

Building on Sustainability

2020 National Green Building Report

KEY FINDINGS





BOMA BEST Sustainable Buildings



BOMA BEST™ Sustainable Buildings is North America's most widely used environmental assessment and certification program.

It recognizes excellence in energy and environmental management and performance in the commercial real estate industry.

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2008

2012

2016

2019

Between April 1, 2018 and March 31, 2019 we analyzed the performance of 549 certified buildings, of which 278 achieved a Bronze level or higher.

An Office Tower in 2019...



ENERGY

9%

Reduction in
annual energy
use intensity¹

AVERAGING

29.9 ekWh/ft²/yr

ENOUGH TO SAVE



70,000
barrels
of oil



WATER

40%

Reduction in
annual water
use intensity¹

AVERAGING

0.67 m³/m²/yr

ENOUGH TO FILL



Almost
3 billion
bottles of water



CARBON

36%

Reduction in
annual GHG
emissions¹

AVERAGING

6.9 kgCO₂e/ft²/yr

THE EQUIVALENT
OF TAKING



16,700
cars off the road
for 1 year



WASTE

1 in 4

Buildings
achieved
diversion rates
of 70% or higher

WITH

88%



Buildings
implementing
6 or more diversion
programs on site

1. Cumulative reduction between 2018 and 2030.

2019

2023

2027

2030

As more building operators take a stance against climate change, we look at how BOMA BEST buildings will be performing in years to come. See how today's efforts are helping to minimize future building impacts on the environment.

An Office Tower in 2030...



ENERGY

33%

Less energy
used than
today

AVERAGING

20.0 ekWh/ft²/yr

EQUIVALENT TO SAVING



\$0.80 /ft²/yr



WATER

17%

Less water used
than today

AVERAGING

0.55 m³/m²/yr

EQUIVALENT TO SAVING



\$0.03 /ft²/yr



CARBON

50%

Fewer GHG
released
than today

AVERAGING

3.1 kg/CO₂e/ft²/yr

EQUIVALENT TO
PLANTING

880,000
trees



WASTE

70%

Of their total
waste diverted

EQUIVALENT TO
DIVERTING

1,500



garbage trucks
from landfill¹



1

ENERGY

BOMA BEST Office Buildings saved enough energy to power over:

4,000 HOMES



Equivalent to saving¹:

● 2.9 ekWh/ft²/yr

● \$0.20/ft²/yr in energy costs²

Office Buildings Reduce Energy Use by 9%

BOMA BEST office buildings have reduced their energy use by 9% since 2008.

They now average
29.9 ekWh/ft²/yr.

Reduce EUI by up to 38% with Lighting Controls

Technology plays an important role in reducing energy consumption. For example, buildings with lighting controls have on average 38% lower energy use intensity (EUI) in comparison to buildings without these systems.³

38%

Buildings with these efficient systems report a lower energy use intensity

Lighting Controls

38% Lower EUI

Heat Recovery

23% Lower EUI

Efficient Boilers

21% Lower EUI

ENERGY STAR® Lighting

8% Lower EUI

Variable Speed Drive Pumps and Fans

7% Lower EUI

1. versus 2008 2. Energy cost and energy cost savings are estimated based on an average national electricity rate of \$0.12/kWh and an average national natural gas rate of \$0.20/m³ for BOMA BEST certified properties in 2018. 3. Building EUI is not dictated by one practice alone. Buildings with lighting controls are more likely to have other complementary strategies, all of which result in the lower EUI in these buildings.



Having Operation Manuals Accessible Dramatically Lowers EUI

Implementing effective operations and maintenance strategies can also contribute to significant EUI reductions. The following strategies are each associated with an EUI reduction compared to buildings without.

Buildings with these operation and maintenance strategies save on energy



Operation Manuals
27% Lower EUI



Energy Data Shared with Tenants
11% Lower EUI



Equipment Scheduling
35% Lower EUI

Improve Performance by Combining Energy Saving Strategies

By implementing a combination of strategies a building's best performance and greatest energy cost savings can be realized. Performance is not dictated by one practice alone.

Properties implementing 6+ strategies save energy

19% Savings

in energy consumption annually⁴

Equivalent to saving:

➔ \$0.60/ft² in utility costs

➔ \$150,000/yr in utility cost for a 250,000 ft² office building

Properties with six or more strategies implemented report an average energy use intensity of 23.1 ekWh/ft²/yr which is 19% lower than properties that have implemented fewer than three Operations/ Maintenance or System strategies.

4. Compared to office buildings that implement fewer than 3 strategies.



ENERGY FORECASTING

Energy use intensity in BOMA BEST office buildings is decreasing, despite 2018 uptick.

The downward trend is expected to continue as properties use BOMA BEST to chart a path for performance improvement. If the energy intensity continues on its current trajectory, **by 2030 the average BOMA BEST office building could achieve:**

20 ekWh/ft²/yr

Energy use intensity by 2030



39%

Decrease in EUI relative to 2008



\$1.00

Savings in energy costs ft²/yr

Between 2008 and 2018, BOMA BEST certified office properties have achieved an average 1.7% per year reduction in EUI. There are variations around the annual average reduction because the cohort of office buildings certified each year is different, but a trend in improving

performance is clear. A similar downward trend in energy use intensity is also noted by National Resources Canada (NRCan), Global Real Estate Sustainability Benchmark (GRESB) and the International Energy Agency (IEA).

A continuation of this trend is supported by the following industry influences:

Government policy

Past and future policy can create favourable conditions for building owners and managers to invest in energy efficiency. For example, Build Smart – Canada's Buildings Strategy, a key driver of the Pan-Canadian Framework on Clean Growth and Climate Change.

Untapped potential for LED lighting technology

In 2018 less than half of BOMA BEST certified office buildings reported they had installed high-efficiency lighting, indicating a significant opportunity remains. The IEA projects that the share of LEDs in lighting sales will rise to almost 100% by 2050 thanks to cost competitiveness.

Potential for space heating technology

Energy use intensity of space heating, which represents about 56% of office energy use in Canada, should continue to decrease (already down 5% between 2008 and 2016), as conventional gas boilers are replaced with condensing boilers (up to 98% efficient) and heat pumps (usually exceeding 200% efficiency).

Untapped potential in retro-commissioning

With fewer than 50% of 2018 certified BOMA BEST office buildings reporting retro-commissioning, there is untapped potential of operational energy savings. Some leading-edge property teams are already looking to automate the retro-commissioning process using fault detection and diagnostic software to alert building operators of inefficiencies.

The trend to densify existing office spaces may create upwards pressure on EUI as demand for space cooling (6% of typical annual energy use) and equipment loads (14% of annual energy use) increase.

Two future scenarios are predicted:

Future 1

Continued Progress

20 ekWh/ft²/yr

Energy use intensity by 2030

This scenario anticipates that energy intensity continues on its current reduction trajectory. In this scenario, adoption of energy efficient technology and operating practices progresses steadily, supported by a robust provincial and federal policy framework, retrofit codes and incentive programs.

Future 2

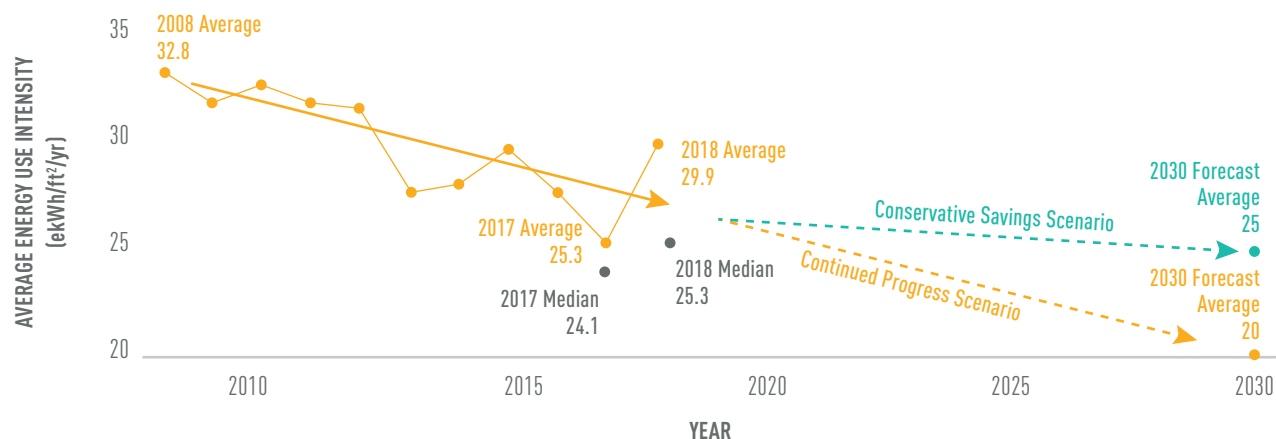
Conservative Savings

25 ekWh/ft²/yr

Energy use intensity by 2030

This scenario anticipates that properties may reduce energy efficiency investments in future years, due to scaled back federal and provincial energy conservation policies or saturation of technology adoption. In this scenario annual EUI reduces by 0.5% per year, consistent with the historical national average EUI reduction for offices in Canada reported by NRCan.

Average Energy Use Intensity and Forecasting





2

CARBON

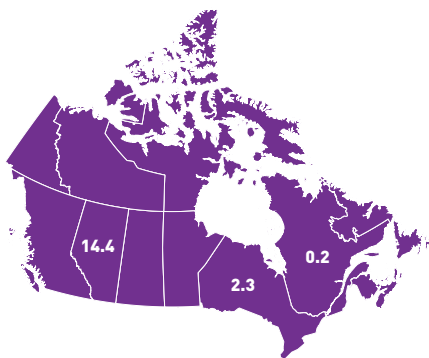
BOMA BEST Office Buildings prevented:

54,000 TONNES OF GHG EMISSIONS¹



Equivalent to: taking **16,700 cars** off the road for one year planting **900,000 trees**

Carbon Emission Intensity Varies Widely Across Canada



Carbon Emission Intensity by Region kgCO₂e/ft²/yr

This year, the average carbon emission intensity for office buildings ranged from as little as 0.2 kgCO₂e/ft² in Quebec to over 14 kgCO₂e/ft² in Alberta, with an average carbon intensity of 6.9 kgCO₂e/ft² across Canada.

1. versus 2008

A building's carbon emissions are not only influenced by how efficiently it uses energy, but also what type of energy is used. Carbon emissions can differ significantly from coast to coast depending on the fuel source used for electricity generation.

For example, in Alberta where most electricity is generated from coal, carbon emissions per kWh of electricity generated are about 20 times higher than in Ontario, where electricity comes from a mix of natural gas, hydro, and nuclear.

As a result of this variation, buildings in different locations can prioritize different actions to achieve carbon reductions.

Consider implementing the following strategies based on your local grid

Low-Carbon Grids Should Reduce Heating Energy Consumption

> British Columbia, Manitoba, Ontario, Quebec

Heat Recovery

Efficient Boilers

Energy Efficient Windows

High-Carbon Grids Should Reduce Electricity Consumption

> Alberta, Saskatchewan, Nova Scotia

Lighting Controls

ENERGY STAR Lighting

Variable Speed Motors



CARBON FORECASTING

Canada's national emissions reduction strategy identifies buildings as a key focus area. BOMA BEST certified properties have already begun their low-carbon transition by investing in energy saving systems and practices as well as active and alternative transportation options.

3.1 kgCO₂e/ft²/yr

Average carbon emission intensity by 2030



71%

Reduction in carbon emissions since 2008



33,000

Passenger vehicles off the road for one year¹

BOMA BEST Office buildings can continue to reduce their carbon emissions by targeting the following strategies:

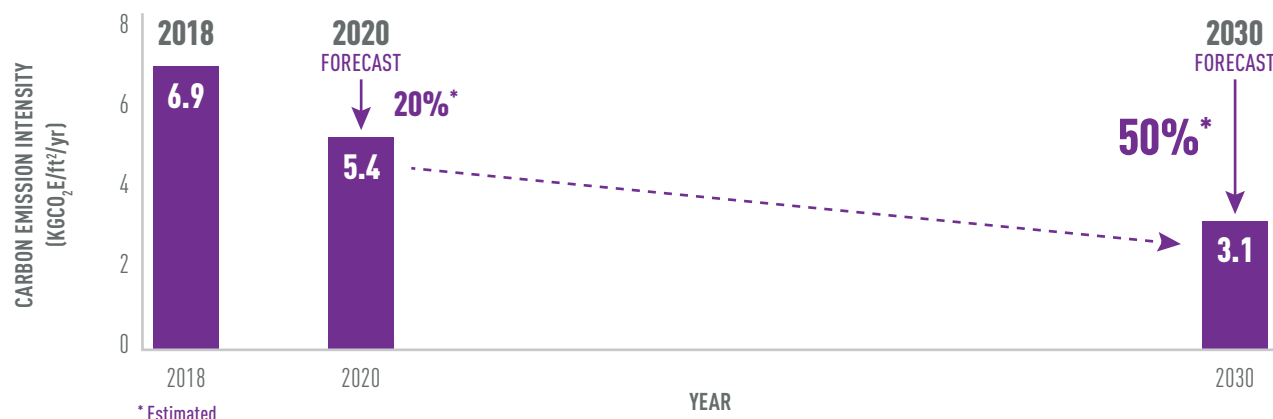
Improving energy efficiency

With BOMA BEST, average energy use intensity forecast to reach 20 ekWh/ft² by 2030 in the continuous progress scenario (see page 10).

Decarbonizing electricity grids

Provinces continue to integrate low-carbon fuel sources into their electricity generating capacity.

Average Carbon Use Intensity and Forecasting





3

WATER

BOMA BEST Office Buildings saved almost:

3 BILLION WATER BOTTLES



Equivalent to saving¹:

● 0.46 m³/m²/yr

● \$0.10/ft²/yr in water costs¹



A 40% Reduction in Water Consumption

BOMA BEST Office buildings have reduced their water use by 40% since 2008. They now average 0.67 m³/m²/year—33% lower than the REALPAC National Average.

Platinum Offices Use 23% Less Water

Across all property types, **Platinum certified buildings** lead the way in implementing water-saving technologies, which contribute to their reduced water use and cost. The next page will show what technologies can achieve the highest water reductions.



What does 23% savings mean?

\$8,500

Yearly water savings for a 250,000 ft² office building²

1. versus 2008 2. Water cost and water cost savings are estimated based on an average national water rate of \$2.43/m³ for BOMA BEST certified properties in 2018.

3. Flush and flow fixtures are considered implemented if over 75% of fixtures at the property meet the requirement.

An Opportunity to Improve

In 2016, BOMA BEST increased its performance threshold for “high-efficiency” fixtures.³ Only 30% of buildings currently meet this standard.

Results suggest that over half of buildings are not meeting the previous standard set in 1992.

To highlight the untapped potential of implementing high-efficiency technology, we compare Platinum certified buildings to all other levels.



> Building Photo: **Eighth Avenue Place** – 525 8th Avenue SW Calgary, AB. Managed by Hines Canada Management. BOMA BEST Platinum.

Water-Efficient Technology



Drip of Root-Fed Irrigation

68%
Platinum

24%
Other Levels



Irrigation Moisture Sensors

68%
Platinum

21%
Other Levels



High-Efficiency Toilets

4.8 litres per flush or less

68%
Platinum

22%
Other Levels



High-Efficiency Urinals

1.9 litres per flush or less

68%
Platinum

29%
Other Levels



High-Efficiency Lavatory or Kitchen Faucets

5.7 litres per minute or less

96%
Platinum

47%
Other Levels



WATER FORECASTING

As more properties implement water efficient systems, water use intensity in office buildings continues to trend downwards, decreasing on average at a rate of about 5% per year since 2008 for BOMA BEST certified Office properties.

At this rate, the average BOMA BEST Office building could achieve the following:

0.55 $\text{m}^3/\text{m}^2/\text{yr}$

Water use intensity by 2030



Equivalent to saving:

☉ **730** Olympic sized swimming pools since 2008

☉ **\$0.10** Savings in water costs /ft²/yr^{1,2}

Reduce water consumption with these key features:



9% reduction with high-efficiency water fixtures

32% of typical commercial office building's water consumption is associated with domestic water use. Implementing high-efficiency water fixtures such as toilets, urinals, lavatories, kitchenettes are one technology strategy for reducing water use.



Accelerate water savings with rainwater captures and drought tolerant plant species

More advanced strategies including rainwater capture and reuse, expanded use of drought tolerant plant species, and high-efficiency or water-free cooling towers, automated leak detection, and fault detection and diagnostics for water consuming systems could accelerate water savings.



8% reduction with high-efficiency irrigation technologies

Full implementation of water efficient irrigation technology could reduce total building consumption by about 8%.

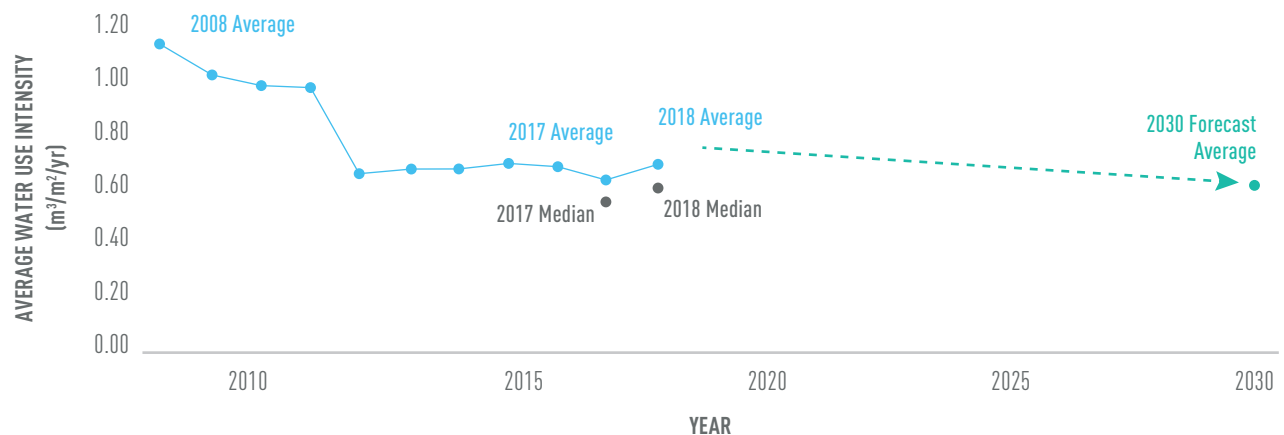
1. versus 2008 2. Water cost and water cost savings are estimated based on an average national water rate of \$2.43/m³ for BOMA BEST certified properties in 2018.

Since 2012, water use intensity at BOMA BEST certified office properties has been relatively constant, between 0.6 m³/m² and 0.7 m³/m² each year.

The 2018 median is 0.54 m³/m², indicating that while average performance has remained steady for several years, a lower water use intensity at office properties is not only achievable, but has already been realized at a significant number of BOMA BEST properties.

The most significant reduction in average office water use intensity was achieved between 2008 and 2012, when it declined 42%. There could be several factors contributing to this reduction, but during this time three significant market influencers for water efficiency emerged—REALPAC's Water Benchmarking Pilot, BOMA BEST's v2 program, and LEED for Existing Buildings.

Average Water Use Intensity and Forecasting



> Building Photo: **725 Granville** – 725 Granville, Vancouver, BC. Managed by Cadillac Fairview Corporation Ltd. BOMA BEST Platinum.



4

WASTE



25%

of buildings achieved a diversion rate of 70% or higher



244

buildings have implemented 6 or more diversion practices

Recycling Habits Have Far Reaching Effects



Waste management programs can be an occupant's most tangible experience of a property manager's sustainability commitment. By implementing specialty recycling initiatives that go above and beyond typical municipal programs, property managers can demonstrate their commitment to sustainability and make it easier for tenants to improve their own recycling habits.

Platinum Buildings Achieve a 80% Diversion Rate


This year, more than half of office buildings reported waste diversion rates above 50%.

Among Platinum certified buildings the reduction was higher, with a quarter achieving rates above 80% and one building reaching over 90%. 16 office buildings reported a waste diversion rate above 80% this year. These buildings were located in Ontario (13 properties), Alberta (2 properties), and Manitoba (1 property).

80% of BOMA BEST Buildings implement the following diversion programs

-  Electronics
-  Ballasts and Fluorescent Tubes
-  Batteries

Opportunities exist in the following categories

-  Reusable China and Utensils
-  Paper Accountability
-  Packaging Reduction
-  Coffee Pods and Cups
-  Bulk Dispensers



Diversion Rate: The Diversion Rate is the proportion by weight of all waste diverted from disposal (via recycling, composting etc.) to the total weight of all waste material generated, expressed as a percentage.

Specialty Recycling Programs Boost Diversion Rates

When products are designed with their end-of-life in mind, they are built to last, to be reused, repaired, remanufactured or to have materials recovered, supporting a circular economy. This model is regenerative by design and eliminates the concept of waste. It replaces the “take->make->waste” linear model of production with one where materials flow in loops.



Circular Economy: an economic system where products that have reached the end of their useful life can be recycled into components for a new product or service.

Buildings with more resource recovery programs have better waste diversion rates

Buildings reporting diversion rates of:

90%

implemented 17 specialty diversion programs



Across all BOMA BEST property types, when the number of available waste management programs increases, so do property waste diversion rates.



Waste Accountability is on the Rise

Recent news stories highlighting Canada’s exports of recyclable materials internationally have increased tenant awareness of waste management challenges and increased expectations of accountability for what happens to waste after it leaves the site.¹

1. www.bomacanada.ca/resources/NGBR2020References

Leading properties make sure what ends up in the recycling actually gets recycled

70%

of BOMA BEST Gold and Platinum buildings demonstrate accountability by tracking materials to their final destination



WASTE FORECASTING

Today, building owners and managers use data to make decisions more than ever before, and rely on quality information to make the right decisions. This means property teams are closely monitoring performance data about all aspects of their operations, including waste management.

As buildings improve, the average BOMA BEST office building could achieve the following by 2030:

70%



9%



1.8

Average diversion rate

Increase in diversion rate

Million Kilograms of
additional waste diverted²

Building management teams are increasingly seeking greater transparency on their monthly waste reporting data as well as asking questions about the collection and processing of recyclable materials, organics and non-recyclables.

Collaboration between the property team, tenants, custodial staff, and waste management service providers is often necessary to understand the complete process from waste generation through diversion and how improvements can be achieved.



Waste Accountability is a Priority at Oshawa Centre

Oshawa Centre is one of the largest shopping centres in the Greater Toronto Area, with over 240 stores across 1.2 million square feet. It is a platinum certified BOMA BEST and welcomes over 10 million visitors per year, and Ivanhoe Cambridge's property management and operations team prides itself on creating an excellent experience for each visitor.

Waste accountability is a priority at Oshawa Centre. The property team and its cleaning service separate recyclable and non-recyclable waste on-site to maximize capture rate. The property also provides feedback and educates individual tenants when collected recycled

materials are contaminated, which improves diversion and capture rate, and creates engagement touchpoints between the tenant and the property owner. Oshawa Centre also implements a unique food waste diversion program, collaborating with food court vendors to collect unsold food at the end of each day to donate to local support organizations and shelters through Feed the Need Durham.



For more information on Oshawa Centre's sustainability journey, visit www.bomacanada.ca/resources

2. Based on average waste generation rate of 0.25 kg/ft², per the 2015 Recycling Council of Ontario Report



As waste technologies increase, diversion rate decreases

Focusing on performance improvement is leading to increased diligence in waste measurement and reporting. Technological solutions including on-site weigh scales and built-in waste bin monitoring are helping improve the accuracy of waste and recycling measurement. However, as these technologies are introduced, properties are seeing their diversion rate change, and often decrease, as data based on actual measurements

takes the place of estimated weights based on number of recycling totes or quantity of bins removed.

A trend towards improved measurement accuracy could cause reported diversion rates for commercial properties to be lower than the 60% historical average for the next several years, even as recycling and waste management practices continue to improve.

Long-term benefits supported by improved measurement accuracy:



Better waste profiling

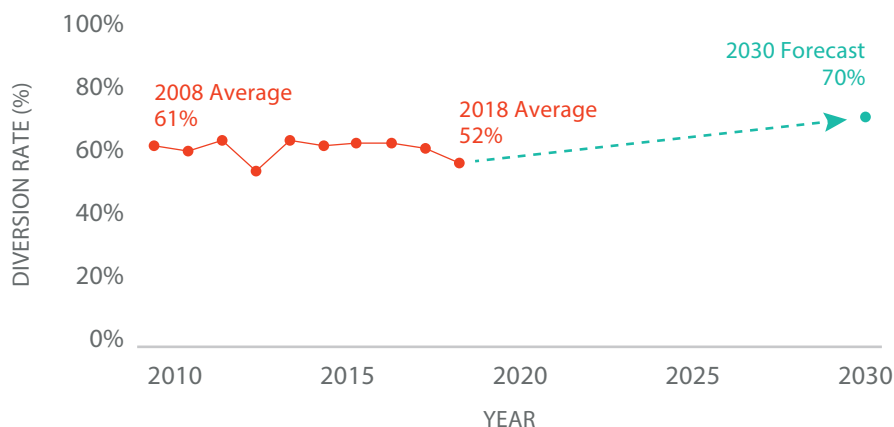


Improved decision making



Fuel efficiency for waste haulers

Long-term forecast for waste in BOMA BEST office buildings:



The average diversion rate for BOMA BEST properties dipped slightly this year to 52% after remaining relatively constant for several years at about 60%. Similar to energy and water use intensities, the dip in performance is largely due to the higher percentage of Silver certified properties in this year's BOMA BEST cohort, the majority of which had diversion rates of less than 50%.



5

RESILIENCE

Hazard Mitigation Saves Society Money

Risk assessments are the first step in evaluating the hazards that a property may face from extreme weather events and a changing climate. These can include extreme precipitation and flooding, extreme wind events, and heat waves.

By understanding the risks, building owners and managers can plan and then act to implement resilience strategies that best mitigate their property's specific hazards, prevent future losses (e.g., restoration costs, business downtime, reputation impact, etc.) and support tenant business continuity.



On average, every **\$1.00** invested in hazard mitigation saves society **\$4.00**¹

More properties developed risk assessments and plans in 2018 than 2017. See how our buildings have been responding:

Short-Term Planning



61%

Up from **56%** in 2017

Long-Term Planning



26%

Up from **19%** in 2017



Extreme weather events are one of the most urgent challenges facing commercial real estate today and the foreseeable future. BOMA Canada has placed industry adaptation and resilience to the effects of climate change at the top of our organizational priorities including the creation of the BOMA Canada Resilience Brief (bomacanada.ca/references)

1. www.bomacanada.ca/resources/NGBR2020References

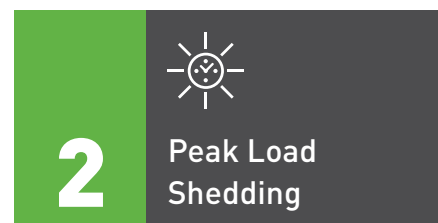
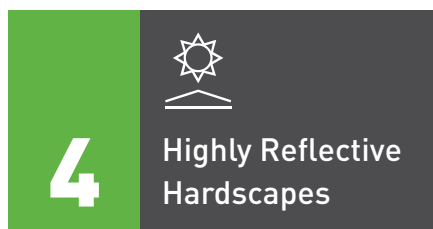
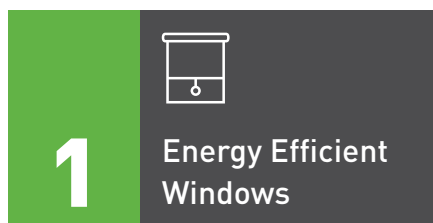
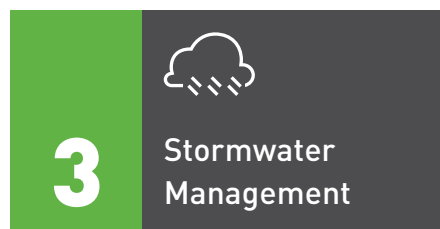
64%

64% of Shopping Centres Implement Peak Load Shedding

BOMA BEST building owners and managers are not only developing risk assessments and plans to mitigate the impacts from extreme weather events, they are also taking action.

Top 5

most commonly implemented strategies to minimize risk



Building owners and managers implement the resilience strategies that best address the hazards specific to their property.

Hazard Type 1

Damaging stormwater flow due to large, hardscaped parking areas

Resilience Strategy

Implement stormwater management measures including retention ponds, rain gardens, green roofs, use of porous pavement and stormwater cisterns.

Implemented at:

35%
Shopping Centres*

28%
Light Industrial & Open Air Retail*

Hazard Type 2

Brownouts and high electricity costs during peak demand periods

Resilience Strategy

Implement peak load shedding programs through base building-controlled systems that reduces stress on the electricity grid and save on electricity costs to the property.

Implemented at:

32%
Office Buildings*

64%
Shopping Centres*

* percentages are based on BOMA BEST certified buildings.



6

HUMAN EXPERIENCE

Healthy Building Features Impact the Bottom Line

Enhancing occupant health and well-being benefits the bottom line. Organizations that implement healthy building features report business benefits.

10%

Improvement in employee performance¹

50%

Of employees indicated increased energy levels and happiness²

TOP TALENT

Attract millennials for whom wellness and flexibility matters more than previous generations³



Enhancing Comfort, Health and Occupant Well-Being at Fifth and Fifth

The management and operations team at GWLRA's Fifth and Fifth property in Calgary is collaborating with tenants to provide features that enhance occupant experience, specifically to support tenants' health and wellness goals.

A re-design of the indoor food court and development of a ground floor fitness center with change rooms and shower facilities have contributed to an increase in tenant comfort, health and occupant well-being. Fifth and Fifth now incorporates natural elements such as indoor planters, wood and stone features that brings the outside in. Creating a welcoming environment that tenants enjoy.



Indoor planters



Wood and Stone Features



Courtyard-like Settings

For more information on Fifth and Fifth's sustainability journey, visit www.bomacanada.ca/resources



36% of BOMA BEST Properties Support Facilities for Commuter Cyclists

Strategy

Benefit

% of BOMA BEST Properties with Strategy Implemented (All Property Types)



Biophilic Features

65%

Of employees feel healthier in an office where every desk had a view of greenery⁴

17%



Exceeding ASHRAE Ventilation Rates

Increased productivity of an employee is worth

150 X

More than the increase in energy costs when doubling office ventilation rates over ASHRAE minimums⁵

17%



Secure Bicycle Racks and Shower Facilities

Commuter cycling has risen by over

60% Since 1996⁶

Cycling promotes a healthy lifestyle and reduces traffic congestion and associated environmental footprints

36%



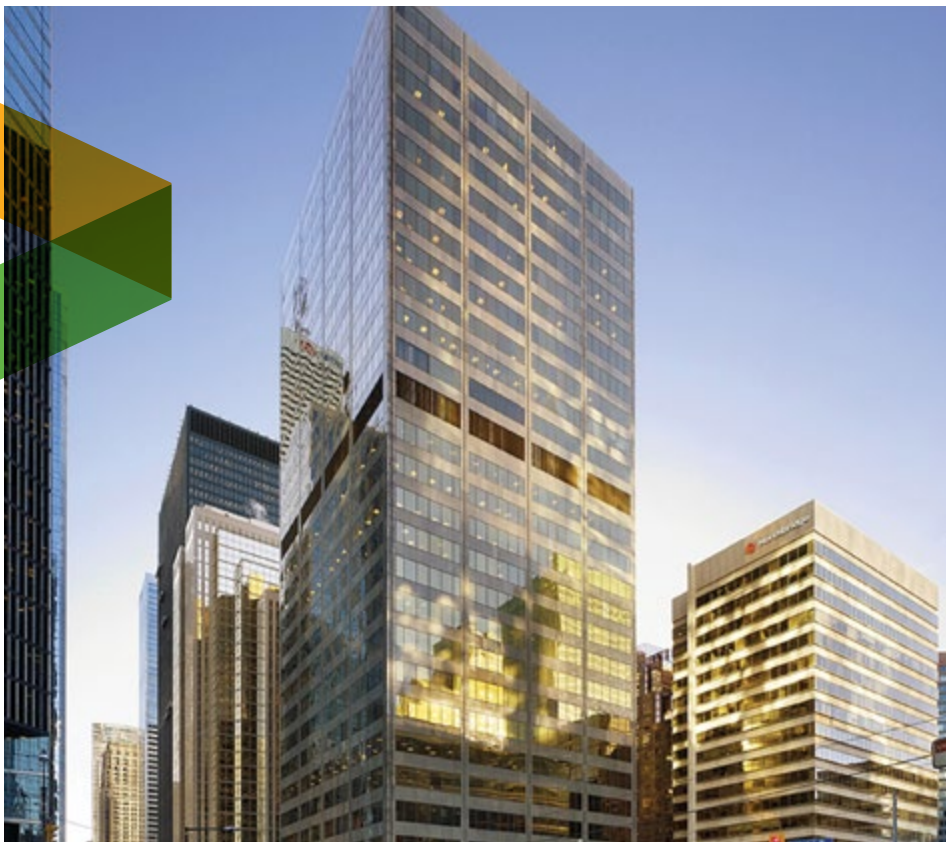
Background Sound Levels

53%

Of employees report that ambient noise reduces their work satisfaction and productivity.⁷ Organizations are implementing strategies to reduce noise distractions⁸

10%

1-8 www.bomacanada.ca/resources/NGBR2020References



> Building Photo: **145 King Street West** – 145 King Street West, Toronto, ON. Managed by QuadReal Property Group. BOMA BEST Gold

This report was prepared with assistance from Purpose Building Inc.



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