green Building Rating System, Version 1.0. Available On-line: <http://www.cagbc.org>.

<sup>39</sup> Canada Green Building Council. 2004. LEED Green Building Rating System, Version 1.0. Available On-line: [http://www.cagbc.org/uploads/FINAL\\_LEED%20CANADA-NC%201.0\\_Green%20Building%20Rating%20System.pdf](http://www.cagbc.org/uploads/FINAL_LEED%20CANADA-NC%201.0_Green%20Building%20Rating%20System.pdf).

### First Built Green Community



The Township of Langley, British Columbia developed the first official Built Green community in 2006, the Yorkson Willoughby Neighbourhood. The 55 lots in Yorkson Village received the Built Green Gold level certification. The Neighbourhood Community Plan included storm-water management and siltation control, aquifer recharge and conservation, fish habitat creation, and a comprehensive program to control erosion and sediment concerns during construction.

Source:  
[http://www.tol.bc.ca/files/web\\_images/planning/news/yorkson\\_plan\\_small\\_may\\_2007.gif](http://www.tol.bc.ca/files/web_images/planning/news/yorkson_plan_small_may_2007.gif)

### The Royal Bank Building in Winnipeg

The Royal Bank Building in Winnipeg has been certified with the Go Green Plus (Best Practices) award. Operational improvements to the building including a lighting retrofit and reduced water have resulted in annual cost savings ranging from \$75 to \$83,000 CAD.

Source:  
<http://www.greenglobes.com/casestudies-royalbank.asp>

buildings. ECD then moved to develop a more holistic evaluation system, Green Globes, as a web-based application of Green Leaf.

Green Globes was launched in Canada in 2002 with the support of federal and provincial ministries and public utilities. Green Globes is an online building audit for assessing and rating new and existing buildings against best practices, standards and principles of sustainable architecture. This rating tool maximizes environmental performance in energy and water efficiency, resource conservation, waste reduction, and health and productivity. It is being used by the Building Owners and Management Association (BOMA) Canada as a national environmental recognition and certification program for existing commercial buildings called the BOMA “Go Green” (Plus) program.

### *BOMA Go Green– (Building Owners and Managers Association)*

BOMA Canada's Go Green program is a national environmental recognition and certification program for existing commercial buildings that address five areas including resource consumption, waste reduction and recycling, building materials, interior environment, and tenant awareness.<sup>40</sup> The BOMA Go Green Plus is a more in-depth on-line tool launched in 2005 that uses a “best practices” model and benchmarking assessment criteria for sustainable building.<sup>41</sup> The BOMA Go Green Plus program incorporates the Green Globes rating and assessment program and involves matching the five major requirements of Go Green and proceeds to provide more detail. The program is specifically designed to aid building owners in reducing their energy consumption, operating costs and improving waste management and benchmark against the best industry operation and management practices. In addition, it is an important educational tool designed to encourage sustainable best practices throughout the building industry. Currently there are over 500 certified Go Green Plus buildings across Canada (see Table 4).

PWGSC has adopted the Go Green Plus program as the official national environment program for existing Federal Government buildings. Currently there are 317 certified government buildings included in the program.<sup>42</sup>

### *Built Green™ (Built Green Society of Canada)*

Built Green™ is an industry driven voluntary program that promotes sustainable building practices for low-rise residential development to reduce the impact that buildings have on the environment.<sup>43</sup> Built Green™ was launched in 2002 and is owned and managed by the Built Green Society of Canada (BGSC). It is currently available in Alberta and British Columbia. The main purpose of the program is to encourage homebuilders to use construction practices and products that represent resource-efficient and environmentally friendly construction. The program

<sup>40</sup> BOMA Canada Go Green. 2007. Available On-line: <http://www.bomagogreen.com/gg.html>

<sup>41</sup> Ibid

<sup>42</sup> Public Works and Government Services Canada (PWGSC). 2008. BOMA Go Green Plus. Available On-line: [http://www.bomagogreen.com/news/20060320\\_RENX\\_BGGOneYear.pdf](http://www.bomagogreen.com/news/20060320_RENX_BGGOneYear.pdf).

<sup>43</sup> Natural Resources Canada. 2008. “Built Green” Available On-line: <http://www.builtgreencanada.ca/content.php?id=260>.

concentrates on four areas of environmental concern such as energy efficiency, indoor air quality, resource use including waste management, and overall environmental impact.

In its inception, Built Green™ only offered certification for new single-family homes and row homes. In 2005, due to industry interest, BGSC established Built Green™ standards for multi-storey and residential towers, communities and renovations.

**TABLE 4 BOMA COMPLETED PROJECTS**

Province	Go Green	Go Green Plus
British Columbia	98	4
Alberta	67	14
Saskatchewan	3	3
Manitoba	13	1
Ontario	61	81
Quebec	146	28
Atlantic Provinces	4	4

Source: Julie Scarcella. 2008. Envisioning Green Building Manufacturing Centre.

### *ENERGY STAR® for New Homes*

NRCan and the Province of Ontario introduced an energy efficiency pilot project, Energy Star for New Homes, that built on the success of various energy labeling programs, specifically ENERGY STAR®, an internationally recognized rating system, and EnerGuide, a rating system developed by NRCan in 2005. The program has now expanded to include the province of Saskatchewan. In Ontario, ENERGY STAR® is managed by the EnerQuality Corporation. New homes built to the ENERGY STAR® standard are expected to be 40 percent more energy efficient than homes built to minimum building code standards.

ENERGY STAR® is linked to the EnerGuide program. EnerGuide provides no standards or certification levels; it is strictly a rating of a home's energy use. The rating scale is from 1 to 100, with an average home having an EnerGuide rating of 58-68, while new homes range from 71-76. To be ENERGY STAR® certified a home must score a 78 on the EnerGuide for new houses scale. Starting in 2011, all homes constructed in Ontario will be required to meet EnerGuide 80 or better. Homes built in Saskatchewan with ENERGY STAR® usually achieve a rating of 80. Across Canada, the development community has committed to-date building over 5000 homes to ENERGY STAR® levels.

## 6 THE POLICY CONTEXT FOR SUSTAINABLE BUILDING AND CONSTRUCTION IN CANADA

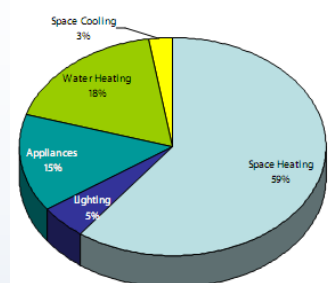
Numerous government policies, programs, standards and financial incentives have been established at the federal, provincial and municipal levels to implement sustainable building practices. A list of national and provincial policies and development targets (programs, regulations, incentives etc.) is provided in Appendix A. This section reviews select programs and policies for sustainable building and construction at the federal level, at the provincial level for the provinces of Ontario and British Columbia, as well as several municipalities across Canada.

### 6.1 FEDERAL LEVEL

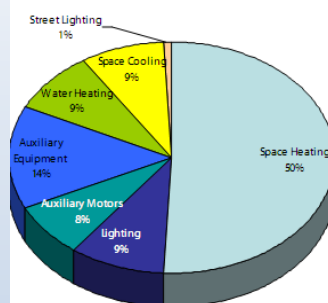
For over four decades, the sustainable building movement has moved forward with the introduction of new policies and regulations at the federal level in response to energy and climate change challenges. Recently, the federal government of Canada replaced several well known programs, including the Commercial Building Improvement Program (CBIP) and the Energy Innovators Initiative (EII). There is general agreement within the development and sustainable building community that the removal of these programs will have an impact on the speed of uptake and mainstreaming of sustainable building in development practices in communities across Canada.<sup>44</sup>

This section reviews some of the more widely referenced federal initiatives related to the building code, financial incentives and regulations for sustainable building. Table 5 provides a more detailed overview of each federal initiative discussed.

**Annual Energy Use in Canadian Residential, Institutional and Commercial Buildings**



**Residential Energy Use**



**Institutional and Commercial Energy Use**

Source: Brent Gilmour. (2008). The New District Energy: Building Blocks for Sustainable Community Development. Available On-line: [www.cdea.ca/resources](http://www.cdea.ca/resources)

<sup>44</sup> A number of well known federal programs initiated by Natural Resources Canada (NRCan) that placed emphasis on encouraging the development community to concentrate on the preliminary stages of building development (integrated and whole building design using life cycle analysis) by integrating design processes with economic incentives to improve the energy efficiency and operation, such as the Commercial Building Improvement Program, Industrial Building Improvement Program and Energy Innovators Initiative were all cancelled in 2007.

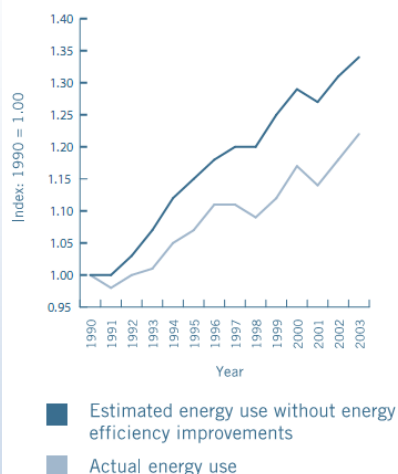
TABLE 5 FEDERAL SUSTAINABLE BUILDING INITIATIVES

Program/Policy	Recipient	Scope and Objective	Technology	Results (Fiscal/Energy)	Sustainable Building Encouragement
<b>The National Building Code of Canada (NBC), 1995 and 2005</b>	All	The Building Code details the minimum provisions and standards acceptable in maintaining the safety of buildings, with regards to public health, fire protection, accessibility and structural sufficiency.	N/A	The National Building Code forms the basis for all of the provincial building codes, with the exception of Ontario.	The NBC is used as a model for virtually all regulations in Canada and applies to the construction, renovation or altering of buildings to remove an unacceptable hazard.
<b>Model National Energy Code of Canada for Buildings (MNECB)</b>	Commercial/ Residential	The MNECB is a model in which energy-conscious building designers, developers, and contractors across Canada can base cost-effective, energy-efficient building designs. This model of energy codes can be adopted (or adapted) by any province or territory, similar to the National Building Code (NBC).	Used in conjunction with the NBC, the MNECB references Canadian standards and regulations, and includes only enforceable requirements.	Only the Province of Ontario has adopted the MNECB. Most other provinces have modified the NBC code for their own purposes.	The MNECB is a benchmark for building evaluation systems, such as LEED, CBIP, C-2000, GB-Tool and Green Globes. It has encouraged conformity between building codes and standards in provinces and territories across the country.
<b>Public Works and Government Services Canada (PWGSC)</b>	Government Commercial Buildings	PWGSC requires that new federal buildings and retrofitting of existing offices adhere to LEED certification and Green Globe standards.	PWGSC has made substantial commitments towards the development and adoption of new assessment tools and standards, such as LEED and Green Globe, in an effort to improve sustainable practices in the federal building industry.	The new targets outlined in the PWGSC's Sustainable Development Strategy-2007-2009 report include: minimizing energy building consumption and air emissions, reducing water consumption and waste water generation, and reducing use of hazardous materials in building construction.	The Government of Canada's commitment to sustainable development continues to drive its efforts in greening government operations. Such greening efforts offer an opportunity to help protect and conserve the environment, and in general contribute to the economy.

<b>EcoAction -Natural Resources Canada</b>	Commercial Residential Industrial	The EcoAction program label works towards improving energy conservation in every sector of the Canadian economy.	Alternative sources of energy such as solar panels, heating systems, etc.	Under EcoAction there is a new action plan called “Turning the Corner,” which sets targets on industries to reduce their greenhouse gas emissions and air pollutants in half by 2015. The program also strengthens the energy efficiency standards for a number of energy-using products.	This action plan encourages companies to invest in green technologies that produce real benefits for the environment while at the same time balance the need for economic growth.
<b>CMHC-NetZero Program</b>	Residential	The Canadian Mortgage and Housing Corporation (CMHC) has developed their own Equilibrium program and within it NetZero practices for residential buildings. This program attempts to address and reduce the intensity of energy consumption that exists in Canada’s housing sector.	Passive solar energy, solar domestic hot water, solar electricity (photovoltaics), and GeoExchange technologies.	A net-zero energy home is capable of producing an annual output of renewable energy that is equal to the total amount of its annual purchased energy.	The program encourages all new home construction to meet a net-zero energy home standard by 2030.
<b>Sustainable Development Technology Canada (SDTC)</b>	Industry Academia NGOs Financial community All levels of government	Sustainable Development Technology Canada (SDTC) is a not-for-profit foundation that finances and supports the development and demonstration of clean technologies to provide solutions to issues of climate change and sustainable development.	SDTC’s mission is to act as the primary catalyst in building a sustainable development technology infrastructure in Canada.	The \$550 million SD Tech Fund supports projects that address climate change air quality, clean water and clean soil. The \$500 million NextGen Biofuels Fund supports the establishment of first-of-kind large demonstration-scale facilities for the production of next-generation renewable fuels.	SDTC helps build the capacity for innovation and success in Canada’s clean-technology entrepreneurs by encouraging innovation and collaboration among private, academic and public sector partners, and to ensure the dispersion of clean technologies in relevant market sectors throughout Canada.

### Energy Reductions across Canada from Energy Efficiency Initiatives

Impact of Energy Efficiency Improvements on Energy Use, 1990 to 2003



Source: Office of Energy Efficiency: The State of Energy Efficiency in Canada. 2006. Available at: <http://oee.nrcan.gc.ca/Publications/statistics/see06/pdf/see06.pdf>

### Model National Energy Code of Canada for Buildings (MNECB)

Introduced in 1997 by the National Research Council of Canada (NRC), the Model National Energy Code of Canada for Buildings (MNECB) introduced minimum standards for energy efficiency for buildings across Canada.<sup>45</sup> Maximum thermal transmittance levels as well as identifying new standards for heating recovery and referenced new energy efficient equipment standards are outlined within the Code.<sup>46</sup> The MNECB also addresses issues related to energy for the retrofit of older buildings. The MNECB has encouraged conformity between various building codes and standards in provinces and territories across Canada. However, as a model code, it has no legal status until it is adopted by a jurisdiction that regulates construction.<sup>47</sup>

Only the City of Vancouver and the Province of Ontario have adopted the MNECB as part of their building codes. The reluctance by provinces and municipalities to adopt the MNECB is, in part, related to the building community's disinclination to introduce new or expend existing standards unless there is some strong consensus on a minimum level of action, as well as the influence of low energy prices.

After much consideration and consultation between provinces, territories, developers and other stakeholders, the Canadian Commission of Building and Fire Codes (CCBFC) is moving forward to update the MNECB that will improve energy efficiency standards for commercial and institutional buildings. The updated version of the MNECB is expected to be released in 2011.<sup>48</sup> A significant change expected with the MNECB is the replacement of general performance targets with specific "gigajoule" energy intensity targets for sustainable development.<sup>49</sup>

### Public Works and Government Services Canada (PWGSC)

PWGSC, which is responsible for the development, construction and renovation of federal buildings across Canada, has taken the lead on encouraging sustainable building. In the 2007-2009 Sustainable Development Strategy for the PWGSC, specific commitments were made towards the development and adoption of new assessment tools and standards in an effort to improve sustainable practices in the

<sup>45</sup> National Resources Canada, Office of Energy Efficiency. 1999. Introduction to the Model National Energy Code for Buildings.

<sup>46</sup> Ibid.

<sup>47</sup> Released during the same year as the MNECB, the Model National Energy Code of Canada for Homes (MNECH) provided similar cost-effective energy efficiency standards for low-rise residential housing. Standards that focus upon building materials, heating components and energy efficiency in windows/heat recovery are outlined within the regulatory document. To date, no province or territory has adopted the MNECH directly, but some provinces have referenced specific aspects of the code in their own building documents.

<sup>48</sup> National Research Council. 2007. "Call for Nominations: Updating of 1997 MNECB."

National Research Council. Available On-line:

[http://www.nationalcodes.ca/mnebc/call\\_for\\_nominations\\_e.shtml](http://www.nationalcodes.ca/mnebc/call_for_nominations_e.shtml)

<sup>49</sup> Michel Lamanque, National Resources Canada. 2008. Expert Interviewee.



building industry.<sup>50</sup> Examples include the requirement to have buildings designed and rated to LEED® standards or have government offices located in buildings that have or exceeded the BOMA Go Green standards. Table 6 provides some examples of the targets set for all federally owned buildings across Canada.

**TABLE 6 PWGSC SUSTAINABLE DEVELOPMENT STRATEGY 2007-2009**<sup>51</sup>

Target Year	Target Description for Sustainable Crown Buildings
2010	Reduce energy consumption levels by 8% from 2001 – 2002
2010	Reduce air emission levels by 11% from 2001 – 2002
2012	Reduce the use of hazardous materials in operations and maintenance within Crown owned buildings by 25% through the application of PWGSC National Hazardous Materials Reduction Strategy and Guidelines

### *Natural Resources Canada – EcoAction*

Natural Resources Canada (NRCan) has launched a number of programs directed at the public and private (commercial, industrial and residential) sectors to reduce energy consumption and improve energy performance of the built environment across Canada. In 2007, several existing programs were replaced with the EcoAction initiative. The EcoAction program along with its sub-programs, the EcoEnergy Efficiency Program and the EcoEnergy Renewable Initiative, are directed at improving energy conservation in every sector of the Canadian economy through professional workshops, free publications, energy efficiency advertisements, and incentive based initiatives in the form of grants and tax rebates to assist residential and commercial owners in the installation of new energy efficient equipment/components in buildings (solar panels, heating systems etc.).<sup>52</sup> The EcoEnergy Efficiency program works to encourage Canadians to retrofit existing residential, commercial and industrial buildings to improve energy performance.<sup>53</sup>

The EcoEnergy Renewable Initiative incorporates two sub-initiatives. The first initiative provides new opportunities for renewable electricity generation, while the second initiative addresses the development of new techniques/technologies to heat homes.<sup>54</sup>

<sup>50</sup> Public Works and Government Services Canada. 2008. "Sustainable Development Strategy 2007-2009: 2.0 PWGSC Overview and Opportunities." Available On-line: <http://tpsgc-pwgsc.gc.ca/sd-env/sds2007/strategy/sdd-sds2007-ch2-e.html>.

<sup>51</sup> Public Works and Government Services Canada. 2008. Sustainable Development Strategy 2007-2009: 3.0 Sustainable Development Targets. Public Works and Government Services Canada. Available On-line: <http://tpsgc-pwgsc.gc.ca>.

<sup>52</sup> Government of Canada, National Resources Canada. 2008. EcoAction: Using Less –Living Better. Available On-line: <http://www.ecoaction.gc.ca/index-eng.cfm>.

<sup>53</sup> Government of Canada, National Resources Canada. 2008. EcoEnergy Efficiency Program. Available On-line: <http://www.nrcan.gc.ca>.

<sup>54</sup> Government of Canada, National Resources Canada. 2008. EcoEnergy Renewable Initiative. Available On-line: <http://www.nrcan.gc.ca>.



In addition to the new EcoAction based action plan, funding is available through the EcoAction Community Funding Program for projects that address priority issues of clean air and climate change.<sup>55</sup> The funding program is designed to provide further financial support and allow provinces and territories across Canada to develop technology, energy efficiency initiatives and other environmentally friendly projects that provide real results.

### *Canada Mortgage and Housing Program –NetZero (EQuilibrium) Program*

The term “NetZero” means applying a series of measures that eventually result in a zero-net consumption of energy on an annual basis for heating and electricity use in a home.<sup>56</sup> Applied elsewhere in both the United States and the United Kingdom, the CMHC has developed their own program, EQuilibrium™, which incorporates NetZero practices for residential building. The EQuilibrium™ program encourages home-builders to reduce the consumption of resources such as land, construction materials (i.e. virgin wood), and water among many others. Currently, 12 pilot projects are underway with various homebuilders across Canada. The EQuilibrium™ program encourages the public and private sectors to work together to build energy efficient homes that provide comfortable living and that produce as much power as they consume on a yearly basis.

### *Sustainable Development Technology Canada (SDTC)*

Sustainable Development Technology Canada (SDTC) was established by the federal government in 2001 and operates as a not-for-profit foundation that finances and supports the development and demonstration of clean technologies. SDTC has been working with the public and private sectors including industry, academia, non-government organizations (NGOs), the financial community and all levels of government to achieve its mission to build a sustainable development technology infrastructure in Canada. The Government of Canada has committed over \$1 billion CDN to SDTC.

Among the activities of SDTC is the advancement of the current state of sustainable development and future investment priorities in Canada. SDTC has developed a comprehensive evaluation and decision-support process that reviews technologies, their market, the needs they address and the barriers to overcome in order to achieve market success. Recently, the SDTC launched a series of SD Business Cases™ that used the Sustainable Technology Assessment Roadmap (STAR™), an analytical tool that combines data, reports, stakeholder input and industry intelligence to identify the most likely areas of investment potential, for seven of Canada’s primary economic sectors including energy utilization for industrial, commercial eco-efficiency and residential buildings.

<sup>55</sup> Environment Canada. 2003. EcoAction A Community Funding Program. Available On-line: [http://www.ec.gc.ca/ecoaction/what\\_is\\_e.html](http://www.ec.gc.ca/ecoaction/what_is_e.html).

<sup>56</sup> Canadian Housing and Mortgage and Housing Corporation. 2005. “Minister Announces Funding for Sustainable Building. CMHC-SCHL. Available On-line: <http://www.cmhc-schl.gc.ca>.

### Provincial Energy Efficiency Targets

- PEI set a target to reduce peak electricity demand by 5% below its 2004 levels.
- Quebec set a 8 terawatt-hours efficiency by 2015 target.
- Ontario set a 6300 MW reduction target in peak energy by 2025.
- Manitoba set a reduction target in electricity of 842 MW by 2025.
- British Columbia has set a target to acquire 50% of BC Hydro's incremental electricity through conservation by 2020, and that renewable energy generation is to account for 90 percent of total generation.

### Provincial GHG Reduction Targets

- Quebec to meet Kyoto target of 6 percent below 1990 levels by 2012.
- Ontario to achieve 80 percent reduction in GHGs below 1990 levels by 2050.
- Manitoba aims to cut GHGs by 15 percent below 2005 by 2020.
- British Columbia to cut GHGs by 80 percent below 2007 levels by 2050.

Among the first SD Business Cases™ is for eco-efficiency in commercial development. The case has set high industry expectations for improvement in commercial buildings (offices, hospitals, institutions, government etc.) including reductions of 1,093PJ in energy, 1,409BL of water per year and 12.9 Mt of solid waste per year from business as usual trends.<sup>57</sup> To support technologies, programs, policies and regulations to achieve these levels of reduction, the STDC has established the SD Tech Fund, a \$550 million CDN fund. Across Canada, SDTC is helping to create consistent investment indicators to drive the market place towards sustainable building and technology development.

## 6.2 PROVINCIAL LEVEL

Although sustainable development is widely supported by various funding and market related programs at the federal level, it is at the provincial level where standards and regulations are enforced, implemented and put into practice. Under Canada's Constitution, the regulation of building construction is the responsibility of the provincial and territorial governments.

### *Province of Ontario*

In Ontario, the groundswell of interest in energy conservation has led to a comprehensive cross-Ministerial overhaul of major legislation guiding the development of buildings and communities. Table 7 provides a detailed overview of each Ontario initiative discussed.

### *Building Codes and Regulations*

Ontario's new building code (Ontario Regulation 350/06) has led to the introduction of stringent energy-efficient standards that not only increase building performance, but also encourage the use of high-performing building materials for construction purposes, such as insulation, boilers, windows, sealants and assembly process. A central revision to the building code is the incremental raising of standards for different building types, use of renewable energy supplies and the application of different model energy guidelines. Ontario will be among the first provinces to require the application of the MNECB and the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) 90.1.

The changes to the building code balance energy efficiency with affordability and encourage innovation and flexibility within design and construction.<sup>58</sup> More widespread changes are expected to be initiated in 2011 with all new residential homes having to achieve an 80 EnerGuide level.

<sup>57</sup> Sustainable Development Technology Canada. 2007. Technology Assessment, Version 1.

<sup>58</sup> Ministry of Housing and Municipal Affairs. 2006. Energy Efficiency within the 2006 Building Code. Available On-line: <http://www.mah.gov.on.ca/Page681.aspx>.

This change is significant, since the capacity to achieve an 80 EnerGuide levels goes beyond basic “bolt-on” solutions and requires consideration for the whole-building design.<sup>59</sup>

New building requirements have also been established for wind-turbines and considerations are still pending for other alternative energy delivery systems, such as photovoltaic energy systems. Underlying the entire building code revision is a move away from a prescriptive path to a performance-based provision. This change is expected to encourage the uptake of new more efficient products and allow greater innovation in building design.

In addition to the building code improvement, the province has also launched an overhaul of the official planning process to encourage the uptake of more sustainable practices to help communities achieve energy efficiency and meet GHG emission goals. Among the innovative approaches include the use of innovative financing mechanisms that can allow a community to include new building construction related to energy efficient uses of lands, buildings, structures and facilities (e.g. cogeneration, heat pumps, eco-friendly siting of buildings etc.) within the objectives of a Community Improvement Plan.<sup>60</sup> Communities also have the ability to ensure that sustainable design is incorporated into new development, including the capacity to shape the design, layout and servicing of the built environment in order to promote energy conservation and the use of green roofs and solar panels.<sup>61</sup>

### Incentives and Market Change Mechanisms

In Ontario, financial incentives have not had a significant role in assisting the private sector to overcome the cost challenges associated with sustainable development. However, the province has attempted to encourage consumer awareness for energy efficiency through several rebate programs including retail sales tax for efficient appliances and the solar energy systems rebate program.

The retail sales tax is a rebate-based program that encourages consumers purchase energy efficient appliances that in turn results in less energy consumption in the long term.<sup>62</sup> Although this may not be a direct intervention in the sustainable building movement, the energy savings procured by buying and using energy efficient appliances will contribute towards reaching the energy efficient standards as outlined in the new building code.

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<sup>59</sup> Introduced by Natural Resources Canada, EnerGuide encourages consumers to purchase energy efficient equipment by providing them with information on the energy performance of competing products. The program was expanded to encourage the efficient development of homes with trained home builders in energy efficiency. The EnerGuide program for homes is being phased over to the Energy Star™ for New Homes program launched in 2001.

<sup>60</sup> A plan that achieves positive change to the existing physical landscape through municipal drives or incentive based program, including tax breaks, loans etc.

<sup>61</sup> Ministry of Municipal Affairs and Housing. 2005. The Proposed Planning and Conservation Land Statute Law Amendment Act, 2005 Supporting Intensification and Sustainable, Well-Designed Communities. Available On-Line: [www.mah.gov.ca](http://www.mah.gov.ca).

<sup>62</sup> Ministry of Finance, 2008. Retail Sales and Tax Division. Available On-line: <http://www.trd.fin.gov.on.ca>.

TABLE 7 ONTARIO SUSTAINABLE BUILDING INITIATIVES

Program/Policy	Recipient	Scope and Objective	Technology	Results (Fiscal/Energy)	Sustainable Building Encouragement
<b>Building Code 2006</b>	Building Industry	The Ontario Building Code (2006) balances energy efficiency with affordability and encourages innovation and flexibility within all building design and construction.	New technologies include: solar photovoltaic systems, active solar hot water systems, rooftop storm-water retention, and storm/grey water use to enhance “green” building.	Under the Ontario Building Code 2006: In 2007 houses built will be 21% more energy efficient By 2012 all new homes will be 35% more efficient and meet or exceed EnerGuide 80 For non-residential buildings: By 2012 all new commercial buildings will be 25% more energy efficient than under MNECB standards.	The building code strengthens the energy efficiency standards in Ontario’s residential and commercial building code.
<b>Retail Sales Tax Rebate for Efficient Appliances</b>	Consumers, Retailers, Developers, Building Managers	This is a rebate-based program that encourages consumers to purchase energy efficient appliances that result in less energy consumption in the long term.	Energy Star qualified in the EnerGuide Appliance Directory	The Ontario government is making it easier and more cost effective for Ontarians to “go green” by purchasing energy efficient home appliances.	The energy savings procured by buying and using energy efficient appliances will contribute towards reaching energy efficient standards as outlined in the new building code and combating climate change.
<b>The Affordable Housing and Energy Efficiency Program</b>	Residential	The program incorporates energy efficiency measures and practices in the affordable housing units, under the Canada-Ontario Affordable Housing Program. More specifically, it encourages the use of ENERGY STAR products to residents in	Energy Efficient products that meet Energy Star standards.	A financial rebate of up to \$850 per unit, during Phase One, to offset the incremental cost of energy-efficient products and ENERGY STAR qualified products. The program aims to eventually provide funding for 15,000 different	The program encourages a culture of conservation and reduces greenhouse gas emission through the reduction of electrical energy use in residential buildings.

<b>Tax Rebate for Solar Energy Systems</b>	Consumers, Retailers, Developers, Building Managers	affordable housing units. This is a rebate-based program on the purchase of a new solar energy system installed into residential premises, including a multi-residential building, or any expansion or upgrade to an existing solar energy system.	Applies to a solar photovoltaic system that converts solar energy into electricity, or a solar thermal system that converts energy into heat.	housing units. A government target for all generating capacity in the province to come from renewable sources by 5% in 2007 and 10% by 2010.	Not a direct green benefit but the tax rebate encourages energy efficiency and contributes to an overall sustainable building practice in residential low and tall buildings.
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The solar energy system rebate program returns the Retail Sales Tax (RST) paid on solar energy systems to homeowners or builders who install the energy systems in residential or multi-residential premises.<sup>63</sup> Homeowners and developers can also apply for a rebate if they expand or upgrade an existing solar energy system. Programs such as these directly assist in promoting the installation and use of new (renewable) technology.

The province has also partnered with the Ontario Power Authority (OPA) and Natural Resources Canada (NRCan) to deliver the Affordable Housing and Energy Efficiency Program. The program encourages the use of energy efficient products in the construction of new housing built under the Canada-Ontario Affordable Housing Program. The program helps to encourage the use of Energy Star<sup>TM</sup><sup>64</sup> products in new affordable housing developments by providing financial incentives to builders, architects, developers and residents of affordable housing units.<sup>65</sup>

### *British Columbia*

In 2008, the government of British Columbia launched Canada's most comprehensive Climate Action Plan that placed energy efficiency and sustainable building and community planning as the central elements for successfully achieving GHG reductions of 33% by 2020.<sup>66</sup> Table 8 provides a detailed overview of each British Columbia initiative discussed.

### *Building Codes and Regulations*

British Columbia's new Green Building Code was formally adopted in April 2008 to increase energy and water efficiency. The new standards include mandatory water conservation standards (for example ultra low flow toilets-6L and water saving plumbing fixtures) in all new construction and renovations. It is expected that these initial steps will be followed with new considerations for greywater recycling. In terms of energy efficiency, new single/multi-family residential and small commercial/industrial buildings are expected to achieve an EnerGuide rating of 77, while energy efficiency requirements for high-rise multi-family buildings and larger industrial/commercial structures are expected to adhere to the ASHRAE 90.1 2004,

#### **Energy Efficiency Targets for British Columbia**

- Reduce average energy demand per home by 20 percent by 2020.
- Reduce the energy demand at work by nine percent per square meter by 2020.
- Complete energy plans for all B.C. communities.
- Make public sector buildings carbon neutral by 2010.
- Reduce standby losses to one watt for all electronics when turned off.

<sup>63</sup> Ministry of Finance. 2008. Retail Sales and Tax Division. Tax Energy for Solar Energy Systems. Available On-line: [www.trd.fin.gov.on.ca](http://www.trd.fin.gov.on.ca).

<sup>64</sup> The federal government of Canada supports two programs related to improving the efficiency of new products and the development of new homes under ENERGY STAR. For commercial products, the international ENERGY STAR symbol is a simple way for consumers to identify products that are among the most energy-efficient on the market. The ENERGY STAR for New Homes initiative promotes energy efficiency guidelines that enable new homes to be approximately 30 percent more energy efficient than those built to minimum provincial building codes. The increased efficiency of these homes translates into reduced energy costs for homeowners.

<sup>65</sup> Ontario Power Authority. 2007. "The Affordable Housing and Energy Efficiency Initiative." Available On-line: <http://www.powerauthority.on.ca>

<sup>66</sup> For more information on the Climate Change Action plan see [www.livesmartbc.ca](http://www.livesmartbc.ca)

an internationally recognized standard for energy efficiency in buildings standards.<sup>67</sup>

The Green Building Code has an overarching goal to attain targets of 18.5% more energy efficient than those outlined in the MNCEB by enforcing strict sustainable building practices in the planning, design and construction of new homes and commercial buildings in British Columbia.<sup>68</sup> Similar to the Ontario code, the Green Building Code moves away from prescriptive a path to a performance-based provision.

British Columbia has also updated its planning regulations through the Local Government (Green Communities) Statutes Amendment Act, 2008. This amendment encourages and supports the development of more compact communities that reduce energy use, lower the cost of servicing, increase the opportunities to promote walking and cycling and minimize the overall production of GHG emissions. As part of the legislative changes, communities now have the capacity to set GHG emission reduction targets as part of official community planning and use incentives to encourage more sustainable development. Communities are also now expected to development CEPs.

### Incentives and Market Change Mechanisms

As part of the Climate Action Plan initiative, British Columbia has launched several related programs to support sustainable building, including the Energy Efficiency Building Strategy, 100,000 solar roofs, Community Action on Energy Efficiency Program, Towns for Tomorrow, Smart Development Partnership Program, Green Government Buildings and developing energy performance labeling.

The Energy Efficiency Building Strategy builds on the success of *Efficient Buildings: A Plan for B.C.* developed in 2005 and the new Energy Plan for British Columbia by providing nearly 100 million for initiatives that range from constructing self-sufficient homes using renewable and waste energy sources to providing capital funding to retrofit existing provincial and public sector buildings. The strategy also introduced over 23 million per year of provincial tax exemptions for energy conservation equipment and requires all provincial buildings to meet LEED Gold or equivalent sustainable standards.

Other financial incentive programs include the Smart Development Partnership Program which provides local governments with up to \$50,000 to support sustainable land-use planning, while the Towns for Tomorrow program will invest \$21 million in capital projects to assist communities with achieving integrated and

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<sup>67</sup> ASHRAE 90.1 – American Society of Heating, Refrigeration and Air-Conditional Engineers - is an international standard for energy efficiency in buildings.

<sup>68</sup> BC Green Building Code Initiative, Office of Housing and Construction Standards, Building and Safety Policy Branch. 2008. Available On-line:  
<http://www.housing.gov.bc.ca/building/green/TextofCodechanges.pdf>



prosperous communities. British Columbia is also working with the private sector to install solar roofs on 100,000 residential and commercial buildings province wide.<sup>69</sup>

A long-standing program provided by the province is the Green Buildings BC Retrofit Program. This program encourages British Columbia funded schools, universities, colleges and health care institutions to retrofit their facilities to improve their energy and water efficiency, and reduce their GHG emissions and waste generation.<sup>70</sup> Under the program, retrofit projects no longer have to compete with other priorities for funding. The BC Buildings Corporation is delivering the program by facilitating the procurement of retrofit services from the private sector.



Richmond City Hall (Richmond, British Columbia)

<sup>69</sup> British Columbia. 2008. Climate Action Plan. Available On-line: [www.livesmartbc.ca/plan/index.html](http://www.livesmartbc.ca/plan/index.html).

<sup>70</sup> B.C. Buildings Corporation. 2007. Green Buildings B.C. Retrofit. Available On-line: <http://www.greenbuildingsbc.com>.



TABLE 8 BRITISH COLUMBIA SUSTAINABLE BUILDING INITIATIVES

Program/Policy	Recipient	Scope and Objective	Technology	Results (Fiscal/Energy)	Sustainable Building Encouragement
<b>B.C. Green Building Code Initiative, 2006</b>	BC Building Industry	Identify and remove barriers within provincial codes and regulations, propose new provisions for green buildings regulation, and support implementation through an administrative framework.	For residential energy efficiency - Energuide Rating System of 77.  For high-rise residential and commercial buildings - ASHRAE 90.1 standards.	To attain targets of 18.5% more energy efficiency than those outlined in MNECB, by enforcing strict sustainable building practices in the planning, design and construction of new homes and commercial buildings across the province.	The Act is a primary legal document that secures the foundation for future green building initiatives and help to create the necessary political and commercial will to implement new green building development.
<b>Energy Efficiency Building Strategy</b>	Residential	Provide nearly \$100 million for initiatives that range from constructing self-sufficient homes using renewable and waste energy sources to providing capital funding to retrofit existing provincial and public sector buildings.	All green technologies.	Introduced over \$23 million per year of provincial tax exemptions for energy conservation equipment and requires all provincial buildings to meet LEED Gold or equivalent green standards.	Facilitates conversion to green building technologies and sets a province-wide institutional example.
<b>Smart Development Partnership Program</b>	Municipal governments	Provide local governments with up to \$50,000 to support sustainable land-use planning.		Develops effective land use planning and management. Supports land use patterns that encourage walking and bicycle use.	Streamlining the development approval process stimulates private sector investment.
<b>Towns for Tomorrow</b>	Communities	The program will invest \$21 million in capital projects to assist communities with achieving integrative and prosperous communities.	Water and energy infrastructure, heating systems, air ventilation.	The program supports water quality and energy improvements, enhancement of protective and emergency infrastructure services, and the long-term development of recreation, tourism and cultural amenities.	Brings sustainable development practices to smaller communities.

<b>BC Sustainable Energy Association SolarBC Program</b>	<p>Install solar water heating rooftop units on 100,000 residential and commercial buildings province wide by 2020.</p> <p>The Province of British Columbia will invest \$5 million into the program through the Ministry of Energy, Mines and Petroleum Resources.</p>	<p>Small solar water heating systems.</p>	<p>Residents can receive up to \$1,625 in rebates from the provincial and federal governments to put toward the cost of solar water heating systems. The program is expected to increase the supply of renewable energy and help reduce greenhouse gas emissions by 33 percent by 2020.</p>	<p>The program is stimulating the demand for solar technologies, popularize residential solar energy systems, train installers, and enhance manufacturing, system technologies and infrastructure support.</p>
<b>Green Buildings BC Retrofit Program</b>	<p>Encourages BC-funded school districts, universities, colleges and health care institutions to retrofit their facilities to improve their energy and water efficiency, and reduce their greenhouse gas emissions and waste generation.</p>	<p>Heating systems, air ventilation, air sealing, lighting.</p>	<p>Improve the energy efficiency of older buildings and infrastructure.</p>	<p>The program facilitates the procurement of retrofit services from the private sector so retrofit projects no longer have to compete with other priorities for funding.</p>

## 6.3 MUNICIPAL LEVEL

### Municipal Corporate Targets for Sustainable Building

- Region of Waterloo in Ontario adopted LEED Silver as design and construction standard.
- City of Kingston in Ontario adopted LEED certified for new and retrofit projects.
- City of Ottawa adopted LEED certified for all buildings over 500 m<sup>2</sup>.
- City of Calgary in Alberta adopted LEED Silver for new civic buildings and major renovations.
- City of Vancouver in British Columbia adopted LEED Gold for all new civic buildings over 500 m<sup>2</sup> and a mandatory reduction of 30% in energy.
- Region of York in Ontario set LEED Silver for all Regional facilities.
- Town of East Gwillimbury set LEED Silver for all Regional facilities.

Cities represent less than one percent of the earth's total surface, but urban activities around the world generate close to 80 percent of all carbon dioxide emissions, and consume nearly 75 percent of all energy produced. Yet when buildings and cities are properly designed, they can encourage and support a low-carbon, energy-efficient and prosperous lifestyle. Increasingly, communities in Canada are incorporating sustainable urbanization practices into planning activities. This section reviews how the communities of the City of Toronto and the Town of Markham in the province of Ontario, and Metro Vancouver in the province of British Columbia are encouraging sustainable building. A list of municipal initiatives going on across Canada to support sustainable building is provided in Appendix B.

### *City of Toronto: Green Building Development Standards*

In 2007, the City of Toronto passed a landmark climate change plan entitled, *Climate Change, Clean Air and Sustainable Energy Action Plan: Moving from Framework to Action*.<sup>71</sup> The plan is among the first initiatives in Canada to interlink the importance of energy reduction in the built environment with GHG emissions at a City wide level. The plan builds on earlier municipal commitments and aims to cut emissions by 6 percent by 2012, 30 percent by 2020 and a full 80 percent by 2050 relative to 1990 levels.

The plan introduces a number of Toronto wide objectives, including the Toronto Green Building Development Standard (TGDS). The TGDS is a comprehensive document providing targets, principles and practices to achieve sustainable development in buildings and urban design through the use of recently enacted planning powers, including zoning with conditions. The TGDS contains performance targets and guidelines that relate to site and building design and integrates the City's existing guidelines and targets with standards from various rating systems such as LEED® and Green Globes.<sup>72</sup>

In 2007, the City Council approved a Green Roof Incentive Pilot Program to encourage green roof construction in the City to be used for education and promotional purposes. The program offers a grant of \$50 per square metre of eligible green roof area up to a maximum of \$10,000 for single-family homes and a maximum of \$100,000 for all other property owners in the City of Toronto.

<sup>71</sup> The Climate Change, Clean Air and Sustainable Energy Action Plan: Moving from Framework to Action and other City of Toronto energy efficiency and green building initiatives are available for download at <http://www.toronto.ca/changeisintheair/index.htm>.

<sup>72</sup> City of Toronto. 2007. The Toronto Green Development Standard. Available On-line: [http://www.toronto.ca/planning/pdf/gds\\_standardjan07\\_03.pdf](http://www.toronto.ca/planning/pdf/gds_standardjan07_03.pdf).

### Drake Solar Landing



The Town of Okotoks is the first municipality in North America to have established growth targets in a master plan based on the local environmental carrying capacity of the watershed to treat and dispose of effluent. With assistance from several federal organizations and the ATCO group, the Town of Okotoks set out to demonstrate the potential for solar energy to meet space heating and hot water requirements for a new subdivision community, the Drake Solar Landing Community. The 52-home solar community is located with a larger 835 home subdivision and demonstrated the opportunity for district energy systems to work efficiently with low energy consuming residential homes. By developing all of the homes connected to the district energy network using Canada's highest standard for energy efficient homes (R-2000), nearly 90 percent of all space heating needs for the homes are now met by solar energy.

Source: <http://media.canada.com>

### *City of Markham: Markham Centre Performance Measures*

Since the late 1990s, Markham has worked to integrate the concepts of sustainable development into its planning activities. The Town was among the early adopters of new urbanism, which supports the practice of compact and land-efficient urban form, higher density development, a wide range and mix of land uses, a pedestrian friendly and connected grid pattern of streets and high quality urban design. These principles continue to guide Markham's growth, including the ongoing development of the Markham Town Centre, but are now broadening to address concerns with GHG emissions and energy consumption. At the core of these initiatives is a district energy systems that is about to be expanded.

For the Town's largest development project, Markham Town Centre, emphasis was placed on creating a complete, self-contained community with minimal impact on the environment. To help improve the uptake of sustainable building, the Town introduced the Markham Performance Measures and checklist. The performance measures are intended to help implement broader community goals and expectations, while the checklist is used to integrate performance indicators and targets. For instance, in addition to setting high standards for promoting mixed-land use and encouraging design that reduces dependency on the automobile, the Town also set a target to lower energy consumption by 20-30 percent. All development is evaluated using the performance checklist. This approach has resulted in the design bar being raised for all new buildings being developed in the Town Centre (generally designed to LEED standards), and encourages the use of district energy to improve the overall energy management and performance of the community.

### *MetroVancouver: BuildSmart*

In response to a successful demand side management program for energy in buildings, the Greater Vancouver Regional District (GVRD) now MetroVancouver, introduced a comprehensive initiative to explore a wide range of challenges including water use and waste for highrise commercial and residential buildings.<sup>73</sup> Part of the program involved exploring opportunities to convert the LEED® USGBC rating system for use in British Columbia. In 2001, the GVRD was successful in creating the Green Building Program (developed around a LEED for British Columbia rating system) delivered through the Buildsmart website.

The BuildSmart site serves as a one-window portal providing technical guides on all aspects of whole building design and sustainable building techniques, as well as technical guides, tools and Canada's first and most comprehensive list of sustainable building products and supplies.

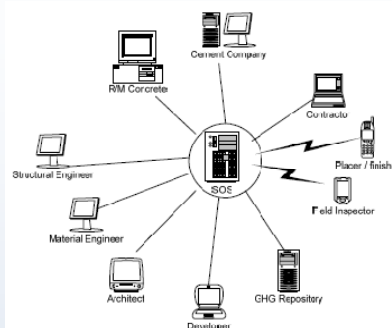
The BuildSmart website focuses on five major stages of construction that include: design strategies, construction, operation and maintenance, retrofit and tenant Improvements, and renovations, demolition/deconstruction. The Green Building Program has expanded to include a component to monitor LEED® certified buildings for energy performance and emissions. The program also provides industry training opportunities through technical workshops.

<sup>73</sup> Helen Goodland, Director, Lighthouse. 2008. Expert Interviewee.

## 7 NEW DEVELOPMENTS IN SUSTAINABLE BUILDING TECHNIQUES AND FINANCING

### Building Envelope Improvements

*Supplementary  
Materials (SCM)  
System*      *Cementing  
Optimization  
System*



EcoSmart Foundation Inc. has developed a modeling system that allows developers, architects, engineers, contractors and material suppliers to optimize the use of supplementary cementing materials. The system enables users to evaluate the reduction in GHG emissions and reduction in construction costs.

Source: Sustainable Development Technology. 2007. Eco-efficiency in Commercial Buildings. Presentation. Available On-Line: <http://www.sdtc.ca>

Product innovation, advancements in control systems, new design software and the availability of information for sustainable building are all rapidly evolving across Canada through investments by government and the private sector. Although investment in research and development has continued, commitment by the investment community to sustainable building development remains largely unchanged with minimal recognition of the competitive and long-term life cycle advantages of supporting sustainable building. This section presents an overview of the identified technologies required for sustainable building, reviews advancements in modeling techniques, and examines how innovative financing is overcoming traditional lending barriers for sustainable building.

### 7.1 TECHNOLOGY NEEDS AND MODELING ADVANCEMENTS

Research into the advancement of sustainable building and technology practices is advancing in part due to the support provided by government funded agencies such as the arms-length federal foundation Sustainable Development Technologies Canada (SDTC), the provincially supported Ontario Centres of Excellence (OCE), and the British Columbia supported Innovative Clean Energy Fund.<sup>74</sup> Collectively, these organizations are investing over a billion dollars CDN to establish competitive sustainable technology and development capacity in Canada. To help identify where needed technology advancement is required to support this market transformation, SDTC undertook to prepare Canada's first commercial buildings competitive assessment. The report identified both non-technical and technical requirements (see Table 9) that can help create more sustainable commercial buildings in existing and future stock.<sup>75</sup>

Among the findings of the report was the requirement to mainstream existing technologies particularly in the areas of integrated design process, building envelope improvements, operations and occupant management tools, systems and equipment efficiencies, and optimization of conventional resources.

<sup>74</sup> The Ontario Centre of Excellence invests in and promotes cutting-edge research through collaborations between industry and institutions to foster innovation in energy markets, systems and technologies.

<sup>75</sup> SDTC is also preparing a Business Case for Energy Utilization related to industrial and residential development. For the latest reports, visit: [http://www.sdtc.ca/en/knowledge/business\\_case.htm](http://www.sdtc.ca/en/knowledge/business_case.htm).

TABLE 9 COMMERCIAL BUILDING TECHNOLOGY NEEDS ASSESSMENT

Non-Technical		Technical Needs	
Price on Carbon	Consistent price on carbon.	Integrated Building Design	Better uptake of integrated design.
Integrate Supply Chain	Greater agreement on systems requirements.	Building Envelope Improvements	Need technologies to minimize thermal transfer.
Integrate Building Practices	Integrated practices for regional planning, construction and financing.	Operator & Occupant Management Tools	Need for technology to monitor resource consumption and indoor air quality.
Improved Building Code and Greater Enforcement	Update to MNECB.	System & Equipment Efficiency Improvements	Need high efficiency mechanical and electrical equipment.
Continuous Reporting	Require measurable, defensible and producible financial assessments.	Optimized Resource Supply	Optimize the supply of conventional resources.
Information Exchange	Require a clearinghouse of information for district energy.		
Sustainability Ethic in Education	Sustainability needs to be integrated throughout all curriculum.		

Source: Canada Foundation for Sustainable Development Technology. 2007. *Sustainable Development Business Case Report: Commercial Buildings – Eco Efficiency*.

Advanced work is also being undertaken by federal agencies, such as the National Research Council of Canada – Institute for Research in Construction (NRC-IRC) for sustainable building. The NRC-IRC has helped innovate in the areas related to durability, efficiency and longevity of structures since its inception in 1947. The range of innovative research and development has included early reports on the use of old bricks in new buildings to the use of effective and efficient lighting.<sup>76</sup> In 2005, NRC-IRC refocused its research and technology transfer activities to address three broad areas including: climate change, green buildings, and life cycle performance.

Among the areas of growing research importance for sustainable building, particularly for the construction and financing sector, is life cycle performance. NRC-IRC is currently developing materials to provide a reliable prediction of the life cycle performance a building for the key stages of development including initial design, extraction of materials, production of components, construction, use,

<sup>76</sup> All papers, research materials, workshops and conference produced by the NRC-IRC since 1947 are available for download at [http://irc.nrc-cnrc.gc.ca/index\\_e.html](http://irc.nrc-cnrc.gc.ca/index_e.html).

#### Operator & Occupant Management Tools

Microprocessor Based Dimmer Technology



Fifth Light Technologies Ltd. had developed a patented controller system that allows fluorescent lighting systems using magnetic ballasts to be dimmed. The majority of commercial lighting uses magnetic ballasts.

Source: Sustainable Development Technology. 2007. *Eco-efficiency in Commercial Buildings*. Presentation. Available On-Line: <http://www.sdtc.ca>

inspection, deterioration, maintenance, rehabilitation, demolition, disposal, recycling, and renewal.<sup>77</sup>

### *Modeling Advancements*

As new technology and approaches for sustainable building come on stream, there is an increasing requirement to have simulation software that can quickly perform energy calculations and validate design approaches. Through the Sustainable Buildings and Communities Group within the CANMET Energy Technology Centre, a branch of NRCan, a wide range of new simulation technologies for lighting and daylighting, HVAC, building envelop and windows, whole house design and performance, and whole building performance are available to assist architects and engineers to optimize the energy performance of building designs and to demonstrate compliance with the Model National Energy Code (see Table 10).

**TABLE 10 WHOLE BUILDING AND ENERGY MODELING SOFTWARE**

Area of Application	Software	Description
Lighting and Daylighting	Lightswitch Wizard	Develop lighting and daylighting scenarios.
	SkyVision Software	Used to design and locate skylights.
HVAC	GS2000™	Sizing of ground heat exchangers for ground source heat pumps.
Building Envelope and Windows	BASE CALC™	Residential basement and slab-on-grade heat loss analysis.
	FRAME™plus Online	Assess thermal performance of widow curtain.
Whole House Design and Performance	HOT3000™	Low-rise residential energy analysis and design software.
	Hot2®XP	Quick tool to analyze energy use in residential buildings.
	Hot2EC	Compliance program increases flexibility in design of a building.
Whole Building Performance	HOUSTRAD™	Design to be used for compliance code-trade off.
	EE4	Used to help designers achieve compliance using the MNECB performance path.
	BILDTRAD	Used to analyze building envelop energy efficiency.
	GBTTool™	Developed to support the Green Building Challenge.

A widely recognized international evaluation software for proposed energy efficient and renewable energy technologies is the RETScreen™ International Clean Energy Project Analysis Software. Launched in 1996, RETScreen™ has helped save over \$240 million CAD in energy costs for Canadians and over \$600 million CAD around the world.<sup>78</sup> The software is being used to evaluate the energy production, life-

<sup>77</sup> National Research Council Canada – Institute for Research in Construction. Sustainable Built Environment. Available On-Line at [http://irc.nrc-cnrc.gc.ca/sbe/lifecycle\\_e.html](http://irc.nrc-cnrc.gc.ca/sbe/lifecycle_e.html).

<sup>78</sup> Gregory Leng et al. 2004. RETScreen International Results and Impacts 1996-2012. Natural Resources Canada. Available On-line: <http://www.retscreen.net/ang/home.php>.



### Systems and Equipment Efficiency

Effluent      Heat      Recovery  
Demonstration



RenewABILITY Energy Inc. is developing the Power-Pipe Drain-water Heat Recovery system for use in pulp and paper mills. The systems can reclaim up to 85 percent of waste energy from effluent discharged from mills. System are already in use in residential, commercial and industrial applications.

Source: Sustainable Development Technology. 2007. Eco-efficiency in Commercial Buildings. Presentation. Available On-Line: <http://www.sdtc.ca>

cycle costs and GHG emission reductions for various types of proposed energy efficient and renewable technologies such as wind energy projects, photovoltaic projects (on grid, off-grid and hybrid), biomass heating, solar air heating, solar water heating, passive solar heating and ground source heat pumps.

Nearly 2000 people in Canada have been trained on the software and over 400 around the world. Internationally, the software is supported by the United National Environment Programme (UNEP) Energy Unit of the Vision of Technology, Industry and Economics (DTIE) and the World Bank's Prototype Carbon Fund (PCF). RETScreen International is in the process of developing a new advanced version of the RETScreen software and related support tools in collaboration with UNEP. New models are also being created for use with RETScreen including a combined heat and power (CHP) module, refrigeration project module, and commercial-institutional building energy audit tool.<sup>79</sup>

## 7.2 LEVERAGING "GREEN" DOLLARS FROM THE INVESTMENT COMMUNITY

Implementation of sustainable building is subject to skepticism from a number of sources. At the top of the list is the financial community. Lending institutions continue, for the most part, to operate on the basis of traditional business models, requiring evidence that the payback of a loan or investment will be achieved in a short period of time and do not account for the longer-term life cycle advantages of a sustainable building. As a result, lenders continue to question higher than normal start-up capital costs associated with a sustainable building. Another challenge is having lenders assign value to the reduction in environmental emissions, because the savings are not directly applicable to the balance sheet of a particular sustainable building project.

However, organizations such as the CaGBC and the Royal Institute of Chartered Surveyors (RICS) have prepared seminal reports that suggest meaningful ways to incorporate sustainable building practices into the valuation and financing of buildings.<sup>80</sup> At the same time, public and private lending institutions are also introducing innovative financing alternatives that recognize the life cycle advantages of sustainable building and are directing efforts at overcoming the premium costs of developing sustainable buildings, including the Toronto Atmospheric Fund (TAF) and the Vancouver City Credit Union (VanCity).

### *Toronto Atmospheric Fund*

Established in 1991, the Toronto Atmospheric Fund (TAF), is Canada's only *municipal* agency working to mitigate global warming and to improving air quality. The accomplishments of TAF are many, including the establishment of North America's first urban wind turbine at the Canadian National Exhibition Grounds in

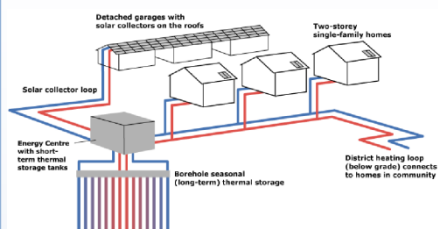
<sup>79</sup> Ibid

<sup>80</sup> A detailed report, Green Value: Green Building, Growing Assets, prepared by RICS, reviews sustainable building in Canada, the U.S. and the U.K. and identified that a link exists between the market value of a building and its green features. Available Online: <http://www.rics.org>.

Toronto, Ontario and contributing to the world's first renewable inner-city district energy cooling system – Deep Lake Water Cooling. The CUI play a key role in the success of this project by understanding necessary technical studies in the early 1990s, providing a basis for decision-makers to subsequently forge ahead with this project.

### Optimized Resource Supply

#### Underground Thermal Energy Storage



Science Applications International Corp. (SAIC Canada) has developed the first integrated solar thermal and thermal heat storage system in North America in a residential subdivision where all homes are built to the R-2000 standard. Nearly 90 percent of all space heating needs for the homes are met by the thermal storage system.

Source: Sustainable Development Technology. 2007. Eco-efficiency in Commercial Buildings. Presentation. Available On-Line: <http://www.sdtc.ca>

To help meet the challenge of reducing the cost premium for creating environmentally-friendly buildings, TAF launched Green Loan, Canada's first green building loan, to encourage energy efficient and environmentally-friendly condominium development in the City of Toronto. The Green Loan enables a developer to produce a high performance condominium that is competitive with a conventional one. The loan achieves this by enabling the condominium corporation to become the primary agent accountable for repaying the loan. Shifting the loan payment responsibility away from a developer and towards the condominium owners ensures that the financial benefits of an energy efficient building will be realized and reduces the financial risk for a developer.<sup>81</sup>

The positive results from the financial program have led TAF to encourage support for sustainable building from the financing sector. In 2007, TAF introduced a \$2 million CAD fund designed to backstop loans from other financial lenders and to encourage the pooling of funds for energy retrofits and sustainable building.

### Vancouver City Savings Credit Union (VanCity)

As a small credit union in the Vancouver area, Vancity was founded in 1946 on principles of community support and has won numerous awards for its work around sustainability and climate change.<sup>82</sup> Today, VanCity is Canada's largest credit union. VanCity and its subsidiary companies, including Vancity Capital, are committed to corporate social responsibility, taking action against climate change and developing numerous programs that promote sustainable building to improve the quality of life in communities. VanCity is leading the way for non-public sector investment into sustainable building through three major programs: Green Building Grant Program, Eco Efficiency Business Loan and the Bright Ideas Home Financing program.

The Green Building Grant Program was launched in 2004 in partnership with the Real Estate Foundation of British Columbia.<sup>83</sup> This program offers grants up to \$50,000 CAD to fund projects that entail major renovation or retrofits to existing buildings, provide regulatory changes to advance sustainable building development and practice, and education programs to increase the understanding and use of practical sustainable building strategies. A widely applied program is the Eco Efficiency Business Loan Program that offers loans up to \$250,000 CAD with a preferred rate and flexible repayment terms to help manage cash flow for energy improvements. The loan also finances up to 100% of all capital upgrades and is an

<sup>81</sup> Brent Gilmour. 2005. Market Transformation for High Performance Building: One Sector at a Time. *The Ontario Planning Journal*. (Vol. 20 No. 4.)

<sup>82</sup> VanCity. About Us. Available On-line: <https://www.vancity.com/MyCommunity/AboutUs/>.

<sup>83</sup> The Real Estate Foundation of British Columbia. Green Building Grant Program. Available On-line: <http://www.realestatefoundation.com/greenbuilding.html>.

attempt to reduce energy consumption for businesses and not-for-profit community organizations.<sup>84</sup>

Using the ecoENERGY program offered by NRCan, VanCity's Bright Ideas Home Financing Program offers personal loans at a prime rate ranging from \$3,500 CAD to \$20,000 CAD, with a payback period of 10 years.<sup>85</sup> The low interest and long payback period helps the savings recognized from increased energy efficiency pay for most of the upgrades. To be eligible for the program, homeowners need to be eligible to qualify for the ecoENERGY program.



Stratus Winery (Niagara-on-the-Lake, Ontario)

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<sup>84</sup> VanCity. Milestones in Vancity's History. Available On-line: <https://www.vancity.com/MyMoney/AboutUs/MediaCentre/Milestones/>.

<sup>85</sup> VanCity. Milestones in Vancity's History. Available On-line: <https://www.vancity.com/MyMoney/AboutUs/MediaCentre/Milestones/>.

## 8 DEVELOPING CAPACITY IN THE MARKETPLACE

In response to the growing interest in sustainable building practices and alternative energy systems, public and private institutions are responding to industry and consumer demands by establishing sustainable building curriculum in post-secondary learning institutions, fostering collaborative research networks among colleges and universities, and by conducting national research initiatives to assess the needs and required skills to develop capacity in the marketplace for sustainable building. This section reviews collaborative programs emerging across Canada, prominent sustainable building programs in colleges and universities, and also presents some of the continuous professional programs being launched to provide professionals with the latest training in sustainable building. A list of programs offered by colleges, universities and industry associations across Canada is provided in Appendix C.

### 8.1 COLLABORATION AND NETWORKING

Research networks in Canada form a central backbone for the rapid deployment of information and are considered integral to the wide-spread advancement of sustainable building practices and technologies into the general marketplace. Today, the result of collective industry, government and institutional initiatives has led to the creation of various academic and practitioner networks that are actively engaged in the development and application of sustainable building practices. Three well-established networks that are acknowledged as elevating design and technology for sustainable application include, the Canadian Design Research Network (CDRN), the Cross-Canada Network – Avativut, and Canada Green Building Council: Institutional Forum and Educational Development. An overview of the programs is provided in Table 11.

For the most part, all three networks have opted to focus their collaborative efforts on enhancing the design aspects of sustainable building practices and are not engaged in the day to day investigation or review of the industry or trade demands that will be required to meet applied requirements of sustainable construction and technology development.

CDRN is a relatively new pan-Canadian collaborative that is seeking partnerships with universities and colleges to establish new design centres in all parts of the country that will examine construction, industrial design, interactive technologies and the alternative energy industry. The Cross-Canada Network – Avativut is comprised of colleges across Canada and are collectively working to prepare a joint training program that will cater to building owners, operators and managers across Canada. One of the more active groups across Canada is the CaGBC – Academic Education Committee. The committee has held several national forums to explore new curriculum that encourages multi-disciplinary interaction of different faculties.



Over the last few years, the CaGBC has launched several partnerships and training programs with industry and institutional partners. At the national level, the CaGBC, in partnership with its local chapter offices, is in the process of delivering new workshops to various design and applied disciplines involved in the construction of “green” buildings. Among the activities, is the establishment of a half-day workshop for contractors. The session is intended to familiarize project managers, estimators, allied professions and trade contractors on the specific aspects of the LEED development process relevant to their area of expertise.

**TABLE 11 CANADIAN COLLABORATIONS FOR EDUCATION ON SUSTAINABLE BUILDING**

Network Centre	Description	Collaborative Activities	Partners/Members
CaGBC Educational Development	Host workshop sessions with educators from both college and universities to explore education development requirements.	Work with the BCIT Centre for Green Roofs and Sustainable Building Centre to undertake research and assess skills development for various trades.	All institutions are eligible for membership.
Cross Canada Network – Avativut	Canada wide partnership directed at undertaking research through the practice of applied urban sustainability.	Each member is engaged in collaborative research activities – initiatives include BCIT Centre for College Roofs.	Nova Scotia Community College, Collège de Rosemont, Seneca College, Nunavut Arctic College, SAIT, Douglas College and BCIT.
Canadian Design Research Network (CDRN)	Pan-Canada initiative to better integrate new design concepts and technology into the daily activities of industry.	Working to better integrate design principles with existing approaches, such as LEED, CBIP and MNECB.	Dalhousie University, Ecole de Technologie Supérieure, McGill University, Nova Scotia College of Art and Design, Ontario College of Art and Design, Ryerson Polytechnic University, Simon Fraser University, University of Alberta, University of British Columbia, University of Calgary, University of Manitoba, University of Montreal, University of Waterloo.

## 8.2 BUILDING AND TECHNOLOGY COLLEGE PROGRAMS

There are a variety of college level programs for sustainable building across Canada.

In Ontario, three notable colleges, Fleming College, International Academy of Art and Design, and Seneca College, provide programs in sustainable buildings. Fleming College was among the first colleges in Canada to offer students an intensive program in sustainable building and design. The International Academy of Art and Design program offers students training and skills in sustainable building technology, while Seneca College offers three specialized programs in sustainable building: Buildings Systems Engineering Technician (BTS), Renewable Energy Training Programs – Photovoltaic Technician Program, and Energy Training Office.

Seneca is among the colleges in Ontario and Canada that offers students a variety of programs and training on renewable building system technology, environmental

technology, site remediation, energy efficiency principles and design.<sup>86</sup> Another feature of Seneca's commitment to the sustainable building industry is its Energy Training Office, which offers courses internationally in the areas of photovoltaics, wind energy, geothermal and solar thermal energy.<sup>87</sup>

In Alberta, the Southern Alberta Institute of Technology Construction (SAIT) is working with the local home builders association to deliver programs for trades. In 1998, SAIT partnered with the Carma Centre for Excellence in Home Building and Land Development. Carma is a developer-funded initiative to help educational institutions facilitate the training requirements of residential construction and land development. SAIT works with the Carma Centre to develop individual learning modules for all trades and are integrated into course outlines and include information on new technology or high performance building concepts.<sup>88</sup>

In British Columbia, two colleges engaged in market studies prior to launching their programs. In the case of Douglas College, an employer survey was conducted to assess employment opportunities for graduates. The results of the survey helped to design the Building Environmental Systems program, which educates building owners and managers (developers) in the art of sustainable building management.<sup>89</sup> The program is based on the Seneca College Energy Training Centre program. The British Columbia Institute of Technology (BCIT), School of Construction and Environment also engaged in a stakeholder survey to assess how the design, construction, technology and manufacturing sectors in sustainable building were evolving. The result was the complete overhaul of the school curriculum and resulted in all research and program offerings being delivered through a sustainable framework. BCIT also offers one of the more advanced programs offering students the opportunity to work with LEED buildings.<sup>90</sup>

### 8.3 UNIVERSITY BASED PROFESSIONAL BUILDING AND DESIGN

Across Canada, universities are revisiting the standards and expectations in current curriculum to incorporate issues of sustainable design and development. A contributor to this activity, particularly within the disciplines of architecture and civil and building engineering, is the CaGBC Academic Education committee. The committee has been active across Canada testing a new Integrated Design course that can be incorporated into the curriculum of universities.<sup>91</sup> The committee has

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<sup>86</sup> Canadian Urban Institute. 2006. Faculty of Technology: Competitive Placement Opportunity for Sustainable Construction and Technology Training.

<sup>87</sup> Ibid.

<sup>88</sup> Ibid.

<sup>89</sup> Douglas College. Building environmental Systems. Available On-line: <http://www.douglas.bc.ca/programs/bes.html>.

<sup>90</sup> Canadian Urban Institute. 2006. Faculty of Technology: Competitive Placement Opportunity for Sustainable Construction and Technology Training.

<sup>91</sup> Several universities have participated in the development of the program including University of Dalhousie in Halifax, University of Laval, University of Montreal, University of Montreal, University of Toronto, Ryerson University, University of Manitoba, University of Calgary and University of British Columbia.

engaged a number of universities across Canada and each institution is working with its respective faculties to develop curriculum. All the programs work to provide students with applied opportunities to work in multidisciplinary teams with varied backgrounds on projects in the community.

The most comprehensive national review of university programs for sustainability modules was presented in a paper prepared by the University of Waterloo, Faculty of Architecture. The paper reviewed university level programs in Architecture and the 21 CEAB Accredited programs in Civil and Building Engineering.<sup>92</sup> Among the findings of the report was that nearly 90 percent of engineering programs in Canada did not provide an opportunity to engage students in uses of building science, or building envelope design and testing.<sup>93</sup> Generally, students graduating in architecture were more likely to be familiar with building science and envelop issues.

## 8.4 CONTINUOUS PROFESSIONAL LEARNING

Across Canada, industry associations are responding to the needs of members to offer continuous professional learning, particularly in the areas of sustainable building and development. Over the last several years, organizations have begun to develop a certification process for recognition of a specialization in alternative energy installation or professional knowledge concerning sustainable building development. Currently, the Canadian Solar Industries Association, Green Roof Healthy Cities the Canada Green Building Council, the Heating, Refrigeration and Air Condition Institute, as well as the North American Board of Certified Energy Practitioners all provide familiarization workshops and accreditation/certification opportunities for the design profession, trades and technologies.

Colleges are also forming strategic partnerships with local industry associations to deliver specialized, certifiable programs that meet local energy training needs. For instance, Seneca College has partnered with the Canadian Solar Industries Association to develop an eleven part training program on the fundamentals of PV systems and installation. The certification process is intended to standardize recognition for installers and manufactures across Canada. A similar program exists at SAIT where EnerVision, a not-for-profit company, is licensed to deliver the Natural Resources Canada R-2000 and EnerGuide Rating Service. The program offers continuous training courses for builders in the “technical requirements, marketing, and quality assurance processes of the R-2000 standard.”<sup>94</sup>

Two comprehensive energy management programs include the Building Owners and Managers Institute of Canada (BOMI) the Canadian Institute of Energy Training

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<sup>92</sup> Terri Meyer Boake. 2007. “TAKING INVENTORY: Feeding the Loop: The Role of Professional Education in Successful Building Science Technology Transfer”. National Building Envelope Council Conference.

<sup>93</sup> Ibid.

<sup>94</sup> EnerVision. Available On-line:  
<http://www.enervisionlberta.com/content/subindex.php?id=399>.



(CIET). BOMI Canada offers specialized courses to building owners and managers across Canada in energy management, environmental health, and safety issues.<sup>95</sup>

A similar program was also launched by the Canadian Institute of Energy Training (CIET). The CIET provides an energy training program to a large professional body. The program is divided into two parts, a comprehensive five day course leading to the official designation of a Certified Energy Manager (CEM) and an advanced two day seminar for Certified Energy managers in the areas of systems management and technology.<sup>96</sup>



City of Vancouver National Works Yard (Vancouver, British Columbia)

<sup>95</sup> Building Owners and Managers Institute of Canada. Available On-line: <http://www.bomicanada.com/>.

<sup>96</sup> Canadian Urban Institute. 2006. Faculty of Technology: Competitive Placement Opportunity for Sustainable Construction and Technology Training.

## 9 WHAT'S NEXT FOR SUSTAINABLE BUILDING IN CANADA?

At the beginning of the century, few developers were familiar with the concept of high-performance building or were concerned about environmentally-friendly marketability. In less than then a decade, sustainable building has become synonymous across Canada with achieving the principles of energy efficiency, healthy and environmental friendly building development, and having a measured impact on GHG reduction. The successful bid in 2007 to host the secretariat for the World Green Building Council in the Toronto area was linked in part to this momentum.

### 9.1 INCREASING UPTAKE OF WHOLE BUILDING RATING SYSTEMS

In 2005, there were less than five municipalities and regions across Canada with some form of sustainable building corporate or community policy. Today, there are now well over 50 jurisdictions, in both the U.S. and Canada that have adopted a variety of mechanisms to implement sustainable building. Increasingly, developers are investing in the integration of energy efficiency into new homes and to ensuring that consumers are aware of their efforts. Similarly, government agencies are integrating WBRS, such as the BOMA Go Green, Canada LEED® NC 1.0, and Green Globes as part of the procurement process for the design and development of new, as well as for the renovation of buildings for commercial, government and university, as well as schools and hospitals.

As more building regulatory powers are shifted over to municipalities from provinces, there is an expectation that municipalities will begin to require the application of various WBRS for the development and renovation of existing buildings. For instance, the City of Toronto is in the process of seeking to mandate the use of the Toronto Green Building Development Standard for all new development in the City and is also in the process of enacting a Green Roof by-law. The movement from voluntary approaches to mandatory requirements is an indication that sustainable building is starting to be mainstreamed by government and accepted as good business practices by the development industry.

### 9.2 STANDARDIZING ENERGY EFFICIENCY CODES ACROSS CANADA

The Model National Energy Code for Buildings 1997, although not widely adopted by regulating authorities, has contributed to the establishment of a baseline or as a complement to new building energy efficiency for a number of government, utility and private sector programs, such as the Commercial Building Incentive Program (CBIP), Design Assistance Program offered by Enbridge and Union Gas in Ontario Green Globes, LEED® and other initiatives. With the support of NRCan and the

Canadian Commission on Building and Fire Codes (CCBFC), a national initiative is now under way to update the MNECB. A cross-country engagement process has led to the creation of a special committee, the Building Energy Code collaborative, to help advance the adoption of an updated MNECB rather than have provinces and territories continue to present individual regulatory paths. There is already an accelerated uptake of participation, with the majority provinces and territories exploring the adoption of mandatory energy efficient building codes based on the MNECB.

### 9.3 CARBON PRICING AND TRADING SYSTEM

The province of British Columbia is the first jurisdiction in North America to formally introduce a carbon tax as a component of its 2008 budget, a tax system that the province claims will be the most comprehensive in the world. This step forward to encourage growth in “green” energy has also resulted in the provinces of Ontario and Quebec to begin examining opportunities to use a carbon cap and trade system. As provinces across Canada look to market mechanisms to reduce energy consumption and fund alternative energy development, the potential to capture the savings offered by sustainable building is starting to gain recognition as a way for municipalities to trade credits. For instance, communities that have undertaken a CEP have already established a baseline in energy use and GHG emissions, and are in a position to accurately measure reductions in GHGs through various building and energy efficiency programs. Although no municipality has engaged in a carbon pricing and trading system, WBRS such as LEED® are moving to incorporate performance based rating approaches that would benefit a trading system.

### 9.4 PREPARING FOR EXPORT

The numerous technologies, processes, and corporate practices described in this report strongly suggest that Canadian expertise in all aspects of sustainable building development represent a sector within a sector in economic development terms. The next frontier will be to leverage these innovations in the global marketplace. Conferences such as SB08 are instrumental in stimulating investment interest and over the next 10 years will undoubtedly see federal and provincial governments and agencies turn their attention to working with the private sector to expand Canada’s capacity for outward investment.

## 10 CONCLUSION

This report summaries the rapid increase in interest in sustainable buildings over the past decade. The report and an extensive list of Canadian programs for sustainable building are available for download at [www.sb07toronto.org](http://www.sb07toronto.org) and at [www.canurb.com](http://www.canurb.com).



YMCA Environmental Learning Centre, Residence Building (Paradise Lake, Ontario)

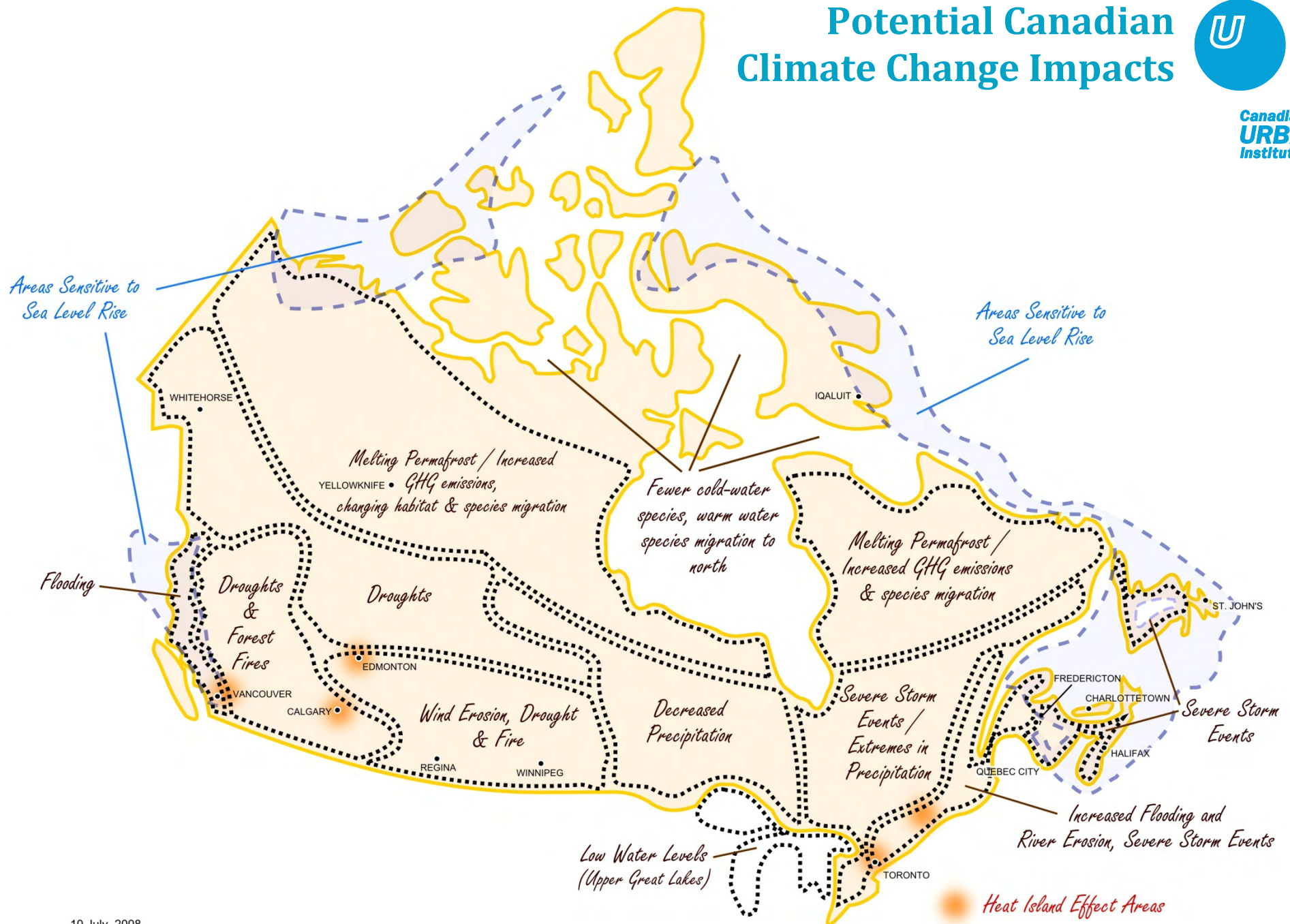
## INDIVIDUALS INTERVIEWED FOR THIS REPORT

Last Name	First Name	Affiliation	Position
Boake	Terri Meyer	University of Waterloo	Architecture Program
Church	Ken	Natural Resources Canada	Manager of Community Planning
Dulmage	Steve	Canada Green Building Council	Education and Development Manager
Goodland	Helen	Lighthouse	
Hawke-Baxter	Kelly	Natural Step	Executive Director
Henricks	Liz	Blue Builders Research Group	
Humber	Bill	Seneca College	
Hydes	Kevin	World Green Building Council	President, Chair
James	Jamie	BuildGreen	
Joseph	Alex	Natural Resources Canada	
Kapelous	George	Ryerson University	Architecture Program
Kellow	Ted	Real Estate Institute of Canada	Honorary Director of CaGBC
Kemp	Steven	Enermodal	
Lamanque	Michel	Natural Resources Canada	
Lazarowich	Renee	Natural Resources Canada	Sustainable Urban Neighbourhood
Leeming	Dan	Planning Partnership	Principal
Maslany	Orest	Green Buildings BC	Project Manager
McDougall	Scott	TerraChoice	President and CEO
Miltimore	Brian	Douglas College	
Mitchell	Robert	Mitchell Lofts	
Pollard	Doug	Canada Mortgage and Housing Corporation	Senior Research
Pope	Stephen	Natural Resources Canada	
Proulx	Wayne	GWL Realty Advisors Inc	Mgr, Energy & Environmental Services
Quail	Richard	Town of Okotoks	Municipal Manager
Ramslie	David	Vancouver Eco Density	Sustainable Development Program Manager
Raymond	Ron	City of Calgary	
Sawler	Viive	Markham Energy Conservation Office	Manager
Silbum	David	EnerVision	Secretariat for Built Green, Alberta Program & Federal Energuide Rating System
Singleton	Mike	Sustainable Buildings Canada	
Skopek	Jiri	Green Globes	
Stewart	Graeme	ERA Architects	
Stoate	Tim	Toronto Atmospheric Fund	Associate Director, Mandate Related Finance
Theaker	Ian	Canada Green Building Council	LEED Program Manager
Webber	Doug	Halsall	
Welsh	Jane	City of Toronto	Senior Planner
Winfield	Mark	York University	Faculty

## IMPACT OF CLIMATE CHANGE IN CANADA



# Potential Canadian Climate Change Impacts






This map of potential climate change impacts was created by Iain Myrans and Glenn Miller, Canadian Urban Institute, for the Canadian Institute of Planners Conference *Planning for Climate Change: Weathering Uncertainty*, Iqaluit, Nunavut, July 20-23 2008.

The map is intended to be modified over time. Comments and suggestions can be sent to [gmler@canurb.com](mailto:gmler@canurb.com).

Sources: This map was assembled from a variety of different maps found on the Natural Resources Canada website ([http://atlas.nrcan.gc.ca/site/english/maps/climatechange/potential impacts](http://atlas.nrcan.gc.ca/site/english/maps/climatechange/potential_impacts)), and with information from Environment Canada (see <http://www.ec.gc.ca/default.asp?lang=en&n=6ee576be-1>).



## RESOURCES

### **Government of Canada, Natural Resources Canada**

<http://www.nrcan-rncan.gc.ca/com/ctp/index-eng.php>

CleanTech Minutes have been developed by Natural Resources Canada to disseminate information about clean energy technologies and how they are being used in Canada.

### **Sustainable Development Technology Canada**

<http://www.sdtc.ca/en/index.htm>

Sustainable Development Technology Canada (SDTC) is a not-for-profit foundation that finances and supports the development and demonstration of clean technologies.

### **National Round Table on the Environment and the Economy (NRTEE)**

<http://www.nrtee-trnee.ca/eng/index-eng.html>

The National Round Table on the Environment and the Economy (NRTEE) is dedicated to exploring new opportunities to integrate environmental conservation and economic development.

### **International Institute for Sustainable Development**

<http://www.iisd.org/>

Engages decision-makers in government, business, NGOs and other sectors in the development and implementation of policies that are simultaneously beneficial to the global economy, the global environment and to social well-being.

### **Sustainable Buildings Canada (Regional Green Building Festival)**

<http://www.sbcCanada.org/>

Seeks to educate, support and empower building professionals and policy makers in Canada showcasing design and operational principles through its Design Charrettes.

### **Building Owners and Managers Association (BOMA) of Canada**

<http://www.bomacanada.ca/>

BOMA facilitates the sharing of information and pooling of expertise, ideas and resources for the benefit of the commercial real estate industry.

### **Cement Association of Canada**

<http://www.cement.ca/cement.nsf>

Provides a voice for the cement production industry in Canada, also raising the industry's awareness of important issues such as climate change and sustainable development.

### **Light House Sustainable Building Centre**

<http://www.sustainablebuildingcentre.com/>

Non-profit society dedicated to advancing and catalyzing sustainability in British Columbia's built environment.

### **Toronto and Region Conservation Authority (Kortright Centre for Conservation)**

<http://www.trca.on.ca/> <http://www.kortright.org/>

The Toronto and Region Conservation prepares and delivers programs for the management of the renewable natural resources within its watersheds.

**Canada Green Building Council**

<http://www.cagbc.org/>

The Canada Green Building Council (CaGBC) is a coalition of representatives from different segments of the design and building industry dedicated to accelerating the design and construction of green buildings in Canada.

**Green Enterprise Toronto**

<http://greenenterprise.net/web/index.php>

Through networking events and workshops with eco-smart entrepreneurs, Green Enterprise Toronto helps independent businesses and customers to become greener and consume locally.

**Blue Wilderness Management Group Inc.**

<http://www.bluewildernessgroup.com/>

The firm provides a wide variety of environmental consulting services, including: LEED Project Management, Sustainable Planning, Green Building Consulting, Ecotourism Development, Ecotourism and Park Policy.

**The Office of Energy Efficiency, Natural Resources Canada**

<http://www.oeenrcan.gc.ca>

Manages the Government of Canada's new ecoENERGY Efficiency Initiative, and provides practical energy conservation advice to consumers, school boards, businesses and institutions.

**Sustainable Buildings Canada**

<http://www.sustainablebuildings.gc.ca>

Portal to Government of Canada programs, activities, and research and development projects related to sustainable buildings, and financial incentives.

**Built Green Canada**

<http://www.builtgreencanada.ca>

Built Green is an industry driven voluntary program that promotes "green" building practices to reduce the impact that building has on the environment.



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