Canada Green Building Council
Every Building Greener

Canada Green Building Trends Report

McGRAW HILL CONSTRUCTION
McGRAW HILL FINANCIAL

Canada Green Building Trends:

Benefits Driving the New and Retrofit Market

SPONSORED BY:

OXFORD

REALpac
Real Property Association of Canada
Association des biens immobiliers du Canada

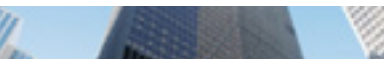
Toronto and Region Conservation
for The Living City

Research and report prepared by McGraw Hill Construction for the Canada Green Building Council.

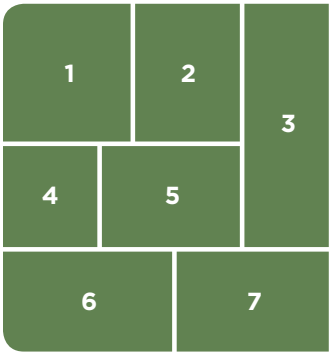
Table of Contents

Table of Contents Cont.

Case Studies



COVER PHOTOS



1 - Child Development Centre, LEED Platinum | Owner: University of Calgary | Architect: Judith Mac Dougall

2 - Fifth Avenue Place, LEED Gold | Owner: Brookfield Office Properties

3 - Manitoba Hydro Place, LEED Platinum | Owner: Manitoba Hydro | Architect: KPMB Architects and Smith Carter Architects

4 - Vancouver Convention Centre, LEED Platinum | Owner: Vancouver Convention Centre Expansion Project Ltd. Architect: Musson Cattell Mackey Partnership

5 - Joggins Fossil Centre, LEED Gold | Owner: Joggins Fossil Institute | Architect: WHW Architects Inc.

6 - Algonquin Centre For Construction Excellence, LEED Platinum | Owner: The Algonquin College of Applied Arts and Technology | Architect: Diamond Schmitt Architects and Edward J. Cuhaci and Associations Architects Inc.

7 - Maison du développement durable, LEED Platinum | Owner: Équiterre / Maison du développement durable Architect: MENKÈS SHOONER DAGENAIS LETOURNEUX Architectes

Methodology

Vancouver Convention Centre, LEED Platinum | Owner: Vancouver Convention Centre Expansion Project Ltd. | Architect: Musson Cattell Mackey Partnership

McGraw Hill Construction conducted an online survey from March 27 to April 21, 2014, for the Canada Green Building Council on green building in Canada. The survey was distributed by several associations, which are listed below. Two additional sources other than association member lists were also used to engage survey respondents—email lists of Canadian contractors from the McGraw Hill Construction Dodge Database and an outside source.

For the study, a green building project is defined as one that is built to LEED (Leadership in Energy and Environmental Design) certification or another recognized green building standard, or is energy and water efficient and addresses improved indoor air quality and/or material resource conservation.

PARTICIPANT DEMOGRAPHICS

Responses were from the following groups:

- Canada Green Building Council: 108 respondents
- Construction Specifications Canada: 37 respondents
- REALpac: 28 respondents
- National Association of Women in Construction: 2 respondents
- Newfoundland and Labrador Construction Association: 1 respondent

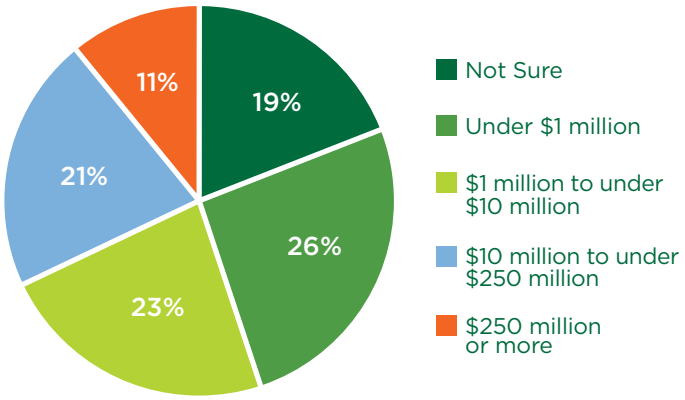
Twenty-four additional responses from the Dodge Database and outside source led to 200 total responses. The total sample size of 200 benchmarks at a high degree of accuracy: 95% confidence interval with a margin of error of +/- 7.0%.

The 200 respondents who completed the survey include the following types of firms:

- 57 architects
- 35 contractors
- 41 builder owners/developers
- 67 consultants and engineers

The companies at which the respondents work were largely located in Ontario, British Columbia and Alberta, which were the only three provinces with a large enough response rate to qualify for separate analysis.

RESPONDENTS BY FIRM SIZE



The percentage of the 200 respondents by province:

- Ontario: 36%
- British Columbia: 20%
- Alberta: 17%
- Quebec: 12%
- Saskatchewan: 6%
- Manitoba: 5%
- Nova Scotia: 3%
- New Brunswick: 2%
- Northwest Territories/Newfoundland and Labrador: 1% each

The percentage of 200 respondents by firm size is indicated in the adjacent chart above.

COMPARISON WITH 2012 WORLD GREEN BUILDING TRENDS STUDY

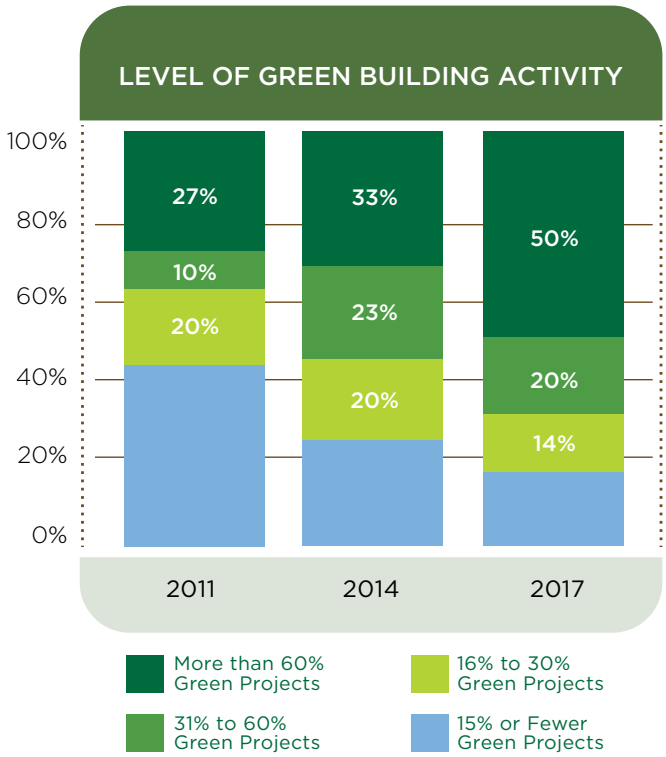
This Canada green building survey used portions of the survey instrument employed in McGraw Hill Construction's 2012 World Green Building Trends study as a basis in order to be able to provide a global context for the data gathered. Analysis in this report includes comparisons where questions remained the same or only small edits were made to adapt the survey to the Canadian market. The results of the World Green Building trends study were published in the 2013 *World Green Building Trends SmartMarket Report*.

In that study, green building was defined as a construction project that is either certified under any recognized global green rating system or built to qualify for certification.

Introduction and Executive Summary

The Canada green building market is vigorous and growing, according to the findings of this study, conducted by McGraw Hill Construction in partnership with the Canada Green Building Council. The elements of the research conducted were a quantitative industry survey of building owners, architects and contractors, which forms the core of the research effort and a qualitative series of confidential in-depth interviews with green leaders in the commercial and institutional sector. These elements demonstrate that green building activity is being driven by the market, and by the benefits that accrue from good sustainable building practices.

The findings of this study throughout the report are placed in the context of research conducted by McGraw Hill Construction on green building in the U.S. and globally, to clearly highlight the aspects of the Canadian green building market that align with the U.S. and global adoption of green, and those that make this marketplace unique.



GREEN BUILDING ACTIVITY IN CANADA

Well over half (56%) of the Canadian respondents to the industry survey report that over 30% of the projects they build are currently green, and by 2017, 70% expect to be doing at least that level of green construction, with 50% reporting that more than 60% of their projects will be green. This suggests that the share of green building in Canada's construction market is likely to see significant increases, creating strong opportunities for firms in this market that can capitalize effectively on this shift.

While the overall level of green involvement in Canada is slightly below those reported by U.S. firms in the 2012 World Green Building Trends study conducted by McGraw Hill Construction, the degree of growth in the involvement in green anticipated in the next three years is much higher now in Canada than the anticipated level of growth over three years reported by the U.S. firms in the 2012 study. This suggests that the Canadian market may soon be on par with the U.S. in terms of the share of green building.

On the other hand, the Canadian level of green building activity is generally a little higher than the global level reported in the 2012 study, published in the *World Green Building Trends SmartMarket Report*. This demonstrates the relative sophistication of the green building market in Canada.

TRIGGERS FOR GREEN BUILDING IN CANADA

Doing the right thing and client demand are the top triggers for increased green building activity in the Canadian market, selected by 42% as one of their top three choices. However, more respondents (24%) rank doing the right thing as the number one trigger when selecting their top three than those that select client demand as the top trigger (18%). The high influence of doing the right thing is unique in a market with the level of green experience that Canada has, and it has strong implications for the best approaches to marketing green products and services effectively to Canadian practitioners.

The importance of client demand also demonstrates the degree to which business factors also drive the market. The in-depth interviews with green leaders in commercial real estate give a high level of importance to the role of clients and tenants in encouraging their green investments, and it demonstrates the broad awareness of the importance of sustainability in Canada. In particular, these leaders highlight the importance of institutional clients in the Canadian market whose sustainability commitments are helping to drive the market.

The ability of green buildings to promote greater health and well-being in building occupants is another critical factor that has helped influenced the growth in the green building market so far, with 60% reporting this as the top social reason for their current investments in green. The potential benefits of this factor are increasingly being recognized as a crucial factor of green building, and if their value can be better captured in the return on investment associated with green building projects, this can help generate a new wave of green building investments.

BENEFITS OF GREEN BUILDING

Like their counterparts in the U.S. and around the world, Canadian building owners, architects and contractors report that green buildings significantly decrease operating costs in the first year after construction, and that their impacts on operating costs continue to increase over five years. Operating cost savings are no doubt impacted by the energy and water savings reported.

- **82% of building owners/developers report decreases in energy consumption compared to similar buildings.**
- **68% of owner/developers report decreases in water consumption.**

The Canadian respondents also report reasonable payback periods of eight years for new green building projects and seven years for green retrofits and renovations. They also find that their green retrofit/renovation efforts contribute to increased building values, with a median increased value of 4%.

The consistency of the findings globally indicated in the tables below for new and renovated/retrofit green building projects, despite the wide disparity of the markets, demonstrates a compelling business case for building green. These benefits will help continue to drive the Canadian market to invest in green.

It should be noted that other benefits beyond strict financial benefits are also considered important by Canadian respondents. **62% find that getting a higher quality building is an important benefit of building green**, second only to lower operating costs. And among those that certify their green projects with a third-party rating system, 73% report that better performing buildings is a key benefit of that process.

BUSINESS BENEFITS FOR NEW GREEN BUILDINGS

	2014 Canada	2012 Global	2012 U.S.	2012 Western Europe	2012 Asia	2012 Brazil
Decreased Operating Costs Over 1 Year	9%	8%	11%	6%	10%	8%
Decreased Operating Costs Over 5 Years	17%	15%	28%	13%	21%	14%
Payback on Green Efforts	8 Years	8 Years	7 Years	9 Years	7 Years	4 Years

Source for Global, U.S. Europe, Asia and Brazil findings is McGraw Hill Construction's 2013 *World Green Building Trends SmartMarket Report.*

BUSINESS BENEFITS FOR GREEN RETROFIT/RENOVATION PROJECTS

	2014 Canada	2012 Global	2012 U.S.	2012 Western Europe	2012 Asia	2012 Brazil
Decreased Operating Costs Over 1 Year	8%	9%	11%	9%	8%	8%
Decreased Operating Costs Over 5 Years	11%	13%	14%	14%	13%	13%
Increased Building Values of Green Versus Non-Green *	4%	4%	3%	3%	2%	**
Payback on Green Efforts	7 Years	7 Years	4 Years	9 Years	5 Years	4 Years

* Canada findings reported by owners and architects, while other findings reported by owners only.
** Sample size too small for separate analysis.
Source for Global, U.S. Europe, Asia and Brazil findings is McGraw Hill Construction's 2013 *World Green Building Trends SmartMarket Report.*

Canadian Construction Market

To understand the implications of the findings of the study on green building, it is helpful to have the larger context of the performance of the Canadian green building market over the last few years, as well as the projected growth of that market. Canada is also part of a larger North American construction market with many industry players conducting work, and selling products and services in both countries. Therefore, it is valuable to understand the similarities and differences in what is driving green in both the U.S. and Canada. Seeing the two markets in the context of each other reveals the opportunities both now and in the near future.

NON-RESIDENTIAL CONSTRUCTION MARKET

The experience of the worldwide recession that emerged from the financial crises in the fall of 2008 was very different in Canada than in the United States. McGraw Hill Construction Dodge's *Construction Market Forecasting Service* (CMFS), which covers U.S. construction, reports that non-residential construction starts (projects starting in the commercial, industrial and institutional sectors) plummeted 30% by value in the U.S. from 2008 to 2009, and the market stayed at historically low levels until the small but notable upswing of 9% in 2013.

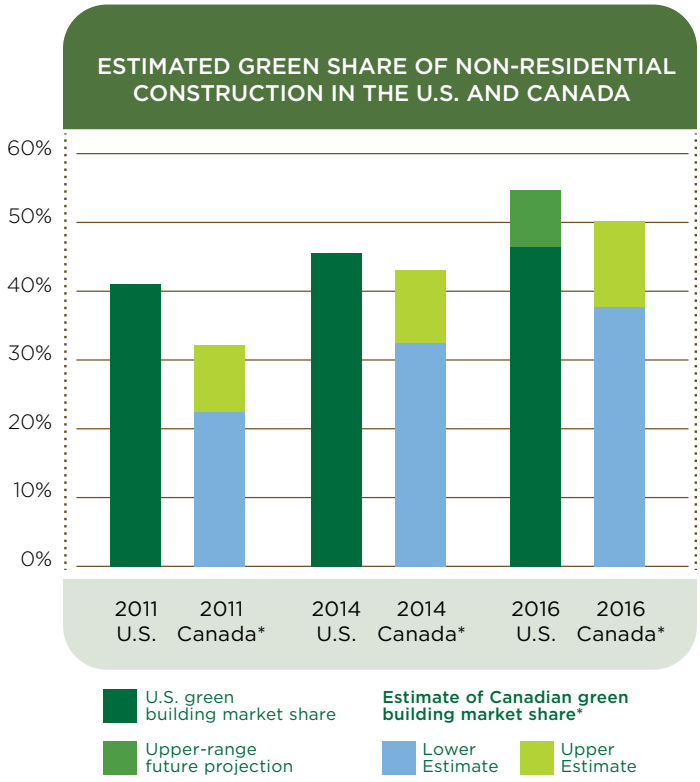
In Canada on the other hand, non-residential building permits saw a 17% reduction in 2009, but had a recovery by 22% in 2010, according to McGraw Hill Construction Dodge's *Canadian Construction Forecasting Service* (CCFS). Less dramatic, but still steady, growth occurred in non-residential construction in Canada through 2012. However, 2013 reflected a drop of 9% in the non-residential market from 2012, and 2014 is currently forecasted to be flat. The economists at McGraw Hill Construction attribute this drop-off in construction to fiscal constraints put in place in response to the relatively weak recovery in the overall Canadian economy, which has dampened the growth in construction activity. While a prolonged downturn is not expected from this, growth remains at relatively low levels in the near future.

Through 2016, McGraw Hill Construction is forecasting double-digit growth in the value of new non-residential project starts for each year for the U.S., but in Canada, while growth in building permits issued is expected in 2015 and 2016, it is not expected to top more than 4% in any one year. Thus, the two markets are recovering very differently from the recession: in the U.S. a dramatic increase is expected after a long dip, while in Canada, the market is more stable, with small shifts year over year rather than the forecasted steep increase expected in the U.S.

IMPLICATIONS FOR THE GREEN NON-RESIDENTIAL MARKET

The very different patterns for construction market growth, combined with the finding about the level of green growth anticipated in Canada according to this study (*see page 11*), creates a very different picture than the expectations for green growth in the U.S. market.

In the U.S. non-residential construction market, from 2010 to 2013, the increasing share of green in a small and stagnant market still led to the growth of the green market by 30%, from $48 billion to $62 billion. By 2013, the gains in the share of green had begun to modulate, with growth in green between 2013 and 2016 expected to jump from 44% of the market in 2013, to 47%–55% of the market by 2016. However, the aggressive growth of the market itself leads to an expectation that the calculated $68 billion green opportunity in 2013 will expand to between $106 and $125 billion by 2016.



In Canada, increased green building activity is widely predicted by many firms in this study, which suggests that the share of green in the overall market is likely to grow at a strong pace. Therefore, it is likely that the pattern in the Canada green building market during this slow period of growth may resemble that of the U.S. market from 2010 to 2013. While Canada's construction market is much smaller than the U.S. and the specific project data used to build the green building share in the U.S. are not available in Canada, the market data from this study suggests that a similar pattern may

be emerging in Canada (a pattern that looks like the early years in the U.S. recession), with green providing opportunities in a market that may not offer strong growth, but does present a relatively stable overall market.

THE OVERALL AND GREEN COMMERCIAL MARKET

The commercial market in Canada basically follows the pattern of the non-residential market, with the gains of the last few years dropping back into negative territory until 2015, and no rigorous growth anticipated even after that. The largest drop in 2013 is anticipated in the retail (trade and service) sector, but only the small recreation sector has forecasted growth for 2013.

44% of the respondents to this study reported that they expect to be building green in this sector, tied with institutional as the highest of any individual building category type. Only existing buildings had a higher level of activity reported. This suggests that the pattern in commercial green share growth may mirror that of the overall non-residential market.

Research conducted in 2013 on the share of green in the retail market in the U.S., published in McGraw Hill Construction's *Green Retail and Hospitality SmartMarket Report*, reveals that 38% of the owners in that sector were doing more than 50% of their projects green in 2013, and that figure is expected to grow to 52% by 2016. It is likely that the expertise and expectation of green being developed in the U.S. will also impact the Canadian retail market, although more research is needed to determine the level of penetration of green into that sector of the Canadian commercial market.

THE OVERALL AND GREEN INSTITUTIONAL MARKET

The institutional sector is expected to begin growing again in 2014, and see growth at a steady pace of around 4% through 2016. The most active group in this sector for the next few years is medical hospital construction, which is the only institutional type of building in which double-digit growth is forecasted for this year.

With 44% of respondents also expecting to build green in this sector in the next three years, the share of green should be about the same, but the size of the actual opportunity should increase growth with the increasing overall institutional market. Education is typically a strong sector for green, as the findings in the U.S. in McGraw-Hill Construction's 2013 *New and Retrofit Green Schools SmartMarket Report* demonstrate. That study reveals that by 2012, 45% of all school construction in the U.S. was green, with two thirds of the K–12 schools and well over three quarters of the university-level institutions obtaining green certification on their projects. It is likely that there is also significant green investment in new construction in the Canadian school market.

In addition, the growth in hospitals should also make that sector of interest to firms seeking green opportunities. This growing interest may provide particular opportunities, both in Canada and beyond, surrounding the health impacts of buildings on their occupants as an important aspect of green building. Hospitals present unique challenges in terms of materials that can be used, but their large energy use also makes them a sector in which a green approach can be particularly rewarding on a financial level.

RESIDENTIAL CONSTRUCTION MARKET

The pattern in Canada for residential market permits strongly resembles the pattern for non-residential building, although the peaks are a little higher. After a 20% drop in the market in 2009, 2010 saw an immediate 36% growth over that year, with strong growth in the single family market and a large leap in the multifamily market. After that initial push, growth has been more modulated but still consistent, until a slight 3% drop forecasted for 2013. However, steady growth is expected between 2014 and 2016. The drop and the lower level of growth are influenced by high levels of debt for Canadian households, coupled with recent, stricter mortgage insurance rules and tighter mortgage underwriting standards that have been enacted in the last few years.[1]

This is in marked contrast to the U.S., in which single family housing remained depressed until significant growth in 2012. However, the market is expected to continue seeing high, double-digit growth through 2016, returning back to pre-recession levels by 2015. Multifamily housing on the other hand almost immediately recovered after a 53% drop in 2009, with growth of 23% in 2010, 32% in 2011, and 36% in 2012. Starting in 2013, the growth begins to modulate, but it is still expected to occur through 2016. This shift up in the U.S. multifamily housing can be attributed to the high level of home foreclosures and the impact of the poor job market throughout the recession, which has created greater need for multifamily housing. In addition, the ongoing push for baby boomers to retire and downsize is also continuing to help drive this market in the U.S.

IMPLICATIONS FOR THE GREEN RESIDENTIAL MARKET

In the U.S., green market share for residential is significantly lower than it is in the non-residential market, but it has steadily grown from 14% in 2010 to 20% in 2012, and projected to be 24% in 2014. In Canada, a much higher percentage of firms expect to do residential green projects in the next three years (25% low-rise and 31% mid-/high-rise) than the U.S. respondents in the 2012 study (14% low-rise and 21% mid-/high-rise). While this does not provide specific numbers on the amount of green projects they expect to build, it indicates the share of green building projects in the Canadian residential market is likely to grow at a higher rate than that observed in the U.S., so the market opportunity in the residential sector may be substantial.

1 Dow Jones & Company Inc. "Canada Building Permits Decline Unexpectedly in March." *Dow Jones News and Commentary*. 7 May 2014. Accessed 8 May 2014. *https://snapshot.factiva.com/Pages/Index*

DATA Section 1

Green Building Market Activity

Fifth Avenue Place, LEED Gold | Owner: Brookfield Office Properties

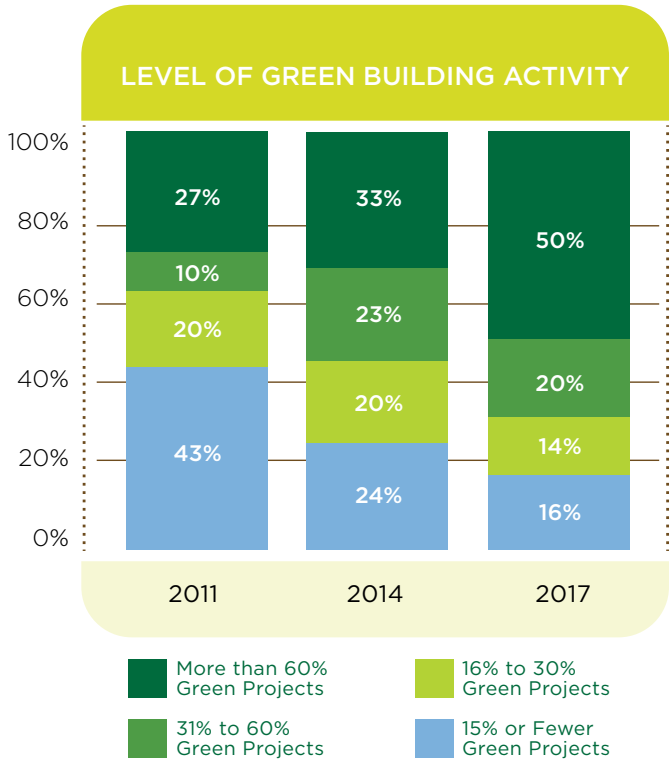
Level of Green Building Activity

Green building has already taken firm hold in the Canadian marketplace and is expected to become even more common. The percentage of firms doing over 30% of their projects green has grown by half in just the last three years.

- **2011: 37% were doing more than 30% of their projects green.**
- **2014: 56% are now doing more than 30% of their projects green.**

Most of the growth in the last three years has been in the intermediate levels of greener building, with the highest level of growth in the 31% to 60% category.

This trend becomes more marked in the near future, but with a notable shift. The largest percentage of growth is expected in the category of those doing more than 60% of their projects green, with half of the firms that participated in the survey expecting to be at that level by 2017.



Comparison with 2012 Global Findings

Canadian firms are slightly higher in their level of green involvement than the global averages reported in 2012. However, the difference is probably due to the additional two years, rather than due to a higher level of green activity in Canada than in other countries globally because it falls between the 2012 levels reported and the levels that global respondents expect to achieve by 2015.

- **15% or fewer green projects:** In 2012, the global average was 32%, but by 2015, that is expected to shrink to 12%.
- **More than 60% green projects:** In 2012, the global average was 28%, but by 2015, that is expected to grow to 51%.

Comparison with the 2012 U.S. Findings

The U.S. participated in the global study, and the findings are particularly relevant for the Canadian market because of the interconnected nature of the two construction marketplaces.

In the 2012 survey, 62% of U.S. respondents reported doing more than 30% green projects, and 40% reported doing more than 60% green projects. This demonstrates that on the basis of activity, the U.S. does report a higher level of green activity than Canada does. However, the level of growth in the category of those doing more than 60% of their projects green in the next three years by the 2012 U.S. respondents, was more tempered than the equivalent growth now anticipated in the Canadian market.

- **U.S.: The percentage of those doing more than 60% of their projects green was expected to grow by 13 percentage points to 53%.**
- **Canada: The percentage of those doing more than 60% of their projects green is expected to grow by 23 percentage points to 50%.**

These findings suggest that the U.S. as a more mature market is starting to see more incremental growth, but that Canada is still in the process of rigorous growth and should soon see green activity at more equivalent levels with the U.S.

Variation by Size of Firm

Large firms and small firms report higher levels of green building activity than moderately sized firms.

- Small Firms (revenue under $1 million): 47% currently do more than 60% of their projects green.
- Medium-Size Firms (revenues between $1 million and $250 million): 26% do more than 60% of their projects green.
- Large Firms (revenues over $250 million): 38% currently do more than 60% of their projects green.

Similar patterns have emerged in the U.S. studies of green adoption. Large firms have the resources to build green expertise, while small firms may specialize in green, and with fewer projects, may be more likely to have a large percentage of their work be green.

It is also notable that the pattern continues to hold in their predictions of the amount of green work they will be doing by 2017. Thus, the greatest opportunity for growth in the future lies with encouraging wider adoption of green among firms in the middle range of revenue.

Building Sectors for Future Green Building Activity

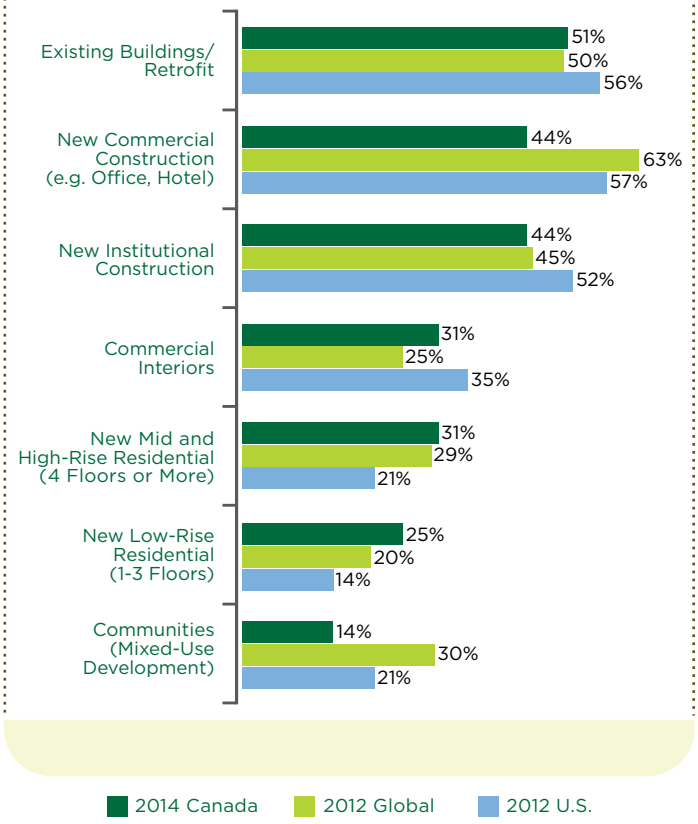
There is a high level of agreement among Canadian firms about the sectors in which they plan to build green in the next three years, with only a seven percentage point difference between existing buildings/retrofit, new commercial construction and new institutional construction. These findings demonstrate that green building is not confined to a single sector. They also suggest a particular emphasis in Canada on greening existing buildings.

COMPARISON WITH 2012 GLOBAL FINDINGS

For the most part, the project types for future green building activity in Canada correspond to the areas that were reported in the 2012 World Green Building Trends study, with two main exceptions.

- **Canadians report fewer expected green communities.** However, the interest in looking at green building at the community level expressed by many of the institutional green experts that participated in the in-depth interview research (*see pages 16-17*) suggests that this area may see more growth than the respondents in the study currently realize.

SECTORS WITH PLANNED GREEN BUILDING ACTIVITY OVER THE NEXT THREE YEARS



- **A lower level of new commercial construction is expected in Canada than was reported globally,** which is not surprising, given the relatively low percentage of highly populated, dense urban areas in Canada. However, the green experts in commercial real estate who participated in the in-depth interviews report that, for high-end commercial construction, there is an expectation that projects will be green, and that it is essential to be able to demonstrate that these properties are green to remain competitive in the marketplace (*see pages 16–17*).

COMPARISON WITH THE 2012 U.S. FINDINGS

A few key differences also emerge from comparisons with the U.S.

- **More firms report that they expect to do commercial and institutional green projects in the U.S. than in Canada.** Since these two sectors typically dominate the green market, this is likely due to the higher overall levels of green activity expected.
- **More firms in Canada expect to do green residential projects than in the U.S.** This finding holds for both the high-rise and low-rise markets. This finding may correlate with the high level of interest in green features reported by the experts in green commercial real estate in the in-depth interviews (*see pages 16–17*), which suggest that there is a generally high public awareness and interest in green.

VARIATION BY GEOGRAPHIC LOCATION

Among the three provinces with a large enough level of response for statistical comparisons to be made (Alberta, British Columbia and Ontario)[1], there are some differences that suggest that the greening of certain project types is emphasized more in some regions than others.

- **50% of firms in British Columbia expect to build green, mid- to high-rise residential projects in the next three years,** compared with 32% in Ontario and 15% in Alberta.
- **65% of firms in Ontario report that they plan to do green existing building/retrofit projects in the next three years,** compared with 40% in British Columbia and 32% in Alberta.

VARIATION BY LEVEL OF GREEN INVOLVEMENT

Respondents from firms doing more than 60% green projects report doing a significantly higher percentage of green projects in new commercial and residential construction. However, what is more surprising given their overall higher level of green work, are the sectors in which they are not doing a significantly higher percentage of green projects.

- **Institutional: 52% of firms doing more than 60% green projects plan to do green institutional building projects in the next three years,** compared with 53% of those doing 31% to 60% green projects, and 45% of those doing 16% to 30% green projects. The lack of a strong differential among respondents from firms with a high green involvement, and firms with a lower level of green involvement in this sector may suggest that many firms are introduced to doing green on their institutional projects, especially given that many institutions have well-published sustainable goals.
- **Existing Buildings/Retrofit: 54% of firms doing more than 60% green projects plan to do an existing building/retrofit project,** compared with 62% of those doing 31% to 60% green projects, and 61% doing 16% to 30% green projects. While none of these differences are statistically significant, they are notable. More research is needed to determine why there is a tendency for firms doing less green work in general to do more green retrofit projects.
- **Commercial Interiors and Communities:** The relatively low level of firms expecting to do green work in these types of projects may be due to several factors. The consistency of the result across firms of all levels of green involvement could demonstrate that this is not an area in Canada with wide green penetration. However, it is also possible that these project types may not be as commonly done among the survey respondents in general, thus skewing the results slightly and making the results appear lower in the level of green work being done, compared to the actual market. More study is needed to determine the exact factors leading to these low percentages.

1 See Methodology on *page 4* for explanation of survey respondents. These three provinces were the only ones that yielded statistically significant samples to make quantitative statements about their markets.

Expected Use of Green Building Certification/ Rating Systems by Building Sector

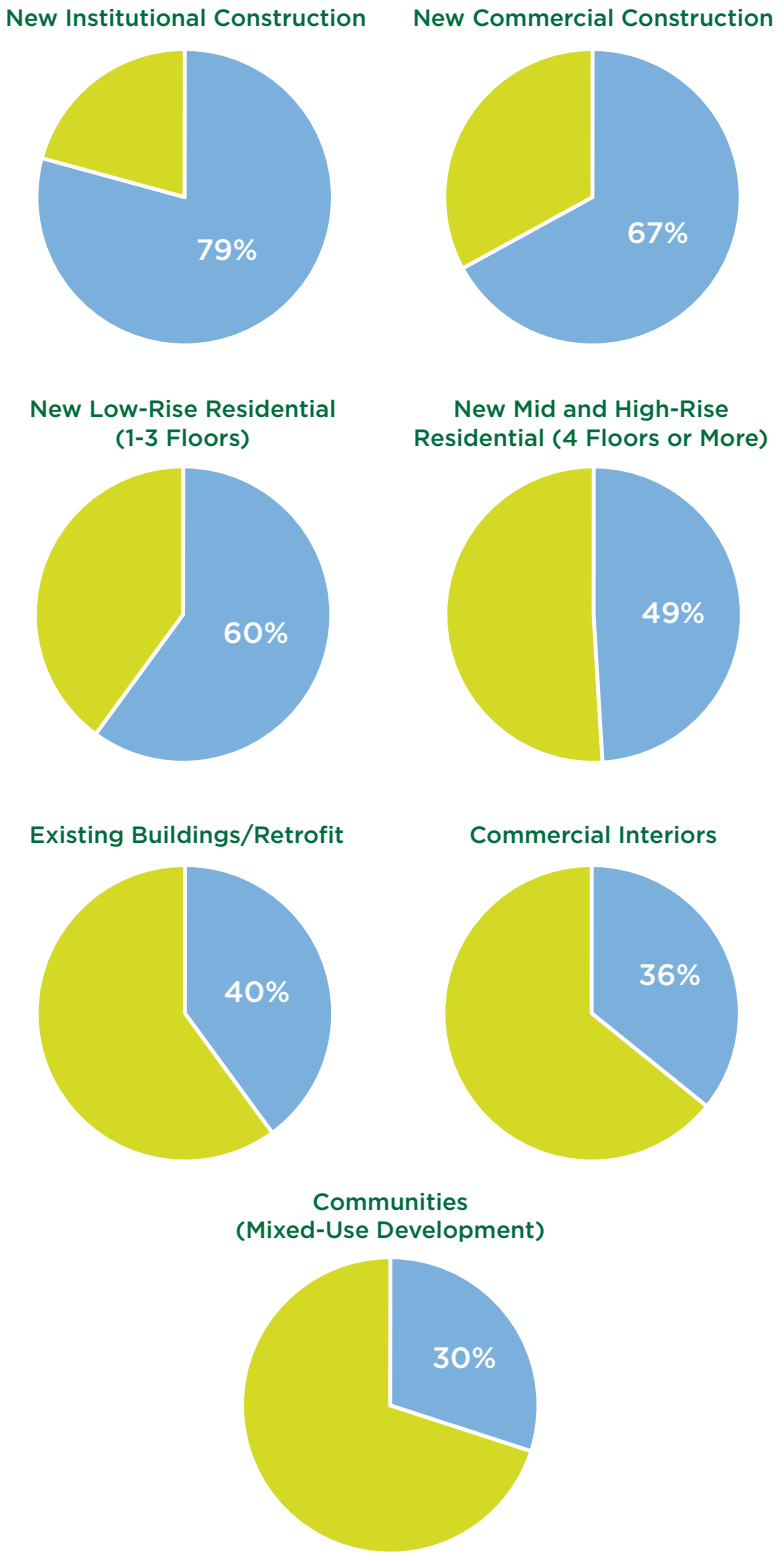
On *page 11*, the building sectors in which respondents expect to build green in the next three years were reported. Respondents who are planning to do green building in those sectors were also asked about whether they plan to seek green project certification on 50% of their projects or more. The findings clearly demonstrate that the use of certification is expected to vary strongly by sector.

- **Most green projects in the institutional and commercial sectors are expected to seek green certification.** The green experts in the in-depth interviews reported that in Canada, there is now an expectation that significant commercial and institutional projects will be green, therefore it is not surprising that certification is also widely used.
- **Certification is expected to be more widely used in low-rise residential projects than it is in mid- to high-rise residential projects.** This finding suggests that the greening of residential projects in Canada is not expected to be largely focused on urban, luxury units, as is a typical pattern in the U.S.
- **Certification carries less sway for existing buildings than it does for new commercial or institutional buildings**. This finding is notable because it suggests that that existing building projects are being pursued for operational savings, rather than for market positioning, since the third-party verification of greening efforts is less frequently pursued.
- **Green certification is still emerging as a trend in commercial interior and community projects.** However, the institutional experts in the in-depth interviews do report growing interest in consideration of green at the community level, including district energy, eco districts and other efforts. As these become more prominent, it is likely that certification at the community level may increase.

VARIATION BY FIRM TYPE

Nearly all building owners that plan to do green building in the commercial and institutional sectors plan to certify at least half of their green projects. Because owners typically make the decision about whether certification occurs, this further supports the perceived necessity to build green in these sectors in order to be competitive.

SHARE OF ANTICIPATED GREEN BUILDING PROJECTS BY SECTOR EXPECTING TO BE CERTIFIED



Benefits of Using a Rating System

Among the respondents using rating systems, the highest percentage (73%) report that better performing buildings are the main benefit they achieve, exceeding the next most popular benefit—marketing/competitive advantage—by 19 percentage points. This strongly suggests that the decision to use a certification system is driven more by the rigour required in the approach to green than by promotion of the project as green, which is often associated with the use of such systems.

However, **the fact that 54% do consider marketing/competitive advantage a benefit to the use of a building rating system, does demonstrate that the ability to have third-party verification of green assertions can improve the marketability and appeal of green projects**, impacting the feasibility and desirability of making projects green.

Forty-nine percent of respondents also consider the way in which rating systems provide a common industry standard important. When considered together with the high percentage that find marketing/competitive advantage an important benefit, it suggests that respondents appear to value the ability that rating systems have to quell concerns about the reliability of green claims.

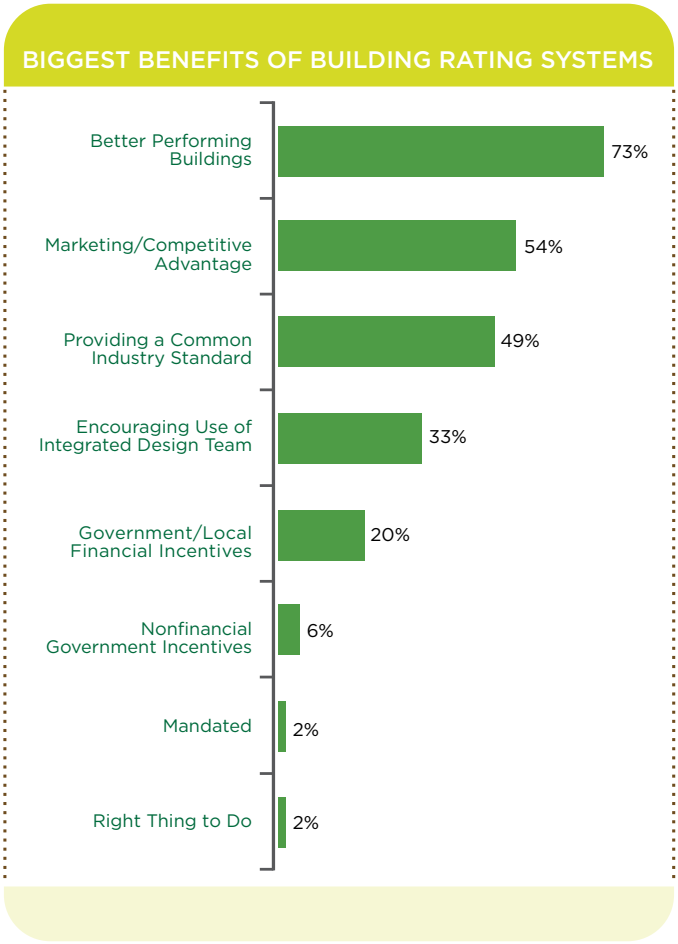
Meeting mandates or achieving government incentives are not perceived to be significant benefits of rating systems, suggesting that private industry rather than government is more important in Canada for driving the value associated with obtaining a green building rating.

COMPARISON WITH THE 2012 U.S. FINDINGS

While better performing buildings is also a top benefit for U.S. respondents, selected by 75%, the same percentage also finds that the marketing and competitive advantages of a rating system are important. This corresponds with the findings that demonstrate that the U.S. market is triggered more directly by the business benefits of green (*see page 24*).

Two other key differences reported by the U.S. and Canadian **respondents suggest that respondents in the U.S. are more attuned to the benefits of a rating system that improve the process of building and communication between project team members than Canadian respondents.**

- 54% in the U.S. find that using a rating system encourages use of an integrated design team, compared with 33% in Canada.
- 61% in the U.S. find that a rating system provides a common language in the industry.



VARIATION BY TYPE OF FIRM

86% of owners find that better performing buildings is one of the biggest benefits of using a green rating system. For owners, use of a rating system may help demonstrate that they will achieve the level of building performance they need in order to see a better return on their green investment, and perhaps even carry more authority than the estimates of their design and construction teams.

Architects are more attuned to the impact of using a rating system in their process, with 48% reporting that one of the biggest benefits of using a system is that it encourages the use of an integrated design team. One of the advantages noted by many practitioners using integrated design is that the design intent is less likely to be value engineered out of an integrated design project, perhaps contributing to the wider recognition of this benefit by architects.

Data Sidebar:

Perspectives on the Canadian Green Building Market from Green Leaders in the Commercial and Institutional Sectors

As part of the research for this report, McGraw Hill Construction conducted a series of confidential, in-depth interviews with green building leaders who are senior executives at commercial real estate and institutional organizations. Ten interviews were conducted in all, with five in each sector. Their perspectives as highly knowledgeable, forward-thinking experts in the area of green building help shed light on: the benefits, drivers and obstacles for green building in Canada, specific green building strategies favored now and in the near future, and the aspects of Canada that makes its green building market unique.

BENEFITS OF GREEN BUILDING

Both the practices that they currently pursue and the practices they intend to adopt in the future demonstrate that energy savings are the top priority in the Canadian market. This is most clearly evident in the green activities in the next few years anticipated by the green leaders in both the commercial and institutional sector. Most of the commercial owners plan to focus on strategies to improve upon their gains in energy use savings, including plans to use cogeneration and deep lake cooling, real-time energy monitoring and increased use of LED lighting. Among the institutional green leaders, at least one is focused on having building owners provide mandatory benchmarking of energy use on large commercial buildings, while others seek to strengthen their current efforts to increase energy efficiency in their existing buildings.

Despite the focus in current and future activities on energy, the owners in the commercial and institutional sectors interviewed do not see cost savings alone as the key benefit of green buildings. **The top benefit, in addition to cost savings, reported by the experts in green commercial real estate, is creating a positive tenant experience.** One owner summed up the top benefits they get from their green building efforts concisely as: "tenant engagement, tenant retention, recognized leadership in the industry and tenant attraction." Several regard improving tenant business as the primary function of their company and green building as a highly effective means to reach that goal.

Institutional owners also highly value energy savings, but they link their energy use reduction efforts to the goal of reducing greenhouse gas (GHG) emissions. **Another related key benefit for institutional owners, and one that is frequently mentioned as a driver, is the ability to influence the market by leading by example.** One institutional leader explains that they believe their green building efforts impact the larger market. "People get used to doing things differently, and that transfers over into everything they do—economic stimulus and green awareness." Health and productivity benefits are also mentioned as important by two of the green leaders in the institutional sector, reflecting the growing interest in capturing the impact of green buildings on these factors across the green industry as a whole. However, most of the commercial owners caution that they find it difficult to obtain specific, quantifiable data on building impacts on health and productivity.

DRIVERS OF GREEN BUILDINGS

For the green leaders in commercial real estate, the drivers align with the key benefit of improving tenant experiences. **In fact, one of the critical findings of this research, both in these interviews and in the industry survey, is that the Canadian market is motivated to an unusual degree to build green because it is the right thing to do.** In the commercial real estate market, this is reflected in the expectations that tenants bring to green buildings.

One green leader in commercial real estate who has been in the industry for 40 years, reports that he has seen a true sea change in terms of client awareness of green over his career. He describes how the results of their annual survey of over 50,000 occupants of their buildings clearly demonstrates the growing importance of sustainability to their tenants: "We notice across time that people are more and more socially conscious. They want to work in a workplace that is going to minimize the adverse impact on the global environment. They are prepared to have warmer space in the summer and cooler space in the winter to minimize greenhouse gas emissions. They want recycling programs, waste diversion programs, composting programs, et cetera, and they want natural daylight and fresh air."

Another key factor reported by both commercial and institutional green leaders in these interviews that differentiates the Canadian market and encourages the growth of green building is the role that institutions like pension funds and banks play, directly as building owners, as funders of/investors in projects, and as tenants. One commercial real estate green leader states, "I think [green building] is driven by the institutional client base that owns a big portion of the Canadian real estate market. Any of the big downtown towers are generally owned by an institutional company—an institutional pension fund or a bank. In the U.S., it is still a lot of developers." And institutional green leaders spearheading the push toward sustainability at a major university find the investment by institutions like pension funds into the green building market to be an exciting emerging trend: "Instead of investing in the stock market, [pension funds] are investing in the energy efficiency of existing buildings…The payback on [these investments] is very robust, especially if you are in the first wave of energy retrofits."

For institutional green leaders, the drivers also largely align with the most important benefits: they see the ability to lead by example and to reap energy savings as key drivers in the market. However, at least one institutional green leader believes that to drive the market further, a key component that is missing is providing a way to capture the value of reducing carbon and GHG emissions. Many of the institutional efforts around green seek to impact those emissions, but they cannot reflect the benefit of those reductions in business plans or their calculations of their return on investment.

OBSTACLES TO GREEN BUILDING

Commercial and institutional green leaders agree that several obstacles impede additional increased green building investment in Canada.

- **Concerns and misperceptions about higher first costs (capital expenditures made at the start of a project):** Many feel that this concern continues to weigh on the Canadian market. One of the green leaders in commercial real estate though, reports only nominal impacts on his decision to build a LEED Platinum office building, asserting that, by setting Platinum certification as a goal from the start of the process, the additional cost was less than 2% of total construction cost.
- **Low cost of energy:** Respondents from different sectors and from different parts of Canada find that the low cost of energy in Canada dampens the potential of green building investments. The ability to also provide a financial benefit for GHG emission reduction could help offset this issue.
- **Rural areas/small cities:** The comparative dearth of large population centers across the majority of Canada, compared with other advanced green nations, makes green adoption more difficult, largely due to costs and the additional challenges in these areas of obtaining LEED credits for certification.

Misperceptions about green also persist in the U.S. market despite research and public communications on achieving green affordably. However, the green leaders in the interviews did put far more weight on the factors driving green building in Canada than the factors limiting its application.

GREENING AT THE NEIGHBOURHOOD SCALE

One aspect of green building that emerged from the institutional green leaders, but that is not widely reflected in the industry survey or the responses from the commercial green leaders, is the increasing importance of attempting to lift greening efforts to the neighbourhood scale. Despite the fact that this element of green building was not included in the formal survey, this issue came up in discussions with four out of five of the institutional leaders as an important trend emerging in their green building efforts.

Three different neighbourhood scale measures were discussed:

- **District energy:** Use of district energy systems, where neighbourhoods can use cogeneration or other low-carbon energy production, can be a cost-effective way to reduce carbon emissions. One city that has employed this approach reported getting some initial resistance from private firms required to hook up to the system, but they have also found that this resistance tends to fade over time.
- ***Eco districts:** Eco districts have either guidelines or requirements for specific sustainable goals, such as a targeted level of energy conservation that they require from all buildings within the defined district. One city reports two different types of eco districts based on zoning differences.
- **District-wide stormwater catchment systems:** Water management typically functions better at a larger scale when the entire watershed can be considered.

Efforts of greening at the neighbourhood level are typically best pursued by the public sector, and this movement may not yet be impacting design and construction industry firms. However, in the longer term, it could have significant implications for the approach to green in Canada.

**EcoDistricts is a specific program sponsored by the Canada Green Building Council. Though this term was used by interview subjects to be more encompassing of community zones, it is important to note that as defined, an "eco district" is a framework with a prescribed process to identify and implement sustainability measures at a district scale.*

METHODOLOGY

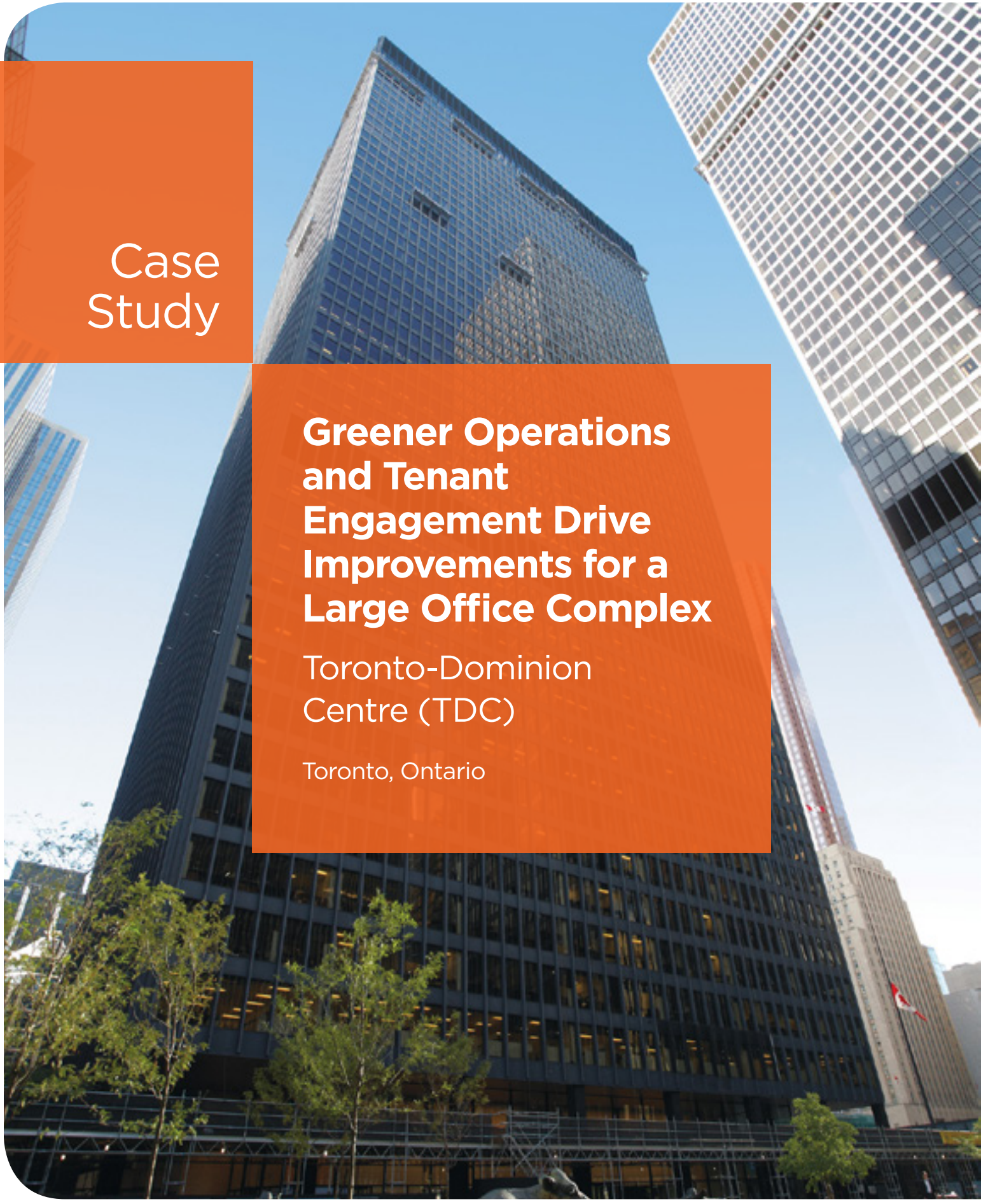
McGraw Hill Construction conducted confidential, 30-minute, in-depth interviews with 10 building owners—five in the commercial real estate sector and five in the institutional sector. All interview subjects were senior people directly in charge of sustainability efforts for their organization. The commercial real estate/asset management firms varied from ones that were primarily focused on Canada, to ones primarily focused on North America, to ones that have a global focus. The size of their portfolios ranged from 40 million square feet in Canada to 300 million square feet globally. The institutional organizations included in the study are an organization at the federal level, one at the provincial level, one at the regional level, one at the municipal level, and one university.

Case Study

Greener Operations and Tenant Engagement Drive Improvements for a Large Office Complex

Toronto-Dominion Centre (TDC)

Toronto, Ontario



Photos: Cadillac Fairview

With six office towers, an iconic design pioneered by renowned architect Ludwig Mies van der Rohe, over four million square feet of rentable space and more than 21,000 tenants, the Toronto-Dominion Centre (TDC) has been one of Canada's largest and most celebrated commercial real estate communities for nearly 50 years. Mies van der Rohe's first two international- style towers were completed in 1967 and 1969; the other buildings followed between 1974 and 1995. Though they were innovative in their time, TDC's oldest towers in particular used more energy and resources than newer buildings of the same scale due to improvements in materials, construction methods and building systems.

Façade upgrade at 77 King Street seek to maintain the appearance of the heritage-protected design while improving performance.

Cadillac Fairview, TDC's owner and manager since it was first built, knew there was room for improvement. Complex-wide upgrades and retrofits helped reduce its energy and water consumption in the earlier half of the 2000s, and further improvements have been made since 2008, when Cadillac Fairview launched its Green at Work program to shrink the environmental footprint for all of their properties in Canada.

"We've always been focused on managing properties efficiently, but when we established Green at Work, we began to monitor building performance in detail so that we can develop best practices, set baseline green standards and establish measurable yearly reduction targets," says Cadillac Fairview's David Hoffman, who serves as TDC's general manager.

In the last few years the complex's capital and operational improvements, environmental stewardship, and innovative landlord/tenant initiatives have earned it recognition from a wide range of environmental and civic organizations as well as green building certifications, including one Platinum and three Gold certifications through LEED for Existing Buildings; the remaining two buildings are expected to attain LEED status by the end of 2014.

UPGRADES AND CAPITAL IMPROVEMENTS CONSERVE RESOURCES

Before Green at Work's 2008 launch, "we'd already begun making retrofits at TDC, such as a building automation upgrade and replacing old HVAC equipment with newer, more efficient models," says Hoffman. During this time, the biggest bang for their buck was modifying the HVAC system in 2003 to use deep lake water cooling, drawing cold water from the bottom of Lake Ontario to cool its buildings. The service is provided by Enwave Energy, which collaborates with the city of Toronto to bring it to commercial buildings in the downtown core. The switch allowed TDC to eliminate its evaporative cooling towers, reduce HVAC water use by 15%, and lower electricity use for air-conditioning by 90%.

Living roof on the TD Bank Building

One major upgrade that's still underway is a window and façade revitalization program for the two original Mies van der Rohe buildings at 77 King Street and 66 Wellington Street. Over time, inefficient single-pane windows and glazing are being swapped out for insulated, double-pane, low-e models that let in sunlight but prevent excess heat gain to lower cooling loads. The windows were tinted bronze and their design chosen to harmonize with the towers' heritage-protected design. "Preserving the iconic look of these buildings is both a requirement and a key consideration as we make these changes," says Hoffman.

Investing in advanced monitoring, automation and control technologies allows TDC's building managers to access energy performance in real time and make tweaks to optimize efficiency. "We do this not only to save money and conserve resources, but to protect the health and well-being of TDC's occupants, which makes for happier workers and more productive tenants," says Hoffman.

Regular audits and ongoing commissioning of HVAC equipment and systems ensure that tenant spaces are comfortable, properly ventilated and free of indoor pollutants. The automation upgrade also enabled TDC to install a metering system by manufacturer Carma that allows tenants to be sub-metered for electrical consumption. "Since tenants pay only for what they use, they have a direct, measurable incentive to curtail these expenditures," says Hoffman.

To guide these intricate decisions, Cadillac Fairview formed a multidisciplinary Energy Innovation Team for TDC composed of its building operators, equipment suppliers, and building and sustainability consultants. The team offers strategic and expert advice on system and technology investments, trains the building staff in best practices, and performs the certifications and audits that managers use to track and improve performance.

CONTINUAL MEASUREMENT, COLLABORATION AND TRANSPARENCY GET RESULTS

Hoffman calls building occupants the "missing link to achieving high environmental performance" particularly at multi-tenant office buildings that host businesses of different sizes and missions. At TDC, Cadillac Fairview has engaged them as active participants in achieving sustainability targets.

This initiative has several facets. TDC's Green Council, composed of representatives from Cadillac Fairview and tenants appointed by each organization's leadership team, meets quarterly to review progress on goals and to set and prioritize new ones. The Council's decisions serve as a driver for the Occupant Engagement Program (managed by contractor HOK), which leads conservation efforts by encouraging people to change the way they use and interact with their workplaces. "Each year the group votes on the conservation efforts that are most critical to them. Then we align those priorities to our resources and work together to make them happen," says Hoffman.

These collaborations have led to several successful conservation and waste reduction campaigns. Among them are an energy awareness effort that encouraged tenants to revise lighting hours, re-lamp office spaces and turn off equipment at day's end, resulting in a reduction of plug loads and lighting energy use by 2.4 million kilowatt-hours; the establishment of a daytime cleaning option, which lowers evening energy consumption, strengthens the relationship between TDC's tenants and cleaning contractors, and improves quality of life for cleaning workers; a dedicated e-waste collection program to support TDC's long-term goal of sending zero waste to landfills; expansion of transit options by building infrastructure to support alternatives such as biking and car sharing; and a current campaign to improve indoor air quality.

Partnerships with individual tenants have also yielded benefits. In 2012, Cadillac Fairview teamed up with TD Bank Group to add a 22,000-square-foot living roof to the TD Bank Building. Its native, drought-resistant plants absorb thousands of gallons of stormwater runoff and reduce the building's cooling load.

PROJECT STATISTICS	
Project location	Toronto, ON
Building type	Commercial
Type of construction	Retrofit/renovation
Number of buildings	Six
Number of tenants	21,000
Building dates	1967 to 1995
Square footage	4.3 million (rentable)
LEED certified buildings	4 LEED-EB; 2 pending
Levels of LEED certification	1 LEED-EB Platinum; 3 LEED-EB Gold
Water use	42% reduction (2008-2013)
Energy use	13% reduction (2008-2013)
GHG emissions per square foot	11.9% reduction (2011-2013)
Waste diversion rate	79% of waste diverted from landfill (2013)

As they did with electricity sub-metering, Cadillac Fairview has put data and resources into the hands of TDC's tenants to

empower them to make smart choices. Its construction manual establishes requirements for retrofits and tenant fit-outs that meet or exceed LEED standards, and guides tenants toward sustainable options. And in 2012 they launched the TDC Green Portal, a website that tracks each building's energy use in real-time via an easy-to-read dashboard display. Each tenant can get a snapshot of their space's performance by day, week or month, and much of this information is available to the general public (http://buildingdashboard.net/tdc/). "The Green Portal and TDC's yearly sustainability reports offer unprecedented transparency of data for a single commercial real estate property in Canada," says Hoffman.

Going forward, TDC plans to keep following the principle of managing what they measure. Continual audits and verification of building performance have yielded valuable information that lets them identify their greatest challenges and develop innovative solutions to solve them. "TDC is a highly visible property due to its size and historic importance in Toronto. We want the improvements we're making here to lead change in the commercial real estate market in Canada," Hoffman says.

He also offers this advice for commercial property owners and managers who want to improve the environmental performance of their buildings: put occupants' health and business goals at the center of these efforts, and demonstrate how sustainability is linked to financial success.

"We're firmly committed to the belief that the highest performing green buildings are achieved when decisions are made collectively, with our tenants, with a transparency that builds trust and encourages action," he says. "Providing a responsive and positive work environment preserves people's health, lowers operating costs, and creates opportunities for success, growth, and long-term business vitality for everybody."

DATA Section 2

Influences on the Green Building Market

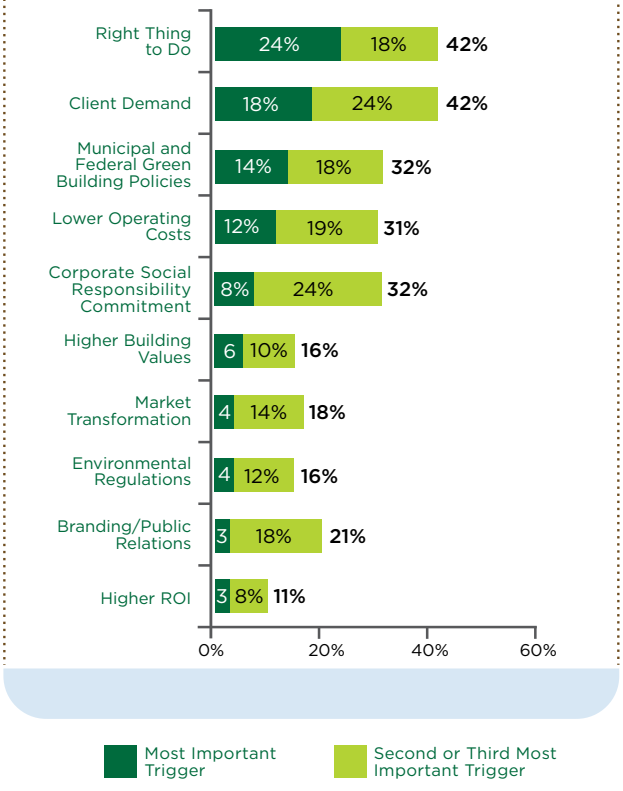
Algonquin Centre For Construction Excellence, LEED Platinum | Owner: The Algonquin College of Applied Arts and Technology
Architect: Diamond Schmitt Architects and Edward J. Cuhaci and Associations Architects Inc.

Top Triggers to Increased Levels of Green Building

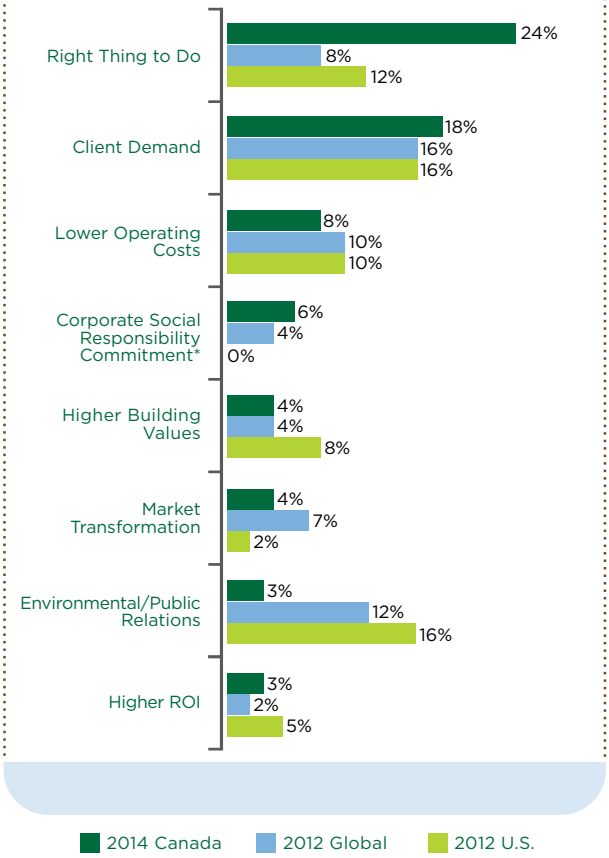
Doing the right thing is the top trigger for increasing levels of green building activity in Canada for nearly one quarter (24%) of respondents, the highest of any factor. This finding is unusual for a green market as advanced as the Canadian market. When McGraw Hill Construction first did its World Green Building Trends research in 2008, the right thing to do was the top trigger, selected by 42%, but it declined to 26% when the study was conducted again in 2012, and a similar pattern holds in the research McGraw Hill Construction has conducted since 2006 of the U.S. green building market. As the green markets studied in these sectors became more experienced, business factors like client demand, corporate commitments and lower operating costs typically became more important triggers than doing the right thing.

However, studies demonstrate that the Canadian market, while still becoming more green (*see page 11*), is a relatively sophisticated and advanced green market. For example, Canada as a country is ranked 24th globally on the 2014 Environmental Performance Index, a joint project between the Yale Center for Environmental Law and Policy and the Center for International Earth Science Information Network at Columbia University, in collaboration with the World Economic Forum. To provide context, the U.S. is ranked 33rd, France is ranked 27th and Japan is ranked 26th.

TOP THREE TRIGGERS FOR INCREASING INVOLVEMENT IN GREEN BUILDING *IN CANADA*



COMPARISON OF MOST IMPORTANT TRIGGERS FOR INCREASING GREEN INVOLVEMENT IN CANADA, COMPARED WITH FIRMS GLOBALLY AND IN U.S.



* In the 2012 global survey, this trigger was listed as Internal |Corporate Commitment.

The important role of doing the right thing in inspiring green building in Canada is supported by the in-depth interviews with green building experts, a number of whom regarded the commitment to green building as the right thing to do as a uniquely Canadian factor that drives companies to do more green projects. In fact, one senior executive of a real estate firm with properties in both Canada and the U.S. notes that their Canadian tenants are far more engaged with green than their U.S. tenants, and that some of the latter regard green initiatives as a burden.

The second most important trigger—tied with doing the right thing when measuring the top three triggers—is client demand (ranked first by 18%). The percentage of Canadian respondents that consider client demand important is roughly equivalent with those in the U.S. and Europe in the 2012 World Green Building Trends study, as well as with the general global numbers. The green experts who participated in the in-depth interviews explain that Canada has an unusually high number of institutional clients, either as building owners or as tenants leasing space. These clients often have strong green goals that companies must fulfill to keep their business. (*See pages 16–17 for more information*).

The high degree of influence of client demand is also linked with the strong percentage that place corporate social responsibility commitments among their top triggers. For example, at 8%, it is the 4th highest trigger ranked first, and 32% place it in their top three (*see chart on page 23*).

The remaining two important triggers driving the Canadian market are both selected by a relatively high percentage of respondents as the most important factor in addition to their strong performance in the top three selections.

- **Municipal and Federal Green Building Policies:** These can range from mandates to incentives (*see page 26*). As one of the green experts in the in-depth interviews notes, policies such as these can help drive the market among those that are not at the leading edge of sustainability. Another green expert notes that mandates and incentives may be critical to encourage more green building activity among lower-value buildings.
- **Lower Operating Costs:** This is consistently an important factor in driving the green market, both in Canada and globally. However, as a larger percentage of buildings within the market become more efficient, and energy efficiency generally becomes more widespread, the importance of this driver may begin to decline.

COMPARISON WITH THE 2012 U.S. FINDINGS

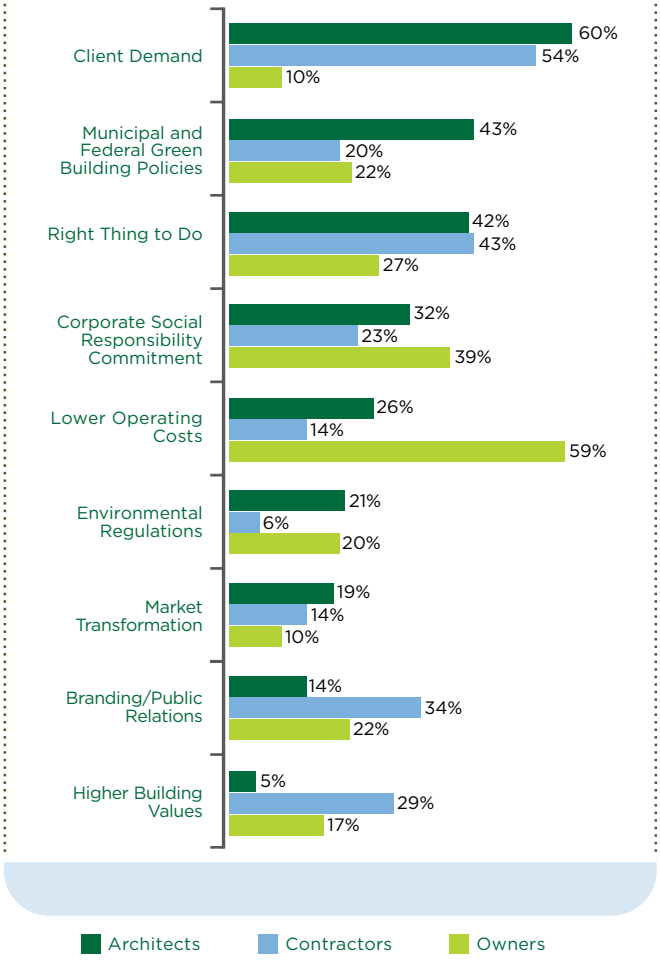
One critical difference between the U.S. and Canadian markets is in the much higher importance placed in the U.S. on branding and public relations than in Canada. Again, this may be a factor of a greater emphasis on business benefits in the U.S.

VARIATION BY FIRM TYPE

While overall, most of the triggers apply equally across firm type, including the top trigger of The Right Thing to Do, there are some factors that have a greater or lesser impact on some types of firms than others.

- **Architects: 44% of architects rank municipal and federal green building policies as one of the top three triggers increasing their involvement with green,** and a very low percentage (5%) consider higher building values among their top three triggers.
- **Contractors: A high percentage of contractors (34%) rank branding and PR as one of the top three triggers.** However, contractors are notably less influenced by environmental regulations, with only 6% reporting this as a trigger. These findings suggest that for contractors, green is a way to differentiate their business.
- **Owners: Not surprisingly, a much higher percentage of owners (59%) consider lower operating costs to be one of their top three triggers.** In fact, one might expect this to be even higher, and the fact that 41% of owners do not rank this among their top three factors may suggest that many feel that they have already captured the low-hanging fruit.

TOP THREE TRIGGERS FOR INCREASING INVOLVEMENT IN GREEN BUILDING (ACCORDING TO ARCHITECTS, CONTRACTORS AND OWNERS)



VARIATION BY SIZE OF FIRM

Firms with annual revenues under $10 million are more strongly influenced by green as the right thing to do and by market transformation as a trigger to future green activity, than those with annual revenues of $10 million or more.

- **Right Thing to Do:** 47% of firms with annual revenues under $10 million, compared with 27% of larger firms
- **Market Transformation:** 25% of firms with annual revenues under $10 million, compared with 10% of larger firms

On the other hand, a higher percentage of the firms with larger annual revenues find lower operating costs and corporate social responsibility commitments to be among their top three triggers for future green activity.

- **Lower Operating Costs: 43% of firms with annual revenues of $10 million and over, compared with 29% of smaller firms.**
- **Corporate Social Responsibility: 40% of firms with annual revenues of $10 million and over, compared with 26% of smaller firms.**

It seems logical that larger companies would respond better to clear, formal direction while smaller firms have more flexibility to do green as the right thing to do.

VARIATION BY LEVEL OF GREEN INVOLVEMENT

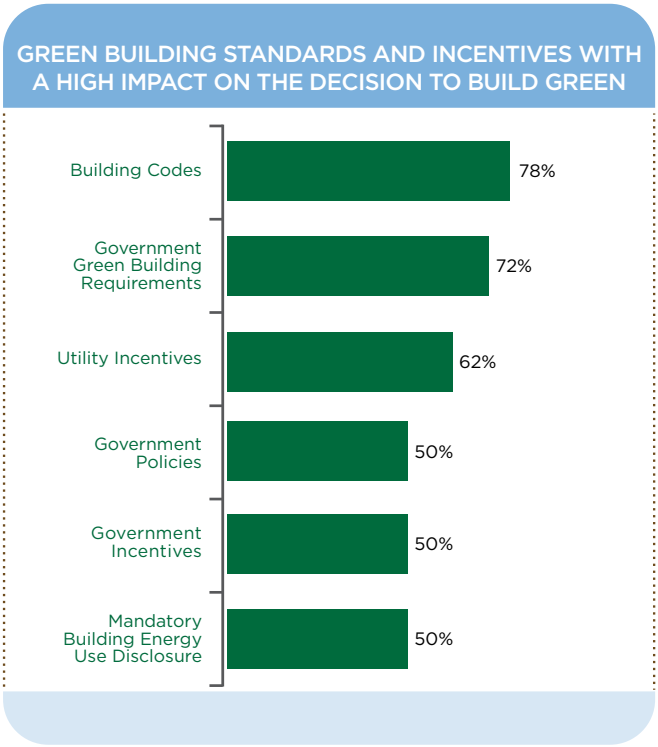
The amount of green work that the respondents' firms are engaged in also impacts the degree to which they rank certain triggers to be among their top three.

- **The higher the level of green involvement, the more likely respondents are to be influenced by green as the right thing to do.**
  - **15% or fewer green projects: 27% rank right thing to do among the top three triggers for greater green involvement**
  - **16% to 30% green projects: 37%**
  - **31% to 60% green projects: 47%**
  - **More than 60% green projects: 52%**
- **Market transformation has a similar pattern to the right thing to do,** with only 3% of those doing 15% or fewer green projects and 26% of those doing more than 60% green projects ranking this as a top three trigger.
- **A low percentage of those doing more than 60% green projects (25%) rank client demands among their top three triggers.**
- **A high percentage of those doing 15% or fewer green projects (39%) rank environmental regulations among their top three triggers.**
- Notably, for business factors like lower operating costs, higher building values and even branding/public relations, there are no significant differences in ranking based on level of green involvement.

These findings reveal a distinct character for the Canadian green building market, in which commitment to the importance of building green is driving the market. Benefits driving their commitments to create greener buildings are perceived more broadly than just business advantages. The role of institutions in the establishment of green building in Canada—as commercial tenants, as funders of projects through pension funds, and as major building owners in their own right—is evident in these results, since institutions typically have a larger mission than just creating a strong bottom line.

Impact of Government Incentives and Mandates on Green Building

All types of government mandates and incentives are considered to have a high impact on the decision to build green by a relatively high percentage of respondents, with 50% or more ranking each measure as having a high or very high impact.



MANDATES

There are no government incentives in Canada, but government mandates have made a large impact on the decision to build green by most companies. Green Building policies and more stringent building codes in some jurisdictions are considered to have a high impact by about three quarters of respondents. For those seeking to increase the level of green building in Canada, the best tool may be to create stricter mandates.

Canada has a Model National Energy Code, but individual provinces must adopt and enforce it. Overall, though, the Royal Architectural Institute of Canada reports that "the energy performance standards and requirements of Canadian building codes are lower than those of the United States and many other European countries."[1] Given the importance of mandates revealed by the respondents, attention needs to be given to improve mandates to help drive further green activity in this market.

INCENTIVES AND OTHER MEASURES

More respondents find utility incentives to be more compelling than government incentives. It is worth noting that the one measure that encourages the private market to push further green growth—mandatory energy use disclosure—was found to be impactful by the same percentage as those influenced by government policies and incentives. Mandatory disclosure has not yet become a policy in Canada, however respondents may be looking at its emergence and influence in other parts of the world at driving green building adoption and thus, considering it as having the potential to emerge and have future influence on the Canadian market as well.

VARIATION BY REGION

The only variation by region for those with quantitative results (*see methodology on page 4*) was in their response to building codes, with British Columbia finding the use codes most influential.

- Percentage that report building codes have a high impact on their decision to build green:
  - **British Columbia: 89%**
  - **Ontario: 82%**
  - **Alberta: 61%**

The Office of Housing and Construction Standards in British Columbia reports that efforts to make the B.C. building code greener are ongoing.[2]

VARIATION BY FIRM TYPE

A higher percentage of architects (83%) report being influenced by government green building requirements, compared with contractors (57%) and building owners (61%). This is probably due to their role in projects as the player that needs to account for all government requirements in the design.

1 Architecture Canada. "Sustainable Architecture." *raic.org/architecture_architects/green_architecture/sustainability_e.htm*

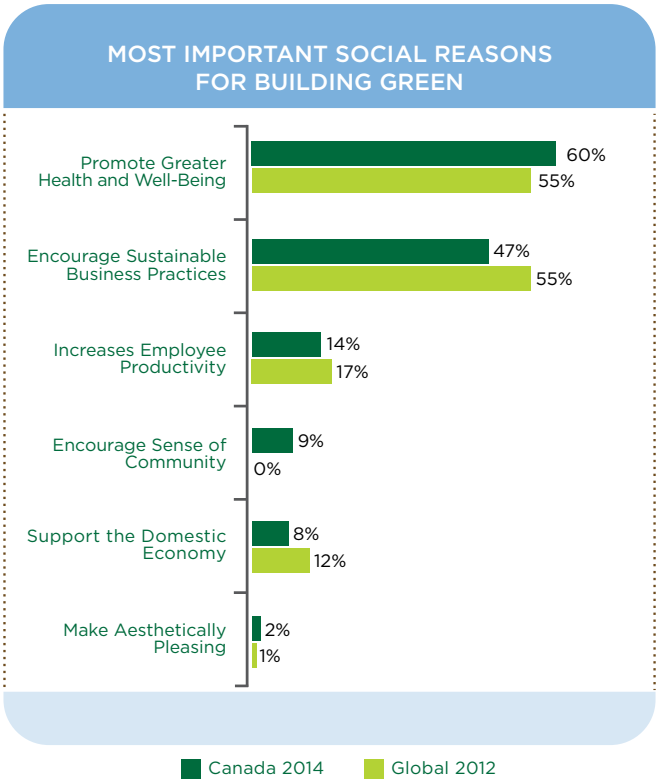
2 Ministry of Energy, Mines and Natural Gas. Office of Housing and Construction Standards. "Green Building." *housing.gov.bc.ca/building/green/*.

Social Reasons for Building Green

By far, the most important social reason for building green identified by the respondents is that green buildings promote greater health and well-being, with 60% selecting this as one of the top two most important social drivers.

Globally, in the 2012 World Green Building Trends study, promoting greater health and well-being was selected as a top factor[1], but encouraging sustainable business practices had an equal percentage that considered it important. Although there is only a five percentage point difference, the greater importance of promoting health and well-being in the current Canadian study is notable. However, it is unclear whether this is due to greater interest in Canada or the increasing attention on the impact of buildings on health and well-being over the last few years.

While lower than promoting greater health and well-being, encouraging sustainable business practices is still the other dominant social reason in Canada for building green. The actual percentage is more comparable to the percentage of U.S. participants in the global study (43%) than it is to the global average (55%), although the 2012 numbers indicate the top selection, while the Canada survey asked respondents to select the top two most important reasons.



VARIATION BY FIRM TYPE

75% of architects consider the fact that green buildings promote greater health and well-being one of the top two most important reasons for building green, more than contractors (55%) or building owners (58%). This finding suggests that architects may be more conscious of the broader spectrum of green impacts than just conservation of energy, water and resources.

Owners place greater importance on increases in worker productivity, lifting it considerably in importance compared with other players:

- Owners: 24%
- Architects: 8%
- Contractors: 5%

Owners will directly benefit from increased worker productivity. In addition, they are in a better position to measure and gauge whether their green buildings are delivering on this.

The one point that is interesting about these two findings is that greater health and well-being of workers is primarily the way in which green buildings are able to improve worker productivity. This demonstrates that the same issue can be effective with different players, but that companies seeking to increase their green business must consider how to frame the green element to the audience they are addressing.

1 Note: The 2012 World Green Building Trends survey had respondents first rate the importance of each measure and then select the top items from those ranked high, while the Canada Green Building Survey asked respondents to select their top two most important drivers.

Environmental Reasons for Building Green

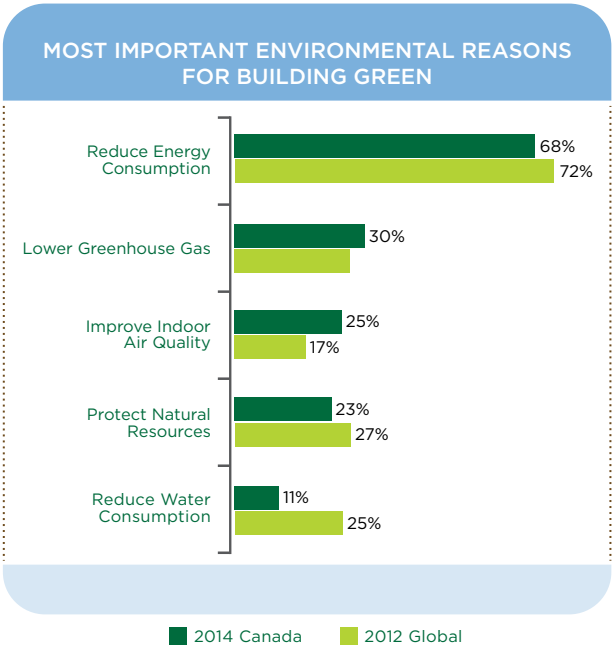
Reducing energy consumption is the top environmental reason in Canada for building green, selected by 68% of the respondents. This finding is consistent with the 2012 World Green Building Trends study, as well as all of the research in the U.S. that McGraw Hill Construction has done on green since 2006. Concerns about energy use, whether related to costs or greenhouse gas emissions, continue to drive building globally.

However, there are at least two areas where Canadians are notably different in the importance they place on environmental reasons to build green.

- **Improve Indoor Air Quality:** This factor carries notably more weight in Canada and is likely linked to the high level of importance placed on healthy buildings (*see page 27*). One factor that may contribute this is to the colder climate in Canada and the increased time spent indoors as a result.
- **Reduce Water Consumption:** Compared with global concerns, driven by many countries and regions in which droughts have been a long-standing issue, reducing water consumption is a much lower priority in Canada. In fact, in the U.S., 32% of respondents to the 2012 World Green Building Trends survey reported that reducing water consumption was their highest priority, second only to reducing energy consumption.

  Since the 2009 Water Use in Buildings SmartMarket Report, U.S. data have consistently prioritized water consumption over most other environmental factors other than energy. This may be driven by populous regions in the south and west of the United States with serious water issues, but MHC studies also demonstrate that those with higher green involvement have also been more attuned to the need to conserve water in the U.S. than those with less green involvement.

The emphasis placed on lowering greenhouse gas emissions—the environmental reason second only to reduced energy consumption in importance for Canadian respondents—is comparable to the findings in the 2012 global study for Australia and Europe. One factor that could be driving that importance in Canada is the large role that institutions, as building owners, financiers and tenants, play in the Canada commercial construction market, as reported by the green real estate experts who participated in the in-depth interviews (*see pages 16–17*).



VARIATION BY FIRM TYPE

Nearly all the building owners surveyed (92%) consider reduced energy consumption one of the top two environmental reasons for building green, compared with 52% of architects and 58% of contractors. This finding is not surprising since energy consumption reductions, and the cost savings they generate, often form the foundation for justifying a green approach to a building project or upgrade.

VARIATION BY LEVEL OF GREEN INVOLVEMENT

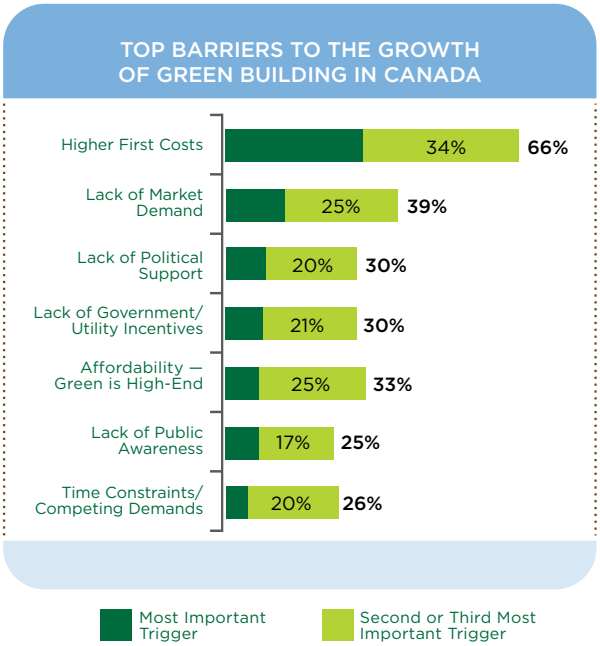
The only significant difference between those doing more than 60% of their projects green and those doing fewer green projects is the importance placed on reduced energy consumption. 82% of those respondents who are highly involved with green consider this one of the top two reasons, compared with 60% of respondents from firms doing less than 60% of their projects green. Greater experience with green may lead to greater recognition of energy savings as the engine that can drive overall green improvements.

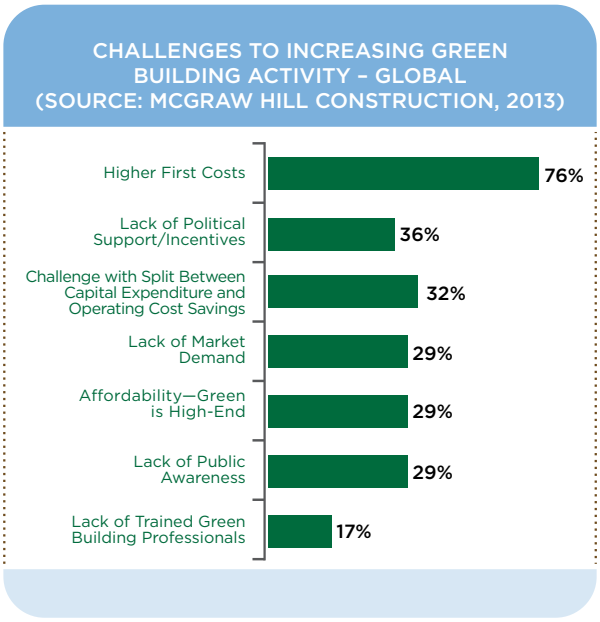
Top Barriers to the Growth of Green Building

The perception of higher first costs (capital expenditures made at the start of a project) is by far the largest barrier to the growth of green building in Canada. The importance given to higher first costs as an obstacle is consistent with other McGraw Hill Construction research on green building conducted in the U.S. However, it is worth noting that concerns about higher first costs in the 2012 World Green Building Trends study was even higher globally, at 76%, and that had declined from 80% in 2008. With nearly one third of the respondents not selecting higher first costs among their top three choices, Canadian respondents seem less concerned about this factor than those in other regions.

Lack of market demand is the only other barrier considered most important by 14% of the respondents, and it was also selected by 39% as one of the top three barriers. This suggests that more owner and tenant education is needed in Canada on the benefits of building green. This is a less important factor in the U.S., with 27% selecting it among their top three barriers, the same as those concerned about affordability and the perception of green as high end, which finishes slightly lower among the Canadian respondents.

The next four of the top barriers for respondents in the survey were selected by between one quarter and one third as one of their top three barriers for increased green building. This wide range of responses—covering everything from public perceptions and awareness to business concerns to the lack of political support—suggests that once the perception of higher costs is removed, there are several areas that will need to be addressed to bring investment in green building to a higher level in Canada. Although there are slight variations, these findings are essentially similar to those in the U.S. in the 2012 World Green Building Trends study, suggesting that the markets experience similar top obstacles.





VARIATION BY FIRM TYPE

29% of contractors consider the lack of products or solutions available in their market to be one of their top three obstacles, compared with 7% of architects and 15% of building owners. Since the final procurement of green products and solutions often lies with the contractors, this suggests that in Canada, this may be a larger problem than much of the industry realizes.

VARIATION BY LEVEL OF GREEN INVOLVEMENT

Lack of public awareness is considered an obstacle by a higher percentage of those with a high level of green involvement than those doing fewer green projects.

- More than 60% Green Projects: 34% consider it a top three obstacle
- 31% to 60% Green Projects: 27%
- 16% to 30% Green Projects: 16%
- 15% or Fewer Green Projects: 18%

This finding suggests that there is a need for greater public education on green in Canada and that those with less familiarity with green may also not be aware of how great that need is.

VARIATION BY LOCATION

A high percentage of respondents from British Columbia find lack of political support (45%) and lack of government/utility incentives (45%) to be among their top three barriers. The lack of political support is considered a top barrier by only 22% of respondents from Ontario and 21% from Alberta, and the lack of government/utility incentives is noted by 24% from Ontario and 21% from Alberta.

This suggests that there is sentiment in British Columbia that increased government support could drive green building even more in their region. The already strong policies in the province may make the respondents more aware of the influence and impact government can have on green building, thus making them more demanding of increased incentives and benefits.

VARIATION BY FIRM SIZE

More respondents from firms with annual revenues under $1 million (33%) find that public awareness is one of their top three barriers than firms with higher revenues (20%). Since these firms are also driven more to do green work because it is the right thing to do (*see page 23*), it is not surprising that they would also think wider recognition of the importance of green would lead to wider adoption of green building.

Case Study

Transformer Power:

Nova Scotia Power Headquarters Re-energize a Derelict Site

Halifax, Nova Scotia

Photographs Courtesy of Tom Arban

The metamorphosis of a derelict coal-fired power plant into the LEED platinum headquarters of Nova Scotia Power (NSP), a provincial electric utility, has transformed not only a building, its site, and a workplace culture, but the relationship of downtown Halifax to a prominent stretch of its waterfront.

Headquarters of Nova Scotia Power on Halifax Harbor

Located right on the boardwalk that lines the western edge of Halifax Harbour, the decommissioned and largely abandoned generating plant was "an eyesore, a blight on the waterfront and a barrier to the city," says Carl Blanchaer, principal at WZMH Architects and design architect for the project. "Now it's the opposite."

A slew of awards testifies to that. In addition to its LEED Platinum certification, NSP's new headquarters has won an OAA Design Excellence Award, a SAB Magazine Canadian Green Building Award, a Nova Scotia Lieutenant Governor's Design Medal of Excellence, and a Nova Scotia Lieutenant Governor's Award for Excellence in Engineering.

DECISION TO UNDERTAKE THE BUILDING TRANSFORMATION

The decision to undertake this complex exercise in adaptive re-use stemmed from a mix of visionary and pragmatic factors: NSP's desire to demonstrate environmental leadership and corporate citizenship, combined with an evaluation of the tangible and intangible costs of continuing to lease downtown space or set up in the suburbs.

"NSP had a strong vision and early mandate to have sustainability at the forefront of their design," says Harrison Chan, project architect.

OVERCOMING CHALLENGES

But no one expected the metamorphosis would be easy. Transforming vast, concrete-encased volumes with "incredibly beautiful, but incredibly complex" steel structures for coal bins and turbines into a bright, connective, multistorey workplace for more than 600 human beings presented a formidable challenge. "It was a three-dimensional puzzle," says Blanchaer, "a real Rubik's Cube."

One of the primary challenges was to adapt the existing structure, built in modules over time and that didn't always line up, to accept new floor slabs at regular intervals with functional ceiling heights. In the end, the design retained the vertical structure, and rationalized the horizontal structure as needed. The detailing was almost impossible to work out in advance, and much of it occurred during construction in a collaborative process with the trades at work onsite.

BENEFITS FOR EMPLOYEES AND BEYOND

When NSP employees began moving into their new 18,000m2 headquarters in August 2011, the puzzles had all been solved. New floors had been inserted into the industrial volumes, with the retained steel structure expressed. A tight new glass-and-spandrel envelope clad the building. The concrete had been opened to admit fabulous views of the harbour. Round skylights marked where smokestacks used to be. And a five-storey atrium and transverse galleria organized the building into light, connective spaces, bringing together NSP staff members who hadn't worked with one another in years.

For the city of Halifax, the transformation has meant the retention of over 600 jobs in the downtown core. It has resulted in support for existing urban amenities and infrastructure, avoiding the sprawl associated with suburban office parks. And it has repaired a prominent spot of urban blight. NSP's transparent atrium, publicly accessible on the ground floor, opens a new link between downtown and the waterfront. And along the galleria, a ground floor café offers waterside seating.

"Revitalizing an existing building highlights the whole social and cultural aspect of sustainability," says Blanchaer. "These buildings are part of the existing urban fabric, and an opportunity to revitalize downtown day-to-day life."

EXEMPLARY ENERGY STRATEGIES

Brownfield reclamation, adaptive reuse of an abandoned structure, daylighting, social connectivity and urban repair constitute major achievements for the NSP Headquarters. But achieving LEED Platinum requires energy conservation credits, and lots of them. Who better to demonstrate what's possible than a power utility?

Recognizing an opportunity in some existing pipes that used to draw seawater from the harbour to cool the old plant's turbines, the design team decided to source thermal energy from seawater to heat and cool the building. The challenge in realizing this opportunity was to find a system that could handle seawater temperatures that dropped below freezing, and could also scale up to meet the building's 300-tonne cooling demand. Innovating with a proven technology in a new context and scale, the team sourced a heat pump system traditionally used to cool the ice and heat the changing rooms in skating arenas.

The system runs seawater through a heat exchanger of corrosion-resistant titanium, where heat pumps pull thermal energy from the circulation loop, sending heating to a radiant perimeter system and cooling to chilled beams. A bypass allows for free cooling during seasons when the harbour water is cold enough. This system gives the building the capacity to meet its heating and cooling demands entirely from a renewable source, creating the potential in future to operate fossil fuel-free.

PROJECT FACTS AND FIGURES

Location	Halifax, NS
Project area	18,000 m2
Construction budget	$53.4 million
Completion	2011
Storeys	7
Energy intensity	366.5 MJ/m2/year
Energy savings	48% (compared to MNECB)
Lighting power density	28.3 kWh/m2
Lighting power density relative to MNECB	45%
Potable water consumption from municipal sources	2,625L/occupant/year
Potable water use reduction	75% (relative to reference building)
Reclaimed and recycled [new construction] materials	30% (by value)
Regional materials	28%

The use of active chilled beams (ACBs), a first in Atlantic Canada, makes a significant contribution to the building's energy efficiency, using only about a third of the air required for conventional VAV systems. The ACBs direct air from the primary supply to induce a larger volume of room air across a cooling coil. The reduction in the amount of air being moved about by fans enables space cooling at tremendous fan energy savings. Moreover, since ACBs are effective at higher water temperatures than conventional VAV, there's no need for a chiller plant.

Altogether, with the help of daylighting from the atrium and galleria, and an efficient lighting design, the project's energy efficiency enabled it to scoop the full suite of LEED energy credits.

WATER CONSERVATION STRATEGIES

A swimming pool-size water tank, which a former tenant used as an ocean set for films, presented the design team with another conservation opportunity, this time for rainwater harvesting to supply the building's greywater uses. The rainwater system and water-saving fixtures, together with water-wise landscaping that requires no irrigation, reduce the building's use of potable water by 75% compared with a reference building.

The cost savings from these energy- and resource-efficient building systems, estimated in hundreds of thousands of dollars per year, provide yet another validation of what is, in the words of one of the juries awarding the project, "a compelling story of environmental, economic and social sustainability" through transformation.

DATA Section 3

Benefits of Green Buildings

Vancouver Convention Centre, LEED Platinum | Owner: Vancouver Convention Centre Expansion Project Ltd. | Architect: Musson Cattell Mackey Partnership

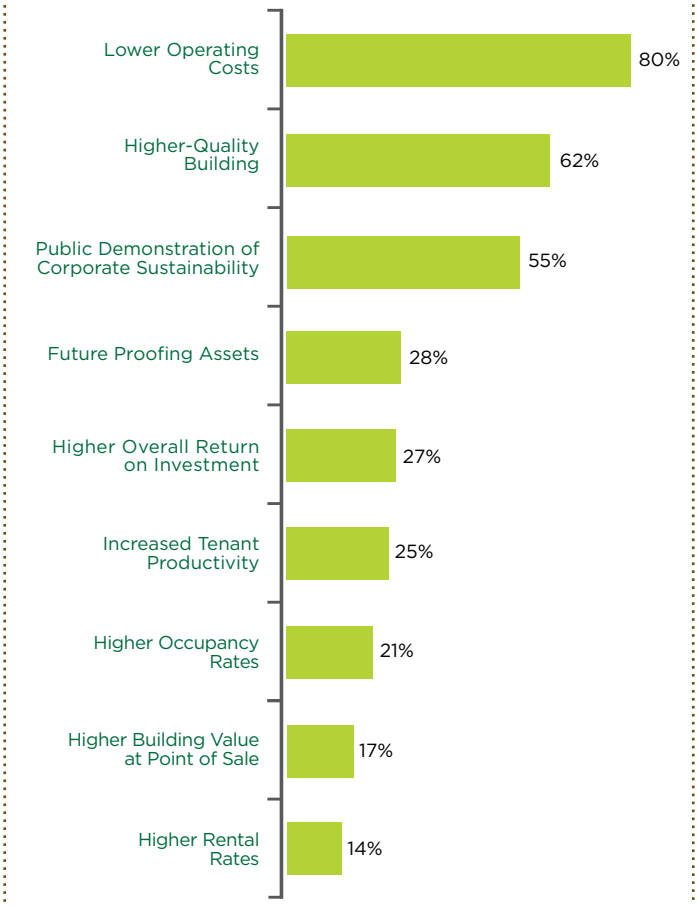
Important Benefits of Green Building

In order to determine the importance of different benefits, respondents first selected all factors they deemed important. For all those selected, they then ranked the relative level of importance from low to very high.

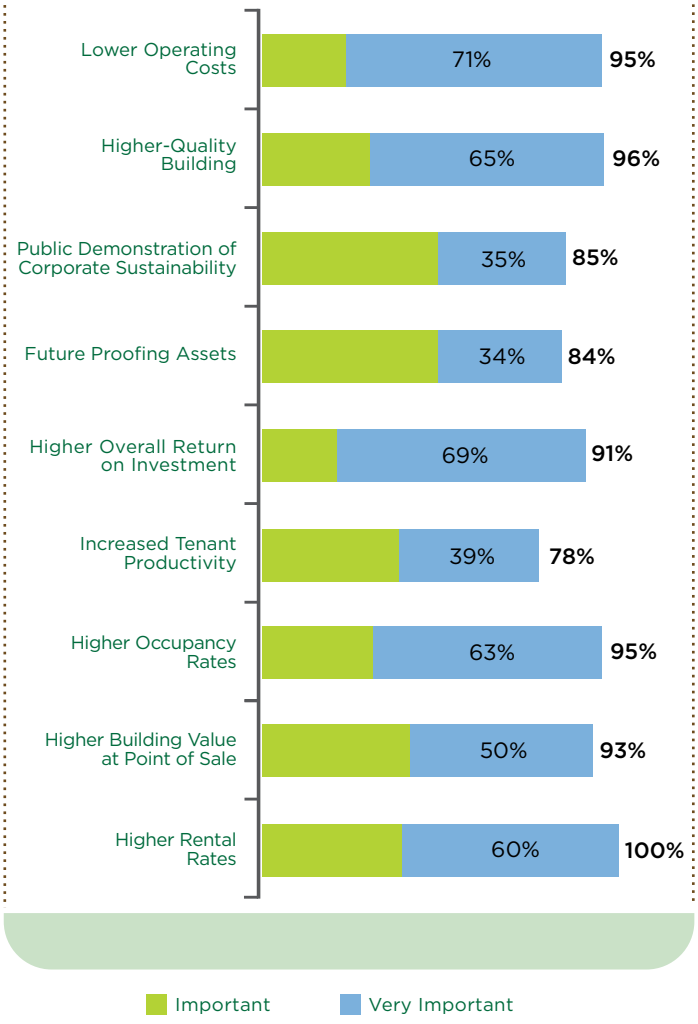
Lower operating costs are selected as important by 80% of the Canadian respondents, and most of that percentage then rate them as very important (71%). This finding is consistent with the global findings in the 2012 World Green Building Trends study (76%), as well as with the U.S. results from that study (87%). Reduced operating costs can be the most concrete, easy-to-measure demonstration of the positive impacts of building green.

Procuring higher-quality buildings is also widely considered an important benefit of building green in Canada. The association of quality with green may be associated with the increasing expectation that high-end office and residential buildings will be built green.

IMPORTANT BENEFITS OF GREEN BUILDING



LEVEL OF IMPORTANCE FOR GREEN BUILDING BENEFITS CONSIDERED IMPORTANT



- **Public Demonstration of Corporate Sustainability** is the only other benefit considered generally important by over half of the respondents, but only roughly one third of those respondents find it very important.
- **Benefits rated as highly important all relate to financial measures for commercial building success:**
  - **Higher Overall Return on Investment**
  - **Higher Occupancy Rates**
  - **Higher Rental Rates**
  - **Higher Building Value at Point of Sale**

One factor that may influence the low general recognition of the financial measures is the difficulty of ascribing an exact value to all these elements due to the fact of a building being green. As one senior real estate executive who participated in the expert in-depth interviews made clear, green is not the sole strategy that they use to draw tenants to their buildings and make the spaces more valuable for the tenants. Therefore, it is difficult to ascribe an exact figure to increases in occupancy, rental rates and building value solely to the building being green.

COMPARISON WITH THE 2012 U.S. FINDINGS

Three benefits are more widely reported as important by the U.S. respondents in the 2012 World Green Building Trends study than among the Canadian respondents in the current study.

- **Higher Value at Point of Sale:** 37% of U.S. respondents consider this an important benefit compared with 17% of Canadian respondents.
- **Higher Rental Rates:** 25% of U.S. respondents consider this important compared with 14% in Canada.
- **Higher Occupancy Rates:** 35% consider this important compared with 21% in Canada.

The greater weight placed on the benefits associated with commercial real estate correlates to the much higher percentage of U.S. respondents in the 2012 study that report expecting to do green projects in the commercial sector.

VARIATION BY LEVEL OF GREEN INVOLVEMENT

A higher percentage of respondents from firms doing more than 30% of their projects green find the following two benefits are important:

- **Higher-Quality Buildings:**
  - **Firms doing more than 30% green projects: Important for 69%**
  - **Firms doing 30% green projects or less: Important for 51%**
- **Higher Value at Point of Sale:**
  - **Firms doing more than 30% green projects: Important for 23%**
  - **Firms doing 30% green projects or less: Important for 7%**

Greater experience with green may help firms identify and better market the quality and green features of their green buildings.

Experience with many green projects seems essential for recognizing the importance of green for future proofing assets. 42% of the respondents from firms doing more than 60% green projects see this as an important benefit. This was also widely recognized by the green experts who participated in the in-depth interview research as an important benefit, whether in terms of remaining competitive or in terms of the quality of the building.

VARIATION BY LOCATION

43% of respondents from British Columbia consider a higher-quality building an important benefit of green, compared with 61% in Ontario and 69% in Alberta. The emphasis on green building codes (*see page 26*) may drive green into less high-end properties, reducing the automatic association of green with quality buildings.

VARIATION BY SIZE OF FIRM

More firms with annual revenues of $10 million and over consider higher occupancy rates to be an important benefit of building green than firms with lower annual revenues.

On the other hand, a higher percentage of firms with lower annual revenues (25% of those with annual revenues of under $10 million), find higher values at point of sale to be an important green building benefit than those with higher annual revenues (7%).

Metrics Used to Measure Financial Benefits of Green Buildings

Canadian firms doing more than 30% of their projects green are capturing more metrics on the performance of their green buildings than those doing fewer green projects, with nearly all those doing more green projects (89%) using at least some metrics compared with 62% of those who do fewer. It is not entirely clear whether this is a correlation or a cause; it is likely that firms that have committed to doing a high percentage of their projects green recognize the value of measuring green impacts, but it is also possible that tracking the benefits encourages firms to invest more in green technology and infrastructure by helping them make their business case.

Several metrics are also tracked by a significantly higher percentage of those doing more than 30% of their projects green, than those doing fewer green projects.

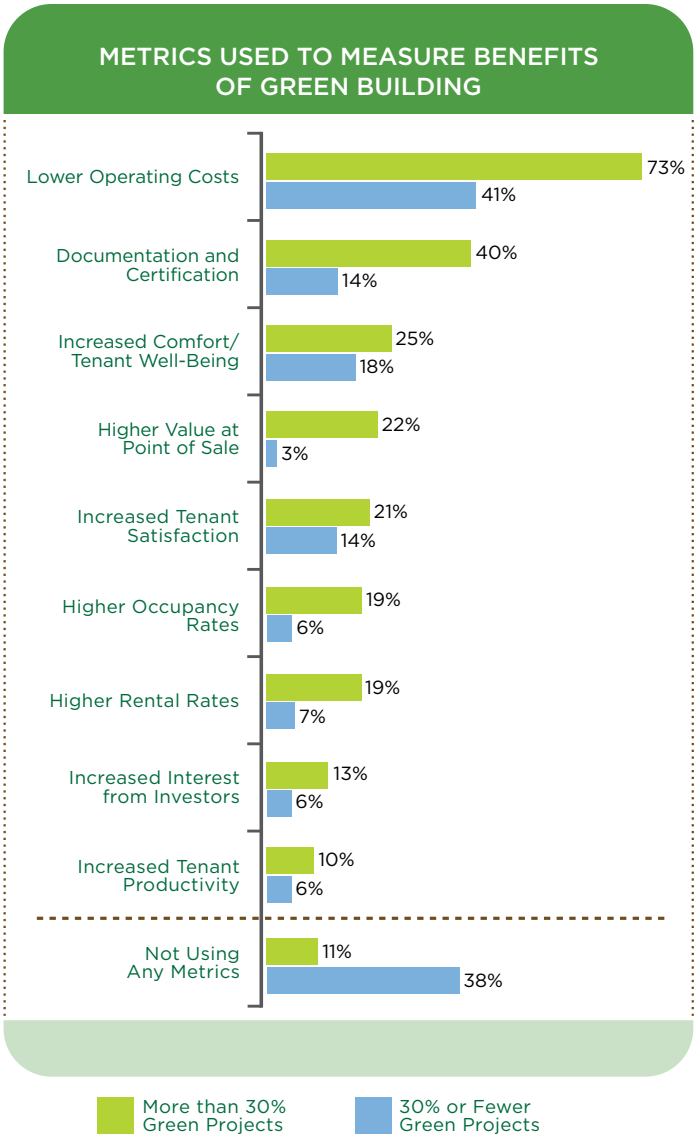
- **Lower Operating Costs**
- **Documentation and Certification**
- **Higher Value at Point of Sale**
- **Higher Occupancy Rates**
- **Higher Rental Rates**
- **Increased Interest from Investors**

Notably, these metrics are also generally those that are easier to track, suggesting that it is the fundamental interest in gathering data on green projects, rather than more experience in how to do so, that is driving these differences. Factors that are the most difficult to measure, such as increased productivity and improved tenant comfort and well-being, are also those tracked by a similar percentage of respondents regardless of their level of green building involvement.

One finding that is a little surprising is that only 2% of all the Canadian respondents are tracking their greenhouse gas emissions, given the fact that GHG's are the second most important environmental reason for building green reported by Canadians. (*See page 28 for more information.*)

COMPARISON WITH 2012 GLOBAL FINDINGS

The findings for the individual metrics tracked in Canada are markedly similar to the findings for those metrics in the 2012 World Green Building Trends study, with no more than a five percentage point difference between any of the top six metrics from that study. However, **76% of the Canadian respondents do report using at least some metrics to gauge the performance of their green buildings compared with 63% from the global study**, suggesting that overall, metrics are more widely used in Canada than globally.



COMPARISON WITH THE 2012 U.S. FINDINGS

Surprisingly, given the importance of business benefits for U.S. firms, the respondents in the 2012 study report a much lower use of metrics to track those benefits than the respondents to the current Canadian study.

- **65% of U.S. respondents reported using at least some metrics to gauge building performance.**
- **6% in the U.S. reported tracking higher value at point of sale, compared with 15% in Canada.**
- **5% in the U.S. reported tracking higher rental rates, compared with 14% in Canada.**

These findings, combined with the findings on the importance of benefits, reveal that there is a greater tendency among those who find these benefits important in Canada to also gather data on them. However, it is unclear whether greater interest in gathering this data in the last couple of years might not also contribute to the gaps in these findings.

VARIATION BY TYPE OF FIRM

The only metric used by a significantly higher percentage of building owners (42%) than architects (12%) or contractors (6%) is increased tenant satisfaction. However, architects do lag significantly behind owners in other financial metrics.

- **Lower Operating Costs:** 68% of owners, compared with 49% of architects
- **Increased Tenant Comfort/Well-Being:** 34% of owners, compared with 14% of architects
- **Higher Occupancy Rates:** 24% of owners, compared with 4% of architects

What may be most interesting about these findings is not that architects lag in tracking these specific, operational measures, but that architects lag significantly behind contractors. This suggests that contractors building green in Canada are attuned to the concerns and key financial drivers for their clients.

VARIATION BY BUILDING SECTOR

While many of the respondents work for firms that do projects in multiple building sectors, it is still notable that **a significantly higher percentage (74%) of those doing at least 25% of their projects in the institutional sector track operating costs, compared with respondents doing equivalent levels of work in the commercial (57%) or residential (60%) sectors**. This suggests that demonstrating the value in direct terms in the institutional sector has a high importance.

Metrics Used to Measure Benefits of Green Building Decisions on Occupant Health

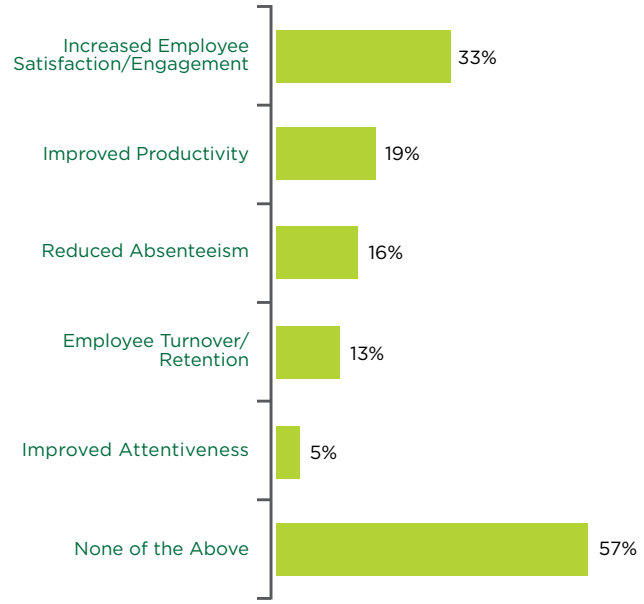
Less than half of the Canadian respondents are using metrics to gauge the impact of design and construction decisions on the health of building occupants. Several factors may influence this lack of measurement. For many firms, the data may be difficult to obtain, relying on building owners and tenants. This is particularly true since owners are the group that reports the least amount of use of any of these metrics, with 73% of owners reporting that they do not use any of the metrics included in the survey.

Another factor that may influence the low level of measurement is the difficulty in attributing specific metrics to one single cause. Even those that gather data on productivity and absenteeism may find that they cannot relate that data back to specific design and construction decisions.

Increased employee satisfaction/engagement is the most widely tracked metric, by 33% of respondents. These metrics can be obtained through surveys relatively easily compared to other measures, and questions can be framed in ways that probe about specific aspects of the building, making gains easier to attribute to building design and features.

Despite the challenges, many leaders in the industry consider good data on all these measures vital to be able to capture the true value of green buildings. This is because the costs associated with employees typically far outweighs the costs associated with leasing, owning or operating buildings.

METRICS USED TO GAUGE IMPACT OF DESIGN AND CONSTRUCTION DECISIONS ON THE HEALTH OF BUILDING OCCUPANTS



Health factors also need to be more widely recognized as a priority among green firms. There is no statistically significant difference in the use of any of these metrics, nor in the general use of health metrics among those doing more green projects and those doing fewer in this study.

VARIATION BY SECTOR

The institutional sector is more engaged in gathering statistics than other sectors. 58% of respondents for which institutional projects account for more than 25% of their company's total revenue report that they are using at least one of these metrics, and 50% of them are tracking increased employee satisfaction/ engagement. Greater transparency of public expenditures, along with a strong commitment to green, may account for wider institutional attention to these metrics.

VARIATION BY SIZE OF FIRM

A higher percentage of respondents from large firms report that they use employee turnover/retention as a metric to track the impact of buildings on health, than do smaller firms.

- Annual revenues of more than $250 million: 36%
- Annual revenues from $10 million to $250 million: 20%
- Annual revenues from $1 million to less than $10 million: 7%

Benefits of Green Building:

FINANCIAL BENEFITS OF GREEN BUILDINGS

150 Commerce Valley Drive, LEED Gold | Owner: LaSalle Investment Management | Architect: Bregman + Hamann Architects

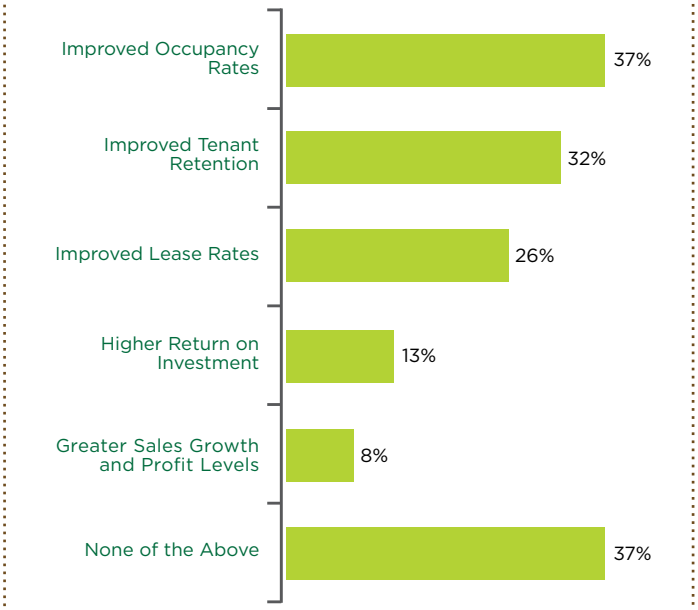
Business Benefits of Green Buildings Expected by Owners

Canadian owners are conservative about the specific business benefits they expect from their green buildings. The most widely expected benefits are improved occupancy rates and improved tenant retention. However, an equal percentage to those who report expecting improved occupancy rates report that they do not expect any of the business benefits of green included in the survey.

There are two critical factors to bear in mind to understand these findings. First, few owners are tracking the financial metrics that would allow them to gauge these benefits (*see page 37*). Only 24% of owners use occupancy rate metrics, and other financial metrics like higher value at point of sale and higher rental rates are used by less than 20%. Therefore, it is not surprising that many owners who are not measuring these benefits also do not have the expectation of achieving them.

In addition, the green experts from commercial real estate who participated in the in-depth interviews made it clear that in the areas in which they do business in Canada, green is becoming the norm for high-end real estate. A few could not provide this type of information during those interviews because all their buildings are green, so they had no basis for comparison. In such an environment, not having green becomes a penalty, rather than the adoption of green leading to specific business benefits. (*See pages 16–17 for more information.*)

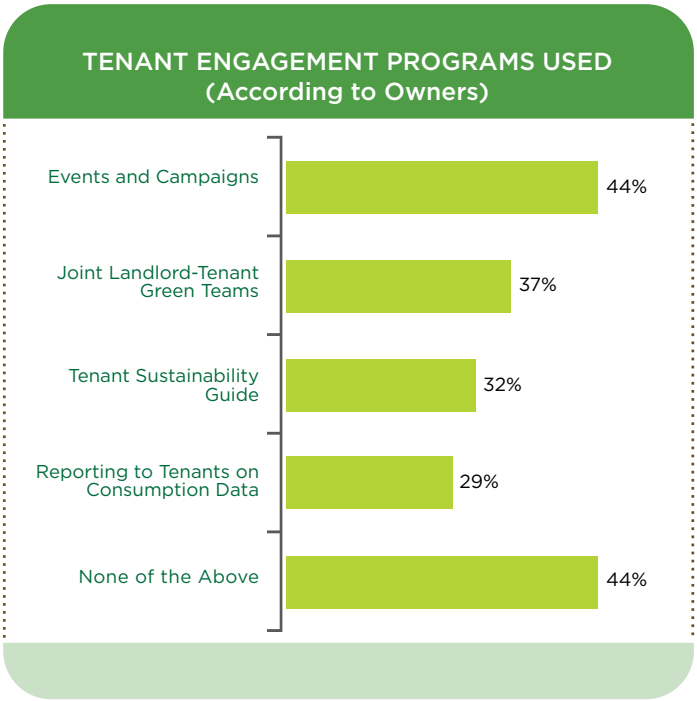
PERCENTAGE OF OWNERS EXPECTING BUSINESS BENEFITS FROM GREEN BUILDING



Benefits Reported by Tenants in Green Buildings

59% of the owners surveyed have tenant-occupied buildings. While this sample of owners is too small to draw quantitative conclusions, some trends emerge from the benefits reported by their tenants.

- Over half have tenants who report that being in a green building improves their image with customers and clients.
- Just under half have tenants who value being in a green building because it helps them meet their corporate sustainability goals.
- Other factors that are considered important by the tenants of one third to under one half of the owners include the improved indoor air quality associated with green, the access to daylight, and increased employee satisfaction and engagement.
- However, measures like productivity and reduced absenteeism are rarely reported to owners, probably due to the difficulty of attributing these factors to a specific cause such as a green building.



Use of Tenant Programs for Green Engagement—66% of Canadian owners report using at least one of the tenant engagement programs included in the survey. The percentage of owners using specific programs ranges from 44% to 29%, which demonstrates that most owners are using multiple types of engagement programs.

- **Over three quarters of owners who use a tenant engagement program (and 44% of all the owners surveyed) are doing events and campaigns, the most popular choice.** These are no doubt popular because they create positive feedback from the tenants.
- **About two thirds of the owners doing tenant engagement programs (and 37% of all the owners surveyed) have joint landlord-tenant green teams.** Because they allow for input from both sides, these are likely to be highly effective. Therefore it is not surprising that they are more widely used than less interactive sustainability guides.
- **About half of those doing these programs (29% of all the owners surveyed) are reporting consumption data to their tenants.** This is a relatively high number because unlike the other measures, this involves having buildings that are sub-metered to the tenant level. Being able to see the impact of reduction decisions can be a powerful motivator with tenants.

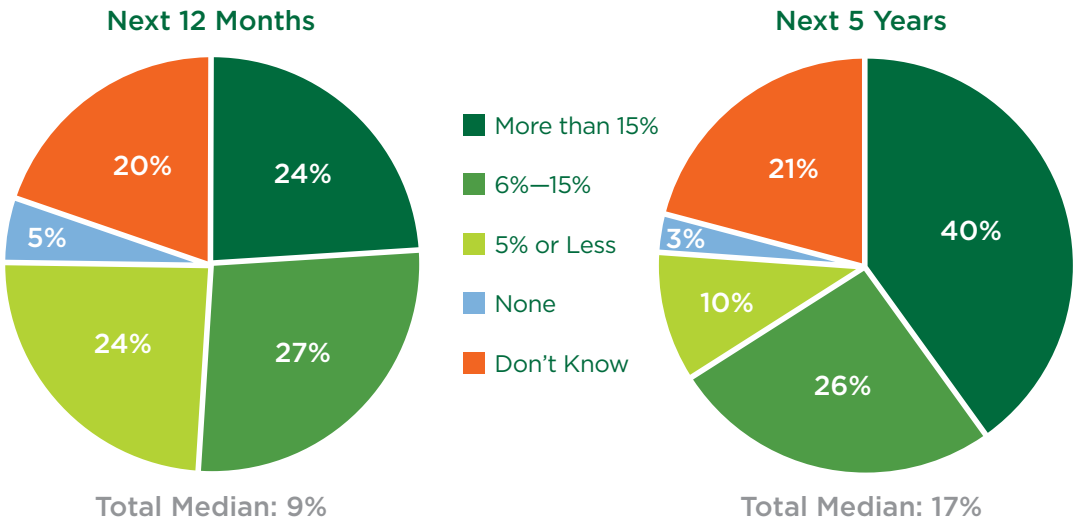
Operating Cost Decreases in New Green Buildings

Most Canadian respondents expect that their green buildings will lower building operating costs compared to a traditional building by a significant amount. Almost one quarter (24%) anticipate that their green buildings will lower operating costs by more than 15% in the next 12 months, and in the next five years that number shoots up to 40%. The median of expected savings reported also nearly doubles, from 9% to 17%.

These findings are slightly higher, but overall mostly consistent, with the findings from the 2012 World Green Building Trends study, where a median operating cost decrease of 8% was reported over one year and 15% in five years. These findings are also consistent with many of the studies of U.S. green buildings conducted by McGraw Hill Construction since 2005.

Another finding that is also consistent with the 2012 global study conducted by McGraw Hill, including the U.S. responses as well as the overall global findings, is the relatively high percentage of firms (20%) that are not sure about operating cost decreases that result from their green building projects. Understanding the reduction of operating costs is important because it is a key driver for green (*see page 23*). While operating costs are the most widely gathered metric for green by the Canadian respondents (*see page 37*), 43% still report not tracking these metrics. Unlike productivity and health benefits, this is a measure that can be captured in a relatively straightforward way. Given the importance of these savings for demonstrating the return on investment offered by green projects, the industry needs to commit to tracking these benefits to encourage greater investment in green buildings.

EXPECTED OPERATING COST DECREASES FOR NEW GREEN EFFORTS



Total Median: 9%

Total Median: 17%

VARIATION BY LEVEL OF GREEN ACTIVITY

Not only are firms that do more green projects measuring these costs more (*see page 37*), they are also finding more impressive results. **Firms that do more than 60% of their projects green have a median level of reported cost savings of 16%, compared with 4% median savings reported by those doing 15% or fewer of their projects green.**

Since the firms doing more green work are tracking these measurements more, their estimates are likely to be more accurate. In addition, greater experience with green may yield ways to maximize savings.

VARIATION BY SIZE OF FIRM

Respondents from companies with annual revenues under $10 million report a median level of operating cost savings of 14%, and those with 10 employees or less report median cost savings of 13%. This may be due to two factors. Smaller companies may be greening buildings in sectors of commercial real estate or overall project types that have not been as typically green in the past. Therefore, they may be able to see more dramatic results than those that are in sectors with relatively high-performing buildings. Also, the smaller pool of buildings they are involved in may prevent some impressive results from being diluted across a broad range of projects.

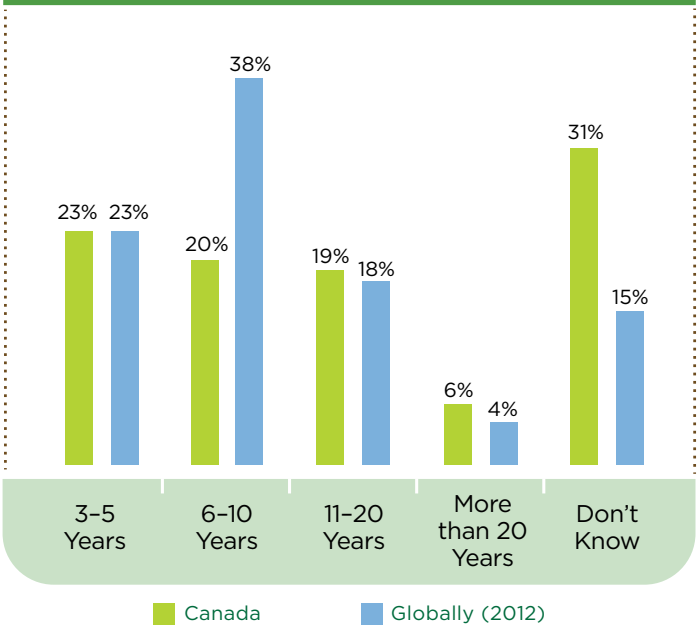
Average Payback on Green Building Investments in New Buildings

ADDITIONAL COST OF BUILDING GREEN

74% of owners and architects believe that new green buildings cost more than new non-green buildings. The median level for that additional cost was reported at 7%. This is higher than that reported by U.S. firms in the 2012 World Green Building Trends study at a median level of 5%.

However, Canadian respondents doing more than 60% of their buildings green report a median additional cost of 4%. Evidence from this and previous studies conducted by McGraw Hill Construction on green building in the U.S., strongly suggests that the level of experience with green and the ability to benefit from economies of scale play a role in the cost impacts of green building.

AVERAGE PAYBACK PERIOD FOR ADDITIONAL COSTS OF A NEW GREEN BUILDING



Note: Canadian responses are according to Owners and Architects only, Global responses are according to all firms surveyed, including Owners and Architects.

AVERAGE PAYBACK PERIOD FOR ADDITIONAL COSTS OF BUILDING GREEN FOR NEW BUILDINGS

The median payback period on a new green building, according to Canadian owners and architects who think that there is an additional cost for building green, is eight years. This corresponds with the findings of the 2012 World Green Building Trends study conducted by McGraw Hill Construction, and it is only one year higher than the median payback period reported by the U.S. respondents in that study (reported at seven years).

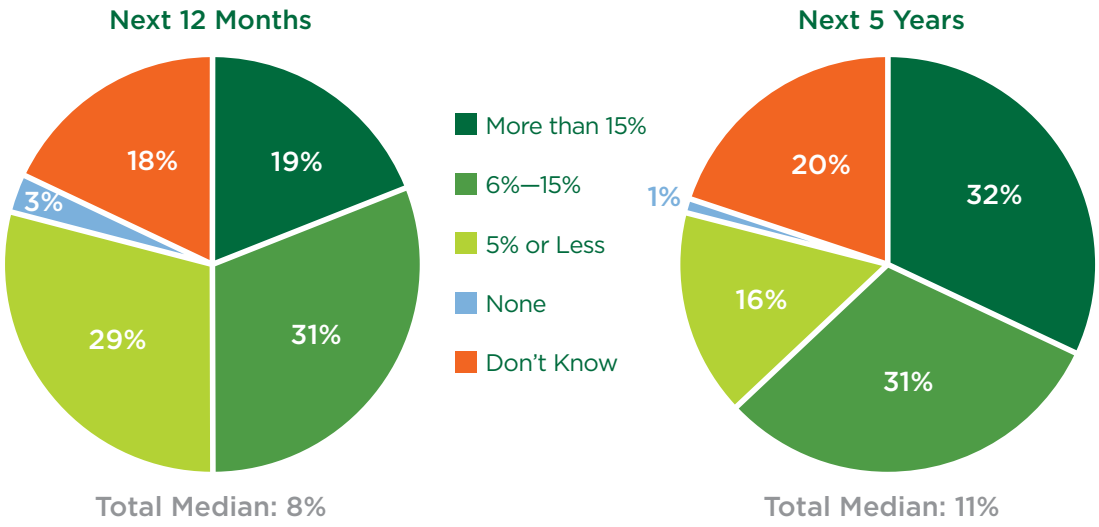
However, one major distinction between the Canadian responses and those in the global survey is the percentage of Canadian owners and architects who are not sure about the payback for the additional costs of building green. Only 17% of the overall global respondents and 6% of the U.S. respondents reported not knowing a payback period, much lower than the 31% of Canadian respondents who could not provide a payback period. In fact, half of the Canadian architects who responded did not know. This is important because architects need to be able to make the business case to clients for incorporating green into their buildings, and only being aware of additional upfront costs without being able to address the payback makes it more difficult for them to make that business case.

Operating Cost Decreases in Existing Buildings for Green Retrofits/Renovations

Respondents involved in renovation projects report similar findings, although more conservative in terms of the longer-term outlook, to those doing new green buildings.

- **There is a significant 13-point difference between the percentage who expect to see more than 15% operating costs decreases between over the next 12 months (19%) and the percentage who expects the same decrease over the next five years (32%) in renovated green buildings.** In fact, the expected operating cost decreases for renovated green buildings is similar to those expected for new green buildings.
- **Roughly the same percentage as those reporting on new buildings note that they do not know the level of operating cost decreases in their renovated green buildings.**

EXPECTED OPERATING COST DECREASES FOR RETROFIT/RENOVATION GREEN EFFORTS



There is a notable difference in the distribution of the savings expected. **A higher percentage of the respondents doing renovations expect their projects to result in operating cost decreases in the 3% to 10% range than among those doing new buildings,** especially when asked to consider savings across the next five years. This has resulted in lower total medians.

The medians are also slightly lower than those reported in the 2012 World Green Building Trends study. The median global decrease for 12 months was 9% and for five years was 11%. The median decrease reported by U.S. respondents in that study was 11% for 12 months and 14% for five years. The higher medians may be the result of more green building experience, but they could also be influenced by other factors, such as average age and condition of building stock. More research is needed to determine the cause.

One factor that may influence this finding is the ability to create greater efficiencies when that goal is present from the start of building design rather than in a building that already exists. Retrofits and renovations can tackle significant inefficiencies, but they are less likely to holistically consider how all building systems contribute to building performance, as can be done with a new building.

Impact of Green Retrofits/Renovations on Building Asset Value

With just a small number of building owners in the survey who conducted green retrofit/renovation projects, the analysis must be confined to looking for trends. **One striking difference between the renovation/retrofit project responses and the responses on new buildings, is that no owners conducting green retrofits/renovations report being uncertain about the impact of their green efforts on the building asset value.** The impact on value may be easier to measure on a building with a determined value before and after the renovation/retrofit, than on a new building against a theoretically similar non-green building.

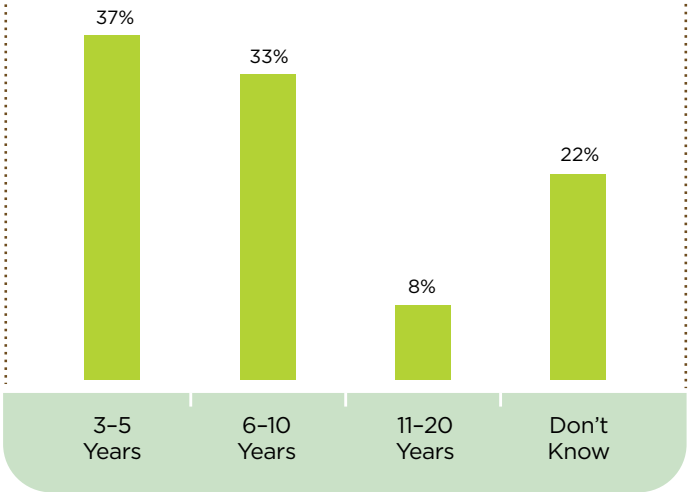
Their median response totals 4%, the same as that reported for new buildings by the owners and architects. This suggests a relatively consistent bump in value for green buildings in the market whether the building is built green or retrofitted to become green.

Average Payback Period for Green Retrofit/Renovation Projects

Owners are more knowledgeable than architects about the payback period for their green renovation/retrofit projects, with all but one providing an estimate, compared to just half of the architects. Owners are also much more likely to estimate that payback takes three to five years, compared with architects who are more likely to expect payback in six to 10 years. One factor that may be influencing this finding is that small retrofit projects completed by owners may not include involvement by an architect, while larger, more involved projects would more typically include an architect. Additionally, it could also reflect that owners are closer to the results than architects and are more likely to track the specific paybacks.

The average median payback period of seven years reported by the architects and owners is the same as that reported in the 2012 global study, but it is notable that the median payback reported by the U.S. respondents is only four years. Again, this may be due to many different factors, but the overall consistency of the U.S. reports of benefits suggests that the higher levels of green building activity also helps U.S. firms to better capitalize on their green investments. If this is the case, then the rapid acceleration of green building activity in Canada should also see a strengthening in the level of benefits reported due to green investments.

AVERAGE PAYBACK PERIOD FOR ADDITIONAL COSTS OF A NEW GREEN RENOVATION/RETROFIT (According to Owners and Architects)



Benefits of Green Building:

ENERGY AND WATER USE SAVINGS

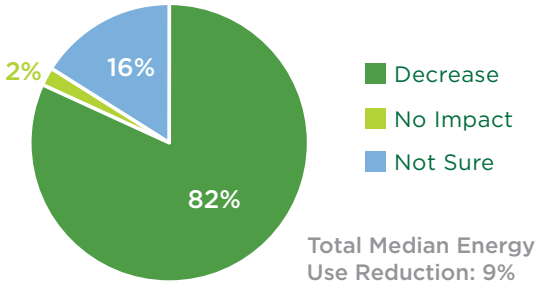
Joggins Fossil Centre, LEED Gold | Owner: Joggins Fossil Institute | Architect: WHW Architects Inc.

Reduction in Traditional Energy Use in Green Buildings

Nearly all the Canadian building owners surveyed (82%), who have an opinion about the impact of their green buildings on energy, report that energy use is reduced. The median for the reduction in energy use they report is 9%, although it is notable that 19% report savings of 20% or more.

Energy use reduction not only helps companies lower their operating costs, but they are also one of the best means of reducing greenhouse gas emissions, one of the key environmental reasons cited by respondents for building green (*see page 28*).

IMPACT OF GREEN BUILDING ON TRADITIONAL ENERGY USE (According to Owners)



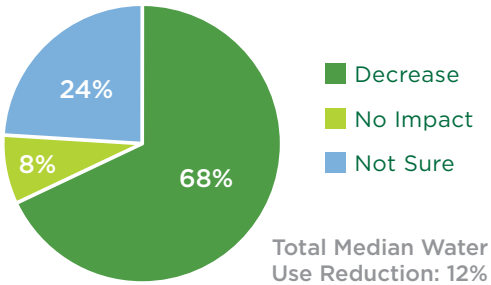
Total Median Energy Use Reduction: 9%

Reduction in Water Consumption in Green Buildings

With water use reduction a relatively low priority in Canada (*see page 28*), it is not surprising that fewer owners report a reduction in water use than energy. However, the reductions that are reported are substantial (68%), with one quarter of owners reporting decreases seeing them at levels of 20% or more.

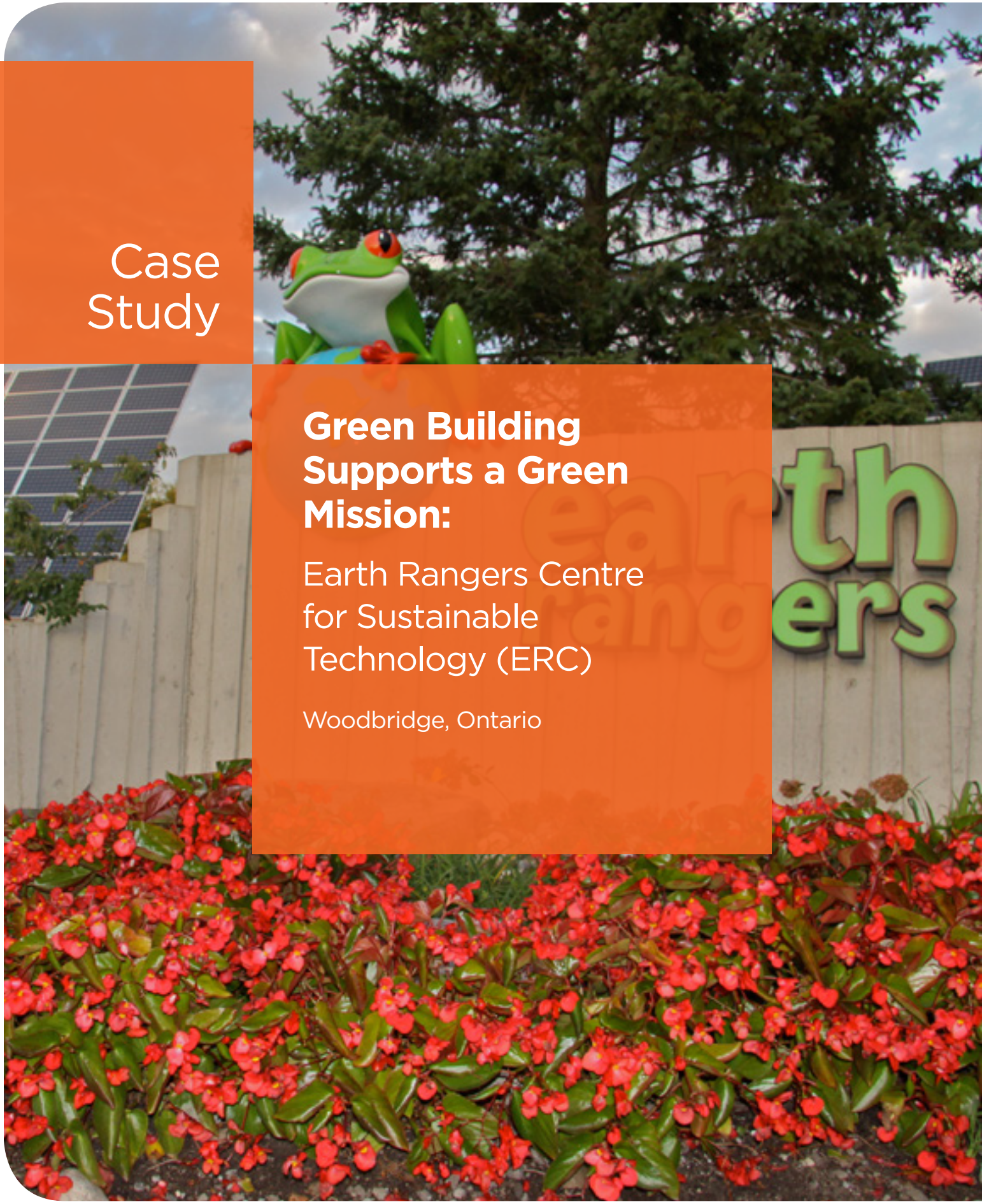
The attention paid to the reduction of water use may see increases in the future, according to one of the green experts in the in-depth interviews. Impacts from climate change have led to flood and drought problems in regions of Canada that have traditionally not experienced these issues. Increased events may increase the priority of water use reduction measures on green projects.

IMPACT OF GREEN BUILDINGS ON WATER USE (According to Owners)



Total Median Water Use Reduction: 12%

Case Study



Green Building Supports a Green Mission:

Earth Rangers Centre for Sustainable Technology (ERC)

Woodbridge, Ontario

Known as the kids' conservation organization, Earth Rangers is a non-profit membership group that gives children the opportunity to learn about biodiversity and protect endangered animals and their habitat. Each year 10,000 visitors tour its 66,000-square-foot headquarters near Toronto, which houses about 60 animals as well as offices and support spaces for 80 to 100 people. From the outset, Earth Rangers' leaders wanted its headquarters, called the Earth Rangers Centre for Sustainable Technology (ERC), to reflect its mission of environmental stewardship. "It's only fitting that we operate our building in the most efficient way possible," says Brett Sverkas, senior manager for ERC.

Designed for efficiency from the ground up, ERC was completed in 2004 and its two buildings (the main facility and a smaller out-building used for storage) earned a LEED-NC Gold certification in 2006. Subsequent automation upgrades and additional investments to curb energy and water consumption earned them a LEED-EB Platinum rating in 2012, with the highest score for an existing building in Canada. Today it uses nearly 90% less energy than typical buildings of its size and consumes about 90% less potable water than an average building in Canada.

The new Earth Rangers headquarters earned a LEED Platinum rating when originally opened, and subsequent improvements has led it to consume 90% less energy than a typical building of its size.

BUILT TO SAVE ENERGY

The original design was intended to exceed code requirements for energy use by more than 60%. Much of the savings came from a heating, cooling, and ventilation strategy that prioritized efficiency. First, the heating and cooling load was reduced by building the structure from reinforced concrete, which provides thermal mass that holds heat well in winter and insulates against extreme temperatures. The concrete ceiling delivers low-energy radiant heating and cooling to interior spaces, thanks to 22 kilometers worth of PEX tubing embedded in the concrete that circulates a heated (or cooled) mixture of propylene glycol and water.

The building's ventilation system, which is separate from the ductless heating and cooling system, makes use of a passive technology known as earth tubes. They consist of a network of standard concrete drainage pipes installed underground, where the earth's temperature remains relatively constant. When fresh air for ventilating the building passes through the tubes, they warm it passively by as much as 17°C in winter (or cool it by up to 10°C in summer) without the need for mechanical equipment. "Doing this lets us deliver demand-controlled ventilation with 100% fresh air at minimal cost, and the combination of radiant heating or cooling with displacement ventilation is more comfortable and less drafty than forced-air heat or air-conditioning," says Sverkas.

Construction of earth tubes for ventilation.

A CLOSED LOOP FOR WATER USE

From the outset ERC's goal was to handle all its water needs on-site. "Our integrated water system ensures that we make the most of every litre that we take from our well," says Sverkas.

Its dedicated well delivers potable water to sinks and showers, where low-flow aerators and fixtures reduce the amount of water consumed by up to 77%. (Well water is filtered and treated prior to use.)

All other water at the site is recycled or captured for reuse. The building's green roof absorbs 50% of runoff from rain and snow; the rest is collected from the flat areas of the roof (during big storms, peak flow can exceed 55 litres per minute). Wastewater is treated at an onsite plant that uses anaerobic and aerobic digestion, filtration and UV light to kill pathogens and remove contaminants for up to 12,800 litres per day. The runoff and treated wastewater, held in a 310,000-liter cistern located under the parking lot, is used for irrigation and flushing low-flow toilets and urinals. The cistern also acts as a local water reserve in case of a fire. Today these strategies help ERC recycle 1.7 million litres of water per year.

MORE STEPS TOWARD LESS CONSUMPTION

ERC achieved its LEED-NC Gold status without specifically targeting that certification. But the release of the LEED-EB standard and rating system helped them create a road map for future projects. "Its benchmarks provided specific targets to work toward, so we were able to prioritize some projects in the planning stage and change or modify policies and procedures to operate the building more efficiently," says Sverkas.

To further reduce their impact on water resources, ERC installed a bioswale to capture runoff from its expanded parking lot.

A bioswale captures stormwater run-off from the parking lot.

"We also looked at permeable paving, but a bioswale was more cost-effective and easier to install and maintain for this area," says Sverkas. The project was done as a research partnership with their co-tenant at ERC, the Toronto and Region Conservation Authority (TRCA), which protects local watersheds. By installing the system, ERC and TRCA aim to demonstrate the feasibility of using bioswales at other commercial office buildings in Canada.

The Ontario Power Authority's feed-in tariff (FIT) program also gave ERC an incentive to install a 27.8-kW solar array on the roof and a 58-kW one in the parking lot, which generate 26% of the building's electricity. "Under this program, the utility purchases power that the arrays produce at a premium rate, and we can purchase it back at a lower rate, which gives us a revenue benefit," says Sverkas.

To heat and cool the building more efficiently, a ground-source heat pump (GSHP) system was installed in the parking lot. The system uses 44 wells, each 120 meters deep, to provide heat transfer to the fluid that flows through the PEX tubing in the concrete ceilings. The system has lowered ERC's natural gas consumption by 90%.

Investing in technology to monitor resource usage has also paid dividends. Intelligent building hardware and software allows ERC to track electric, thermal, and water usage at more than 300 different points, in intervals as short as 15 minutes. The system also measures comfort metrics such as temperature, humidity, and levels of carbon dioxide.

ERC took the intelligent building system a step further by integrating energy and lighting systems with other information assets such as security/keycard access, occupancy sensors, and login credentials for laptops and phones. Now these systems can dynamically adapt to the number of people in the building without having to rely on a programmed, preset schedule. "A person can swipe their access card at the door and walk to her office, and the building knows to turn on the lights and heat a particular area," says Sverkas. "And it knows which systems to turn off when people leave at night or are working at home."

Workers at ERC can also control their environment and accomplish other tasks via a custom-built application called Earth Rangers Integrated Control Application (ERICA). Using the app on a computer, tablet or smartphone, they can control office lighting, see their workspaces' current temperature, view outdoor conditions, create requests for facility and IT staff, and handle select security and job-specific tasks. "Receiving instant feedback via this app lets us run a tighter ship, and makes us more organized, productive, efficient and safe," says Sverkas.

PROJECT STATISTICS	
Project location	Woodbridge, ON
Building type	Institutional
Type of construction	New
Number of buildings	Two (one occupied, one for storage)
Number of occupants	80 to 100 people; 50 to 60 animals of different species
Building completion dates	2004
Square footage	66,000 total
LEED certified buildings	Two
Levels of LEED certification	Two: LEED-NC (Gold), LEED-EB (Platinum)
Energy use	9 kw-H per square foot, 90% less than average
Percentage of building electricity generated onsite	26%
Litres of water recycled per year	1.7 million
Natural gas savings per year	1 million cubic feet

ERC's leadership attributes the building's low impact to motivated staff, as well as strong partnerships and close relationships with TRCA, their LEED collaborators, and technology providers who helped them tweak various systems to suit their facility. "Modern automation technologies let building professionals integrate separate systems efficiently and with ease—they're way better than they were seven to 10 years ago," says Sverkas. "And having staff that know these technologies and are capable of making customizations is 100% necessary." Mobile-enabled technologies mean that many adjustments and fixes can be done remotely, he adds.

The energy and water savings they achieve are all the more impressive given that some of its animal habitats have unusually high energy requirements—for instance, the use of heat lamps to maintain optimal temperatures for exotic reptiles. But true to their ethos, the staff doesn't let these realities distract or discourage them. Sverkas's advice for facilities whose managers want to green their operations: "Start small. Pick one simple thing and do it now."

DATA Section 4

Green Building Products and Services

Manitoba Hydro Place, LEED Platinum | Owner: Manitoba Hydro | Architect: KPMB Architects and Smith Carter Architects

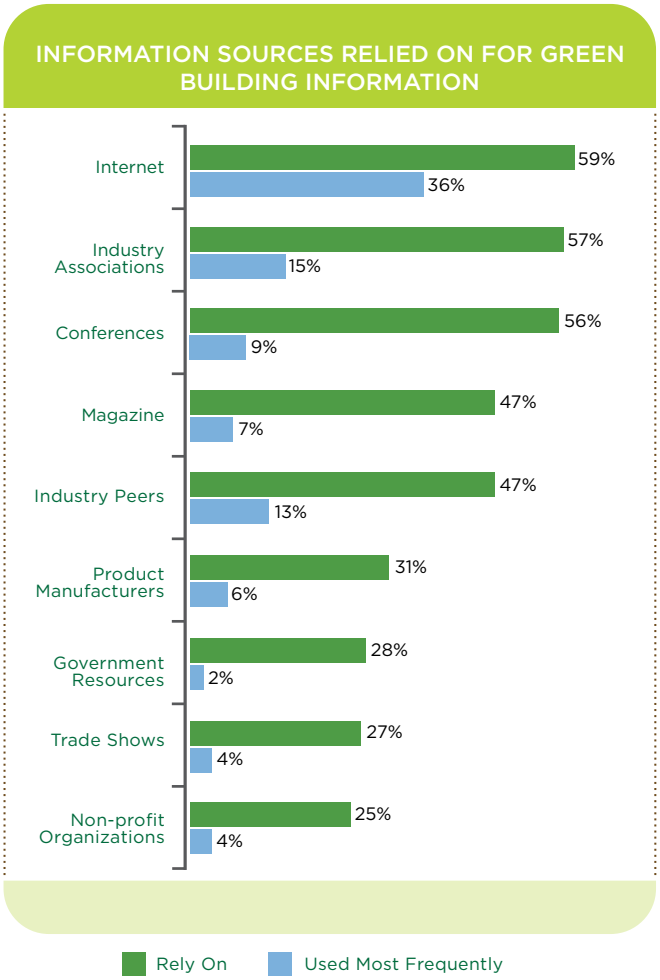
Sources of Green Building Information Used and Relied Upon By Firms

A wide variety of sources are relied upon by firms seeking green information, and the sources they rely on the most tend to be the sources they use the most.

Not surprisingly, the internet is the most relied upon source of information. However, among those that rely on the internet, it only ranks as the single most frequently used by about 60%, which suggests that there are a wide number of resources frequently consulted by the respondents.

Industry associations and conferences are also clearly trusted sources of information, with a high percentage reporting that they rely on them. However, while 15% report that industry associations are where they most frequently go to gain green information, only 9% report the same for conferences.

Magazines and industry peers are relied upon by 47% of respondents, but industry peers are used more frequently for information. This demonstrates the importance of gaining a positive word-of-mouth reputation, as well as a high profile in the industry as part of an overall green strategy for building product manufacturers and service suppliers.



VARIATION BY TYPE OF FIRM

16% of architects report using magazines as their most frequent source of project information, more than double the average across all players. 60% also rely on magazines for green building information. Magazines may be able to capitalize on a highly visual appeal with architects better than they can do with other players.

In addition, a higher percentage of architects (44%) report relying on building product manufacturers for information. However, the percentage that report using manufacturers most frequently is roughly equivalent to the other players. This suggests an opportunity for building product manufacturers to increase their profile with architects, who rely on them but are not using them frequently for information.

Architects lag behind the rest of the players surveyed in their use of industry associations.

- Architects: 2% report industry associations are the most frequently used source of green building information.
- Contractors: 26%
- Owners: 20%

VARIATION BY LEVEL OF GREEN BUILDING INVOLVEMENT

While firms that do a higher percentage of green building projects rely on the same sources of information at close to the same level as those doing few green projects, they do use product manufacturers significantly less.

- 30% or fewer green projects: 13% use product manufacturers to obtain information on green building.
- More than 30% green projects: 3% use product manufacturers.

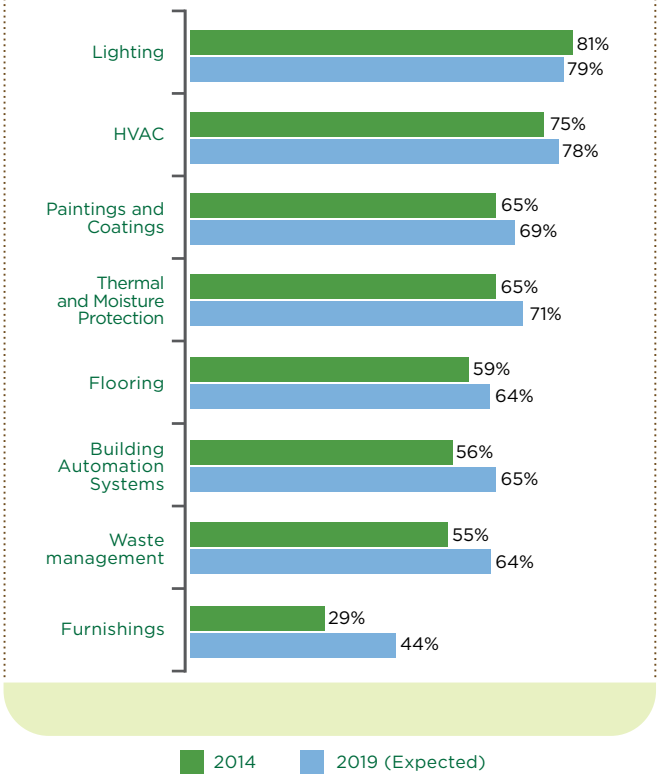
Given the fact that many firms expect to shift to a higher level of green building involvement in the next three years (*see page 11*), building product manufacturers have the opportunity to capitalize on this growing market if they can continue to be perceived as a good primary source of information as the firms grow more sophisticated in green.

Green Building Products and Services Being Used

Over half of the respondents report currently using green building products and services in seven categories ranging from lighting to flooring to waste management.

- **Top categories are those that impact building energy use, including lighting and HVAC.** Since over three quarters of the respondents are already using green products in these categories it is not surprising their expected use stays relatively steady through 2019.
- **Products and services that impact indoor environmental quality are also widely used.** Paintings/coatings, thermal and moisture protection, and flooring choices can all impact indoor air quality. Their wide level of use suggests the importance of this issue in Canada, and the percentage using them is expected to grow by four to six percentage points by 2019, suggesting increasing interest.

CATEGORIES OF GREEN BUILDING PRODUCTS USED (2014 and 2019 [Expected])



- **Building automation systems, waste management and green furnishings have the highest level of expected growth between 2014 and 2019.** The increased interest in building automation systems may suggest that many firms that have already installed green lighting and HVAC expect to seek new ways to improve energy performance. The interest in flooring, waste management and furnishings also suggests that conserving material resources is an increasing priority.
- **Categories selected by less than 5% of respondents include building envelope, windows, millwood, water-efficient fixtures/plumbing and renewable energy.** This continues to demonstrate the relatively low priority given to water efficiency in Canada, and it suggests an interest in investing in green either where it can reduce operating costs or where it can have a notable impact on building occupants, rather than in the building envelope.

VARIATION BY TYPE OF FIRM

Differences in the level of use by firm type not only reflect actual use disparities, but also differences in the level of awareness and interest in specific product categories by different types of firms.

Architects are reporting wider specification of green products and services that impact indoor air quality than other types of firms.

- Thermal and Moisture Protection: 79%
- Paintings and Coatings: 84%
- Flooring: 84%

This finding may suggest that the design intention of improving the indoor environmental quality on projects may not always be as clearly recognized by the rest of the project team as by the architect.

76% of building owners report installing building automation systems in their projects, suggesting the importance of energy use to this group.

VARIATION BY SIZE OF FIRM

Not surprisingly, large companies (those with annual revenues of $250 million or more) report wider use of some green building products and services than smaller companies, particularly those associated with cost savings in the final building:

- HVAC: 91%
- Building Automation Systems: 82%
- Waste Management: 77%
- Flooring: 91%

VARIATION BY LEVEL OF GREEN BUILDING INVOLVEMENT

It is notable that there are only two building product types used by a significantly higher percentage of respondents from firms doing more than 60% green projects, than those doing fewer green projects.

- Building Automation Systems: 69%
- Waste Management: 68%

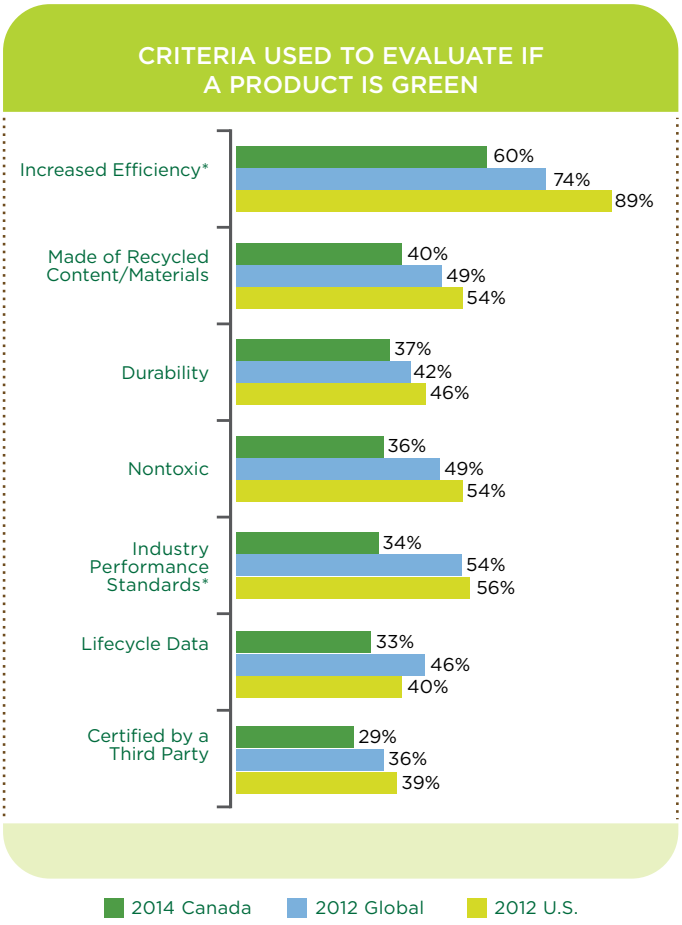
The relatively consistent use of most of the green products and services, even by those doing 16% to 30% of their projects green compared with those doing most of their projects green, demonstrates that awareness and technical expertise regarding green products are sufficiently widespread in most categories. This means there is broad adoption across most Canadian firms, and that lack of adoption should therefore be attributed to other causes.

Criteria for Identifying Green Products

The most widely used criterion by Canadian respondents for evaluating whether a product is green is increased efficiency, with 60% reporting its use. The wide use of increased efficiency for green product selection and the large gap of 20 percentage points between it and the next most frequently used is consistent with the 2012 World Green Building Trends study conducted by McGraw Hill Construction (although it is notable that in that study, energy efficiency, rather than efficiency in general, was the criterion defined). 89% of U.S. respondents to the 2012 study also reported using efficiency as one of their criteria for identifying green products, and all these findings correspond to the general focus on energy use reduction and cost savings considered important in many McGraw Hill Construction green studies over the last eight years.

Only eight percentage points separate the next five criteria, with each used by between 40% and 33% of respondents. This broad use of different criteria suggests that Canadian respondents do not rely on one measure or approach to gauge whether a product is green. Concerns about material resources, health impacts and cost factors all weigh in with similar importance.

It is also worth noting that while this general pattern is consistent with the World Green Building Trends study, the percentage of Canadian respondents using these criteria range from 5% to 15% lower than the averages reported in that study, and the gap between the Canadian and U.S. responses is even higher on most of the criteria measured. This suggests that more information and education is needed in the Canadian market on green product attributes to help make informed product decisions.



* In the 2012 global survey, these criteria were Highly Energy Efficient and Industry Performance Data, respectively.

VARIATION BY FIRM TYPE

A high percentage of architects consider whether products are made of recycled content/materials (64%) and are non-toxic (51%) in making green product decisions. On the other hand, a much higher percentage of contractors (56%) and owners (74%) consider efficiency as a green product criterion than architects (31%). This finding underscores a general pattern evident throughout the data that Canadian architects place less emphasis on energy use reduction and more emphasis on other green building goals than other major project players.

VARIATION BY LEVEL OF GREEN BUILDING ACTIVITY

More firms with a high level of green building activity consider criteria that provide a greater measure of certainty when identifying green products, whether through a third-party evaluation or through data gathered in the industry.

- Third-Party Certification: 36% of firms doing more than 30% of their projects green, compared with 18% of those doing fewer green projects.
- Industry Performance Data: 48% of firms doing more than 60% of their projects green, compared with 29% of those doing fewer green projects.

This finding suggests that as more firms become greener and more conscious of the risk of greenwashing, use of third-party certification and industry performance data should rise in the selection of green products.

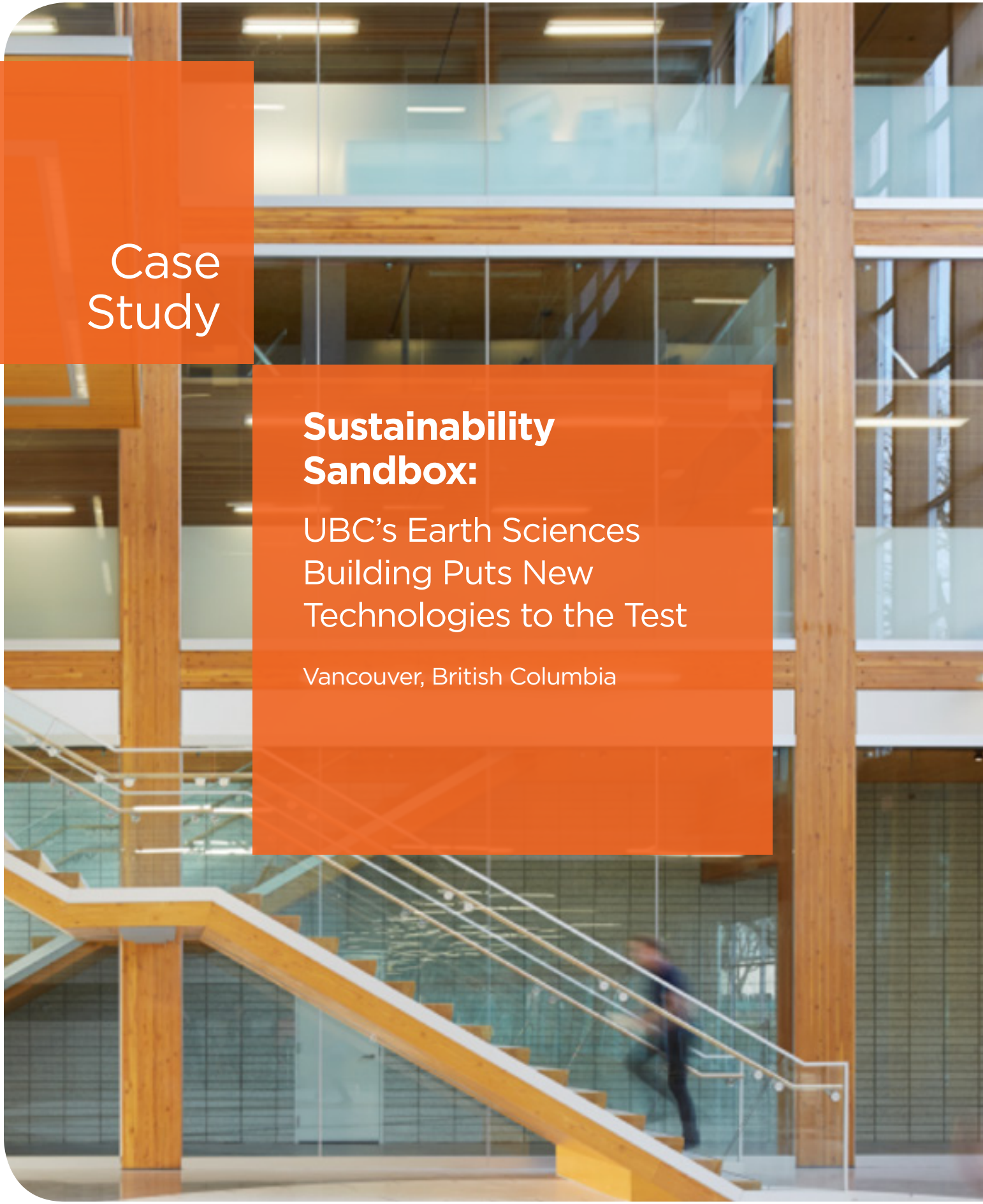
On the other hand, only 25% of those with firms doing more than 60% green projects consider whether products are made from recycled materials as a criterion for whether products are green.

Case Study

Sustainability Sandbox:

UBC's Earth Sciences Building Puts New Technologies to the Test

Vancouver, British Columbia



Photos: Martin Tessler / Courtesy: Perkins+Will

The entire campus of the University of British Columbia is, according to the mandate of its living laboratory initiative, "a kind of giant sandbox" for exploring the technological, environmental, economic, and societal aspects of sustainability. One of the most recent projects to appear in the sandbox is the five-storey Earth Sciences Building (ESB), the result of an integrated design process led by Perkins + Will.

Located on the main promenade of UBC's dense and walkable campus, the glass- and white brick-clad ESB achieves with elegance the conservation targets of a LEED Gold building: it makes impressive energy savings in a high-energy typology; reduces water consumption with low-flow plumbing fixtures; maximizes its use of recycled, regional, and low-emitting materials; manages site rainwater with vegetated swales; and proves out a couple of vanguard technologies in its comprehensive strategy for sustainability.

FOCUS ON CARBON REDUCTION AND SEQUESTRATION

The building is configured around a central, full-height atrium connecting two, approximately equal, wings. Where the south wing, housing offices and research labs, uses concrete for its primary structure, the north wing, housing more offices, classrooms, and lecture theatres, uses engineered wood. The ESB is the largest wood structure in North America.

"Wood is reflective of our local ecology and local building materials," says Rebecca Holt, Sustainable Building Advisor at Perkins + Will, "and the Earth Sciences Building demonstrates the use of wood as a modern and sophisticated material."

Comparing the embodied carbon in the ESB's north and south wings using Athena, an online life-cycle analysis tool, the design team tallied the carbon footprint of the concrete structure at 0.44 tonnes of carbon dioxide equivalents per square metre (tCO2e/m2) of building area, and the heavy timber structure at 0.23 tCO2e/m2. The team found heavy timber reduced the carbon footprint of the structure by almost half.

Wood switchback stairs with oversized landings.

Wood's ability to sequester carbon contributes significantly to the ESB's carbon footprint reduction. As wood grows, it takes in atmospheric carbon for food, sequestering 1.8 to 2.0 tCO2e per tonne of dry wood, depending on species, according to the Forestry Innovation Investment, a forestry market development agency of the Province of British Columbia. The Earth Sciences Building's 1,353 cubic meters of wood are estimated to sequester some 1,094 tCO2e: the equivalent of taking about 415 cars off the road for a year.

However, to maximize carbon sequestration, wood elements must be reusable at the end of a building's life. "Wood construction delays the release of carbon back to the atmosphere," notes Eric Karsh, principal at Equilibrium Consulting, structural engineers for the project. "It doesn't eliminate it." In the ESB, wood-to-wood and pre-engineered aluminum dovetail connectors facilitate the demounting and reuse of columns, beams, and engineered timber panels. Rigid connectors embedded in the concrete-timber composite floors make recovering the timber floor panels more difficult, but not impossible.

The project's use of wood contributed to the achievement of LEED credit for regional materials, and for the innovative life-cycle analysis establishing the embodied carbon of its structural material. Beyond that, according to Rebecca Holt, the use of wood was integral to a number of the building's sustainability strategies, including energy conservation, durability, and indoor air quality.

INNOVATIVE TECHNOLOGY USE TO MAXIMIZE ENERGY EFFICIENCY

As well as pioneering a new building material, and documenting its carbon effect, the ESB pioneers a new thermal technology as part of its comprehensive approach to energy reduction. Relative to the MNECB reference building's annual energy utilization intensity (EUI) of 679 kWh/m2, the ESB's EUI, at 308 kWh/m2, is less than half. Almost 90% of these savings come from reductions in heating energy.

A high-efficiency envelope sets the stage for energy savings, with R-37 roofs, R-23 walls, high-performance glazing (U 0.42, SHGB 0.29), external overhang shades on the south and west façades, and vertical fins on the east façade.

A displacement ventilation system serves the office and administration areas, with radiant slabs heating perimeter zones. Ventilation is demand-controlled, with CO2 sensors installed in each lecture theatre and in the return air duct for the office and administration areas. For natural ventilation and free cooling, the design includes operable windows in offices and classrooms, and a solar chimney in the atrium. Ventilation air for the labs comes through a constant

volume reheat system which uses VAV boxes to reduce ventilation rates at night. For further savings, transfer air from the office areas provides makeup air for the labs.

South and east elevations of Earth Sciences Building

The building's mechanical system consists of two heat recovery chillers with a Thermenex Logic header, a patent-pending technology which the ESB is the first building to implement. The Thermenex header is a water-filled pipe with a hot end and a cold end, and a controlled thermal gradient between. It acts as a hub for the transfer of waste thermal energy from areas that need cooling to areas that need heating.

"Heating water takes a lot of energy," explains Jimmy Ng, a principal with Stantec, mechanical engineers for the project. "The Thermanex set up looks at where the low grade waste heat is useful, and uses that low grade heat before it calls for higher grade boiler heat: just like a hybrid car uses waste energy from braking to power its electric motor before it uses its gas engine."

Heat recovery strategies in the ESB include heat recovery coils in the lab exhausts, and local air-to-water heat pumps from general exhaust and service rooms. By heating with the coldest water possible, and cooling with the warmest water possible, the system meets heating loads using surplus heat from within the building. Three condensing boilers provide back-up heating water, as well as high-temperature hot water for the portion of domestic hot water that is not preheated by the chiller heat pumps.

The result is working very well," says Jimmy Ng. "It's not the common story of energy modelling, where the first five years of operation are nowhere close to the model. At ESB, the energy being consumed is very close to the energy model. So those predicted savings are real."

An elegant new building, with strong all-round environmental performance and several innovative technologies proving out nicely, the ESB reveals an exemplary example of what can be done in the campus sandbox.

PROJECT STATISTICS

Location	Vancouver, B.C.
Project area	15,794 m2
Construction budget	$58,700,000
Completion	2012
Storeys	5
Energy intensity	308 kWh/m2/year
Energy savings	55% (compared to MNECB)
Water use reduction	42.62% (compared to baseline fixtures in the Energy Policy Act 1992)
Recycled materials	> 15%
Regional materials	> 20%
Construction waste diversion	85%
Wood-sequestered carbon	1,094 tCO2e

Resources

CANADA GREEN BUILDING COUNCIL

Main website: *www.cagbc.org*

LEED Canada: *www.cagbc.org/leedcanada*

Membership with the CaGBC: *www.cagbc.org/membership*

CaGBC green building education: *www.cagbc.org/education*

MCGRAW HILL CONSTRUCTION

Main website: *www.construction.com*

Construction Market Research and Intelligence: *www.construction.com/market_research*

ACKNOWLEDGMENTS

The CaGBC wishes to thank McGraw Hill Construction for their strong and sincere efforts in every aspect of this Report. We would especially like to thank our three sponsors of this Report for their support, input and guidance: Oxford Properties Group, REALpac, and the Toronto and Region Conservation Authority.

We would also like to thank everyone in the Canadian building industry who answered the two surveys that resulted in this data, including CaGBC National and Chapter members, and our thousands of stakeholders across the country.

Lastly, we thank all of our stakeholders and industry members who helped disseminate the survey to practicing professionals across Canada. In particular, thank you to the industry associations who shared the survey with their members and staff.

ASSOCIATIONS WHO SHARED THIS SURVEY ON OUR BEHALF

Cement Association of Canada - *www.cement.ca*
Construction Owners Association of Alberta - *www.coaa.ab.ca*
Federation of Canadian Municipalities – *www.fcm.ca*
National Association of Women in Construction – *www.nawic.org*
Newfoundland and Labrador Construction Association – *www.nlca.ca*
Ontario Building Officials Association – *www.oboa.on.ca*
The Royal Architecture Institute of Canada – *www.raic.org*
Canadian Construction Association – *www.cca-acc.com*
Construction Association of New Brunswick – *www.constructnb.ca*
Fort McMurray Construction Association – *www.fmca.net*
Planning Institute of British Columbia – *www.pibc.bc.ca*
Construction Specifications Canada – *www.csc-dcc.ca*
Engineering Institute of Canada – *www.eic-ici.ca*

THANK YOU TO OUR SPONSORS:

OXFORD

Oxford Properties Group is a global platform for real estate investment, development and management, with over 1,400 employees and over $27 billion of real assets that it manages for itself and on behalf of its co-owners and investment partners. Established in 1960, Oxford has regional offices in Toronto, London and New York, and the company's portfolio includes approximately 50 million square feet of office, retail, industrial, multi-family and hotel properties. Oxford is the real estate arm of the OMERS Worldwide Group of Companies. *www.oxfordproperties.com*

REALpac
Real Property Association of Canada
Association des biens immobiliers du Canada

REALpac is Canada's most senior, influential and informative voice in the real property investment industry. REALpac brings together the industry's Chief Executives to collectively influence public policy, to educate government and the public, to ensure stable and beneficial real estate property and capital markets and to promote the performance of the real property sector in Canada. Member companies include publicly traded real estate companies, real estate investment trusts (REITs), private companies, pension funds, banks and life insurance companies with investment real estate assets each in excess of $100 million, large owner/occupiers and pension fund advisers as well as individually selected investment dealers and real estate brokerages. *www.realpac.ca*

Toronto and Region Conservation for The Living City®

TWith 60 years of experience, Toronto and Region Conservation (TRCA) helps people understand, enjoy and care for the natural environment. Our vision is for The Living City®, where human settlement can flourish forever as part of nature's beauty and diversity. *www.trca.on.ca*