PUBLIC AGENDA
SASKATOON ENVIRONMENTAL ADVISORY COMMITTEE

Thursday, September 14, 2017, 11:00 a.m.
Committee Room A, Second Floor, City Hall
Committee Members:

Ms. K. Aikens, Chair
Mr. B. Sawatzky, Vice-Chair
Ms. E. Akins
Ms. A. Bugg
Ms. K. Engele-Carter
Ms. A. Garg
Councillor S. Gersher
Ms. S. Harrison
Mr. S. Homenick
Dr. D. McGrane
Ms. K. Palmer

Pages

1. CALL TO ORDER

2. CONFIRMATION OF AGENDA

Recommendation
That the agenda be confirmed as presented.

3. DECLARATION OF CONFLICT OF INTEREST

4. ADOPTION OF MINUTES

Recommendation
That the minutes of meeting of the Saskatoon Environmental Advisory Committee held on June 8, 2017, be approved.

5. UNFINISHED BUSINESS

6. REPORT OF THE CHAIR [CK. 175-9]

Verbal Update - K. Aikens

Recommendation
That the information be received.

7. COMMUNICATIONS

7.1 Saskatoon Food Council [CK. 5700-1] 4 - 14

A request to speak from Gord Enns, Executive Director, Saskatoon Food Council, dated September 1, 2017, was received.

Also attached for the Committee's information is a letter prepared by the Food Council Board of Directors along with a write up on urban agriculture in Saskatoon.

Recommendation
That the information be received.

8. REPORTS FROM ADMINISTRATION

8.1 Environmental & Corporate Initiatives [CK. 7550-1]

Verbal Update - B. Wallace

Recommendation
That the information be received.

8.2 Vehicle Idling Bylaw Implications [CK. 375-4] 15 - 39

Attached for the Committee's information is a Resolution package from the Standing Policy Committee on Environment, Utilities & Corporate Services meeting held June 12, 2017; it was resolved, in part, that the report of the A/General Manager, Corporate Performance , dated June 12, 2017, be forwarded to the Sasaktoon Environmental Advisory Committee for comment.

Recommendation
That the Committee provide comment on the report of the A/General Manager, Corporate Performance, dated June 12, 2017.

9. CIVIC BUILDING SUSTAINABILITY POLICY [CK. 7550-1]

9.1 Johnson Shoyama Graduate School of Public Policy [CK. 7550-1] 40 - 128

A PowerPoint presentation will be provided.

Attached is a "draft" report on Sustainable Civic Building Policies from the Johnson Shoyama group for the Committee's information.

Recommendation
That the information be received.

9.2 Reports from Administration [CK. 7550-1] 129 - 182

The following "draft" documents have been provided by the Administration:

- Comparison of Energy Efficiency Guidelines
- Comparsion of Green Building Systems
- Draft Outcomes for a High Performance Building Policy

Chris Richards, Manager of Energy and Sustainability Engineering will provide a brief presentation.

Recommendation
That the information be received.

10. GREENHOUSE GAS EMISSIONS SUBCOMMITTEE [CK. 375-4] 183 - 188

As discussed in June 2017, the GHG subcommittee has been working with Unite Digital Marketing Cooperative through the summer on a plan and policy for a continued social media campaign related to climate change in Saskatoon.

The subcommittee will provide the Committee with an update on progress to date and have included a "Draft" Social Media Policy and partial draft of approved information/talking points for social media use. The subcommittee also requests the approval of $300 of Committee funds to use in social media promotion during the months of September - December 2017.

Recommendation
That the Committee provide direction.

11. STATEMENT OF EXPENDITURES [CK. 1704-5] 189 - 189

Attached for the Committee's information is a current Statement of Expenditures for June to August, 2017.

Recommendation
That the information be received.

12. ADJOURNMENT

Community-University Institute for Social Research
425-221 Cumberland Avenue
Saskatoon, Sk.
S7N 1M3

September 1, 2017

Dear Mayor Charlie Clark and City of Saskatoon Councillors:

Formed as a result of a 2013 Community Food Assessment (CFA – attached), the Saskatoon Food Council Inc. is a community-based organization that works with many partners to create a sustainable, accessible, and dynamic food system. The Food Council board (currently including representatives from the City of Saskatoon, University of Saskatchewan, Saskatoon Health Region, a farmer representative and CHEP Good Food Inc.) recognizes that effective implementation of the food assessment recommendations requires a close working relationship with the City of Saskatoon.

To that end, the board of directors of the Saskatoon Food Council requests that the City of Saskatoon:

1. Partner with the Saskatoon Food Council to form a City of Saskatoon Food Systems Committee. Membership will include representatives from Parks, Community Development, Planning, Environment and Corporate Initiatives, Water and Waste Stream, Executive Director and 2 board members of the Saskatoon Food Council.

2. Provide $25,000 in FY2018 to support the operations of the Saskatoon Food Council, specifically to:

    - implement the CFA recommendations with a particular focus on improving food access in Saskatoon.

    - support staff capacity to co-chair the City of Saskatoon Urban Agriculture committee (existing and currently co-chaired with Planners Paul Whitenect and Ellen Pearson)

3. Nominate one City of Saskatoon Councillor to serve as a representative on the board of the Saskatoon Food Council.

While creation of the Saskatoon Food Council was the overarching recommendation of the CFA, the CFA also recommended that the Food Council:

- Promote Saskatchewan foods and food production as a healthy community-minded choice.
- Garden everywhere: expand capacity in urban agriculture.
- Increase collaboration among producers and the development of needed supports.
- Increase ways to obtain local food products.
- Feed the children: substantially increase school meals and snacks.
- Educate residents about healthy food and teach good food skills.
- Increase availability and affordability of good food.
- Increase people's ability to buy good food: reduce inequality.
- Reduce food waste in the home and reduce energy input in food production.
- Preserve water and land for the future.
- Build knowledge of regional food systems.

Like progressive cities across Canada who are engaging with community to form Food Policy Councils, the City of Saskatoon has made progress in implementing parts of these recommendations – however there is much opportunity for further progress. The Saskatoon Food Council looks forward to a strong, ongoing partnership with the City of Saskatoon to foster a sustainable, accessible, and dynamic food system.

We look forward to hearing from you.

Sincerely,

Gordon Enns, Executive Director
On behalf of the Saskatoon Food Council

What is urban agriculture?

Urban agriculture is the practice of cultivating, processing, and distributing food in and around towns and cities1. It has been increasing in popularity in Saskatoon and has expanded from the familiar private backyard garden into community spaces such as parks, school grounds, vacant lots and boulevards.

Urban agriculture in Saskatoon

Currently, there are 48 community gardens in Saskatoon (many of which have waiting lists) and a number of organizations engaged in urban agriculture activities. As well, Saskatoon has individual entrepreneurs developing commercial market gardens within its boundaries and strong advocates, researchers and practitioners at the University of Saskatchewan

There are multiple reasons for this growing interest in urban agriculture, including having more control over what we eat and where our food comes from to building a better understanding of the connection between food and health, the local economy and the environment. New growing techniques and technologies that allow food to be grown almost anywhere are also helping to drive this change. Hydroponics, SPIN farming, aquaponics, container gardens, and vertical growing systems, among other methods, are becoming more available as production alternatives. Building on this new interest, the City of Saskatoon could play a significant role in encouraging the practice of food growing in urban areas in safe and effective ways, through guidelines, regulations and permitting. The City can also enable and facilitate by increasing public awareness, brokering partnerships, removing barriers and creating opportunities for businesses, providing initial operational and material support to organizations, and leading by example with initiatives such as edible landscaping. Capitalizing on Saskatoon's existing strengths and assets in urban agriculture will lead to strong growth and benefits to many, including small businesses, non-profits, community groups, and citizens. The public benefits could include a more resilient local food supply chain, increased community participation in the food system, a greater diversity of fresh food sources, healthier ecosystems and improved efficiencies in the distribution of food.

1 Bailkey, M. and J. Nasr. 2000. From Brownfields to Greenfields: Producing Food in North American Cities. Community Food Security News. Fall 1999/Winter 2000:6

A stronger, more vibrant local economy

Urban agriculture can provide viable, commercial business opportunities in the areas of food production (and related processing and retailing), and the development and application of new technologies and methods for growing large volumes of food in small spaces.

A healthier, more food-secure community

Urban agriculture can help to provide resilience in the event of food supply chain interruptions (from market shifts in commodities or weather events, for instance). It can also help address food-related health and access issues, and increase community participation in the food system.

More attractive, vibrant, and unique places

Increasing the diversity and visibility of food-growing in Saskatoon adds interest and animation to the public realm. A broad spectrum of urban agriculture activities increases access to the diversity of sources of fresh produce within neighbourhoods.

Healthier ecosystems

Urban agriculture can support urban ecosystem services such as storm water management and habitat areas for songbirds, bees, and other species.

Less Energy, Emissions, Waste

closer to home shortens the supply chain, enabling energy and organic matter to be more efficiently recycled. As well, the need for packaging can be decreased and transportation efficiencies can reduce energy use.

Towards a Food Strategy for Saskatoon

Recommendations from the Saskatoon Regional Food System Assessment and Action Plan[1]

Recommendations

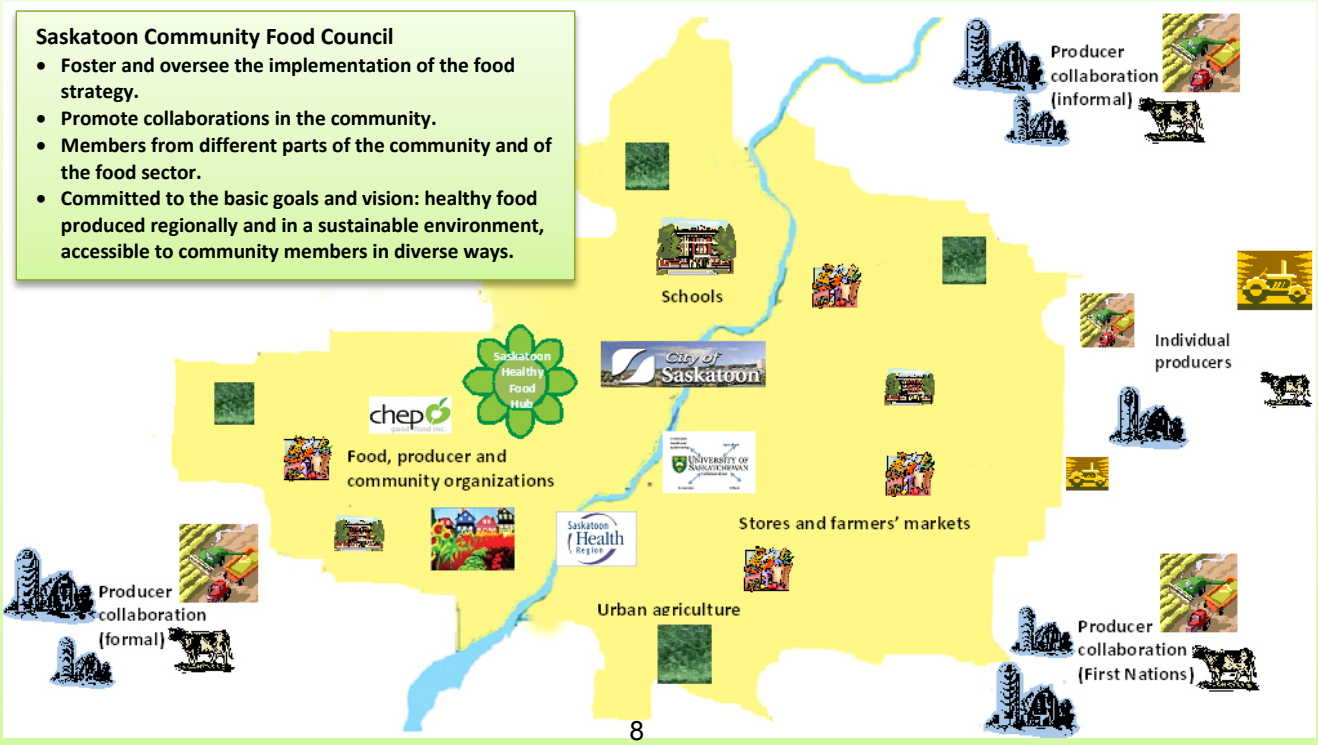
Our assessment has documented many of the factors, organizations, and enterprises already supporting change in the Saskatoon food system. In formulating recommendations and suggestions, our focus is to build on the existing strengths.

1. Our first overarching recommendation is to create a mechanism for ongoing food system action: A Saskatoon Community Food Council.

The Council would have members from different parts of the community and of the food sector, all committed to the basic goals and vision. Its purpose would be to foster and oversee the implementation of the food strategy. It would promote collaborations in the community, among and between producers and residents, and their organizations, building on existing strengths.

From the findings, the need emerges for increased collaboration among those involved. Given the nature of the movement's strength, any collaborations that are formed should retain flexibility, openness and responsiveness, but alliances can lead to more effective use of resources with better economies of scale, and improve the potential to leverage additional investment from outside sources. Alliances also enable the delivery of a coherent message for promotion. Based on our discussions in the assessment, we suggest that an explicit commitment to healthy food produced in a sustainable environment, accessible to community members in diverse ways, would be a message consistent with residents' values.

Saskatoon Community Food Council: Foster the food strategy and promote collaboration



In implementing the food strategy, the Council would act on the recommendations we have made in the following areas. Taken as a whole, the recommendations form the basis for a food strategy and corresponding action plan for Saskatoon.

2. Promote Saskatchewan foods and food production as a healthy community-minded choice.
3. Garden everywhere: expand capacity in urban agriculture.
4. Increase collaboration among producers and the development of needed supports.
5. Increase ways to obtain local food products.
6. Feed the children: substantially increase school meals and snacks.
7. Educate residents about healthy food and teach good food skills.
8. Increase availability and affordability of good food.
9. Increase people's ability to buy good food: reduce inequality.
10. Reduce food waste in the home and reduce energy input in food production.
11. Preserve water and land for the future.
12. Build knowledge of regional food systems.

Detail

2. Promote Saskatchewan foods and food production as a healthy, enjoyable, community-minded choice.

- It is opportune to make good food a key theme for Saskatoon, with the City of Saskatoon and Tourism Saskatoon becoming leaders in the regional food strategy, along with the food sector and organizations. We need to bring together partners from across the food system to explore challenges, and identify opportunity for growth. We need to build on the strengths that we have, by increasing collaborations among organizations active on food strategy goals.
- The overarching message is that Saskatchewan foods and food production are a healthy, enjoyable, community-minded choice.
- The City of Saskatoon should integrate the food strategy goals into the Official Community Plan and promote the food strategy as part of Saskatoon's image and values.
- Food tourism can be a strong contributor to the economy. Tourism Saskatoon should make the availability of interesting local food one of its attractions for Saskatoon. Tourism Saskatoon should market and promote the region's culinary offerings. It should work with local chefs to promote a city/region-oriented label for restaurants. Restaurants in tourist destinations, for example the Western Development Museum or Wanuskewin, could integrate local thematic food. Food festivals such as Taste of Saskatchewan or Folkfest could highlight local food components. The Star-Phoenix Taste of Saskatoon could include a local food component.
- The development of a media strategy for Saskatoon, including newspapers, food writers, social media and other forms, would be an important component of promoting local food and the food strategy in an ongoing way.

3. Garden everywhere: expand capacity in urban agriculture.

We need to grow more food in Saskatoon. We should strengthen the existing collaboration among CHEP, the City of Saskatoon and the University of Saskatchewan to increase support and leadership in urban agriculture, including the following key areas:

- Support existing community gardens and increase the number available. Having people garden on civic land decreases opportunities for crime and vandalism and builds community.
- Create a problem-solving mechanism to assist community gardens to function. Often there are specific logistical problems that good communication could easily resolve. This same mechanism could act to ensure that lower income communities not only have good access to gardens but are not impeded from using them through lack of specific resources, such as tools.
- Plan for community gardens in new neighbourhoods. This would be a better process than retroactively finding a suitable place for a community garden in existing neighbourhoods.
- Work with schools and other institutions interested in establishing gardens.
- Collaborate with interested First Nations and Métis organizations and communities to create and support programs and microenterprise for food production and processing.
- Develop a program to foster rooftop, balcony and boulevard gardens. Let people know that front-yard gardens are allowed.
- Develop CHEP's newly initiated shared-garden initiative, matching those with gardens to share, with others wanting to garden.
- Plant berry bushes and fruit trees where possible on city-owned land.
- Collaborate with Out of Your Tree to promote harvesting from fruit trees.
- Pilot promising practices in urban agriculture, promoting them and teaching about them.
- Create a training program in urban agriculture, which would include Seedy Saturday, and practice opportunities in CHEP and other projects, including recent initiatives in microenterprise projects.
- Inventory available land and resources
    - Develop an inventory of public and private land that can be leased by food growers. The inventory would include factors such as water access, slope and soil conditions.
    - Develop an interactive map that shows where all the edible fruit is on city park land, the U of S, and other accessible land, to encourage residents to harvest this fruit.
    - Develop an inventory of community accessible kitchens that the public can access.
- The City of Saskatoon should adopt several of the best practices in this area for its own jurisdiction, many already adopted by other cities, such as the following:

  Allotment gardens
    - Add at least one allotment garden in the short term, and in the longer term, offer allotment gardens in the west, east, south and north parts of the city.
    - Consider reducing or eliminating the fee to make them more accessible.

  Bylaws and practices supportive of urban agriculture
    - Actively inform residents about what practices are currently allowed in urban agriculture and what practices would be welcomed. For example, the City can support and educate its population about growing food in front yards, boulevards, vacant lots, right of ways, traffic circles etc. It could perhaps encourage the use of rain water/rain barrels connected to schools and businesses to serve as a water source for these gardens.

- In the longer term, review the City's OCP and zoning bylaws to remove impediments to or ambiguities about urban agriculture; and to create policies and allowable practices for commercial uses of urban agriculture.
- In the longer term, consider assigning civic staff to focus on supporting urban agriculture.

4. Increase ways to obtain local food products.

- There is a need for a "Saskatoon Food Hub" or centre, to act as a network hub, providing an important conduit for local food. CHEP could play this role, or perhaps a partnership could be formed. The Hub would:
  - Become the central registry for local food sources and urban-rural links, and hosting the on-line map of local food.
  - Increase bulk-buying, such as the Good Food Box, to increase the flow between producers and consumers at volume discounts.
  - Work with stores like Steep Hill, Herbs and Health, Dad's, and SaskMade to have a consistent and expanding repertoire of local products, perhaps over time increasing distribution to other small stores.
  - Work with the Saskatoon Farmers' Market to expand its producers, diversify its local produce and improve relationships with the core neighbourhoods.
  - Identify ways to support an increase in mini-Farmers Markets within the city, of various forms, while not jeopardizing the Saskatoon Farmers' Market.
  - Develop a stronger presence on the East Side of Saskatoon, to create a city-wide capacity and increase volumes.
- The Saskatoon Health Region should increase its purchase of local food by an increasing amount each year, to reach 5% of the total budget. In moving to centralize purchasing by all health regions, the province should include criteria to support local food purchasing.
- The U. of S. should participate in the national Farm to Cafeteria program, as a way to increase local food offerings in its cafeteria, and as a way to engage students and faculty in a local food system experience, while participating in a cross-Canada dialogue about it.

5. Increase collaboration among producers and the development of needed supports.

- There is a need for producers to collaborate in many different ways, to create economies of scale and increase their capacity and strength in the market, and invest in common infrastructure. Our assessment has documented some examples. There is also an opportunity for local retailers to provide leadership and flexibility in increasing their relationships with local producers.
- A project to "showcase" local producers as teaching examples would be beneficial to increasing both capacity and the potential for collaboration.
- There would be benefit in the partners in the Value Chain Initiative – the Saskatoon Co-ops and the Agriculture Council of Saskatchewan -- to expand the number of producers over time, expanding the capacity of producers in providing organizational infrastructure; creating economies of scale by collaborating in production, and providing market stability through contracts.
- There may be potential for collaboration with interested First Nations communities in and near Saskatoon to build on the economic opportunity presented through their reserve land to produce food for local sale.

- The Saskatoon Food Hub, the Value Chain Initiative and the Food Centre should build knowledge about policies and programs that would support small and medium-sized farmers, including specific implementation guidelines for food safety in smaller enterprises, such knowledge to be used by provincial and federal agencies.

6. Feed the children: substantially increase school meals and snacks.

- City school boards, in partnership with CHEP and with financial support from the provincial government, should expand their meal programs within the community schools to provide meals to all children who attend those schools. This will improve the nutrition of all the children there, while removing the stigma of using the program. Education and engagement about good food should continue to be part of the programs. In addition, there is a need to develop understanding by the general public about the benefits of these programs.
- The provincial government should support childcare centres in providing healthy and affordable meals to children, perhaps through partnering with CHEP in Saskatoon. Over the longer term, the availability of healthy food should be expanded to all public places where children congregate, e.g., all schools, childcare centres, and leisure centres. There should be collaboration with national groups to develop a national child nutrition program for children in Canada.

7. Educate residents about healthy food and teach good food skills.

- Schools are an important site for education of children and families. Saskatoon School Boards, CHEP and the Saskatoon Health Region should continue to develop healthy eating programs in all schools, using standards such as health promoting schools, incorporating gardens, and integrating the families of children so that they learn and support their children's healthy choices.
- The Saskatoon Health Region should champion food security for residents as a determinant of health, and continue to partner with community organizations in increasing access to healthy food and providing education around it. It should be a leader in implementing the food strategy.
- First Nations and Métis organizations, CHEP and the Saskatoon Health Region should continue to collaborate in engaging these communities to participate in food education activities and to improve nutrition.
- CHEP and its partners, including the Saskatoon Health Region, should build on its collective kitchens and other programs that provide education and promotion about healthy food, by encouraging other organizations in the city to do the same with their clientele.
- Newcomer communities could be engaged in identifying how local ingredients can be used or adapted for creating their traditional recipes.
- Breast feeding is an important element of good nutrition. CHEP, the Saskatoon Health Region and others supporting the Saskatoon Breast-Friendly Initiative should continue their initiatives. They should also increase the public's understanding about why breast feeding is part of a good food strategy.

8. Increase availability and affordability of good food.

- CHEP and the new Saskatoon Food Hub should continue to develop ways to make good food available at reasonable prices, including bulk buying and the Good Food Box, as above, but also by providing senior-friendly, community and mobile markets. The Good Food Junction should ensure it continues to provide a healthy food choice for the core neighbourhoods.

- CHEP and the City of Saskatoon should continue to promote and develop community gardens in such a way as to keep them affordable and accessible to people with fewer resources, so that the gardens can be a way to supplement the food intake for lower income people.
- First Nations and Métis communities should continue to provide meals to those in need, while providing education and promotion about healthy food, integrating cultural traditions that enrich the lives of the community, and partnering with CHEP and other groups.
- The Saskatoon Food Bank and Learning Centre should continue to enhance the nutritious elements of food hampers to those in need, while providing education and promotion about healthy food, and integrating projects such as the Potato Patch, which foster urban agriculture and participation by the larger community.

9. Increase people's ability to buy good food: reduce inequality.

- The Saskatoon Health Region should continue to focus on reducing health disparities in the city through health promotion in schools and action on including nutrition in schools and other social determinants of health, in partnership with community organizations.
- The Saskatoon Poverty Reduction Partnership should support the recommendations of the food strategy as a means to reduce food insecurity for Saskatoon residents facing poverty, while continuing to advocate for policies that increase income and other supports.

10. Reduce food waste in the home and energy input in food production.

- Residents should seek food products with minimal packaging, reduce food waste in preparing food and compost food waste.
- The City of Saskatoon should implement the city-wide curbside composting program for food waste, now being studied.
- Federal and provincial government agricultural policies should include goals to reduce the carbon footprint of food production and processing. We need studies of on-farm energy use and energy use by other links in the food chain: transportation, processing and packaging. Farmers need support in moving toward livestock production strategies to reduce energy use and greenhouse gas emissions.

11. Preserve water and land for the future.

Water

- Residents should conserve water and minimize the use of cosmetic pesticides in yards.
- The City of Saskatoon should increase protection of our water sources. We offer the following recommendations
    - Continue to support the protection plan for the South Saskatchewan River Watershed.
    - Incorporate green policies for its own buildings, for example, green roofs.
    - Adopt park design that reuses and saves treated water. (For example, instead of using treated water for spray pads only once before it is washed into the storm sewers, the water could flow to nearby trees, etc.).
- The provincial government should increase protection of our water sources from agricultural waste. Given limited water supplies, the government should prioritize irrigation projects that diversify food production and that target production to the local Saskatoon and area market.

Land

- Federal and provincial governments should implement agricultural policies to preserve and promote the next generations' ability to grow a diverse range of healthy food for our population. For example:
    - In cooperation with other provinces, Saskatchewan should enact a set of land ownership restrictions wherein farmland can only be owned by individuals who are provincial residents, or by incorporated farming operations owned by provincial residents. Residents of other provinces or nations and Saskatchewan non-farm corporations should not be allowed to own more than a small amount of Saskatchewan farmland.
    - Where the land is owned by Saskatchewan residents who are not active or retired farmers, e.g. by Saskatchewan residents who hold farmland as an investment, property tax rates should be higher.

12. Build knowledge of regional food systems.

In the assessment, we noted the need for a way to bring together and build on the different forms of knowledge toward the goal of improving the food system of our Saskatoon and area community. We suggest the following:

- The University of Saskatchewan should establish a regional food systems unit, comprised of university-based and community-based participants, to focus on studies of the local food economy. It would involve different departments and disciplines, including community health, plant sciences, and others but also community partners, such as CHEP and the SHR. The unit could encourage research at many different levels. Examples based on key informant interviews include studies that provide students with research opportunities such as regular food costing (as SHR is doing) nutrition tracking within the city, tracking vacant land uses in the city, and identifying conditions for rooftop gardens. Also arising from this assessment are proposals for studies of best-practices in small to medium-scale agriculture and food processing, and sector-specific analyses for increasing local markets for food products. Finally we need policy research on possibilities for different levels of government to increase support to the local food system. The unit should be housed in a department or college which has multi-disciplinary experience and community partnerships, such as within Plant Sciences in the College of Agriculture or Community Health and Epidemiology in the College of Medicine. Other options include the School of Environment and Sustainability or in the Division of Nutrition. Perhaps funding for a research chair in regional food systems could be obtained.
- In the short term, funds should be applied for to carry out further analyses of the food system in the Saskatoon area. Examples include:
    - Studies could be designed using data from Statistics Canada in conjunction with surveys of local producers to provide sector or product-specific analyses of potential.
    - Partners in First Nations and Métis organizations should be encouraged to collaborate in applying for funds to carry out a study of best practices for meeting the needs of First Nations and Métis communities though a food systems approach.
    - Saskatoon organizations such as the Saskatoon Environmental Society and the Waste Reduction Council could be encouraged to collaborate with others to create a research and education program about the environmental impacts and costs of food as it is consumed in Saskatoon, and how to reduce them.

[i] These recommendations are excerpted from the full report Towards a Food Strategy for Saskatoon: Saskatoon Regional Rood System Assessment and Action Plan, prepared by Kouri Research for the Saskatoon Regional Food System and Action Plan Team, December, 2013. Online at saskatoonfood.ca.

PUBLIC RESOLUTION
STANDING POLICY COMMITTEE ON ENVIRONMENT, UTILITIES AND CORPORATE SERVICES

Main Category: **7. REPORTS FROM ADMINISTRATION**

Sub-Category: **7.2. Matters Requiring Direction**

Item: **7.2.4. Vehicle Idling Bylaw Implications [CK. 375-4 and CP. 7550-001]**

Date: **June 12, 2017**

Any material considered at the meeting regarding this item is appended to this resolution package.

A request to speak from Gary McCallum was added to this item.

Mr. McCallum addressed the Committee regarding unnecessary idling of vehicles supporting the idea that the Administration needs to maintain livability in a city with increasing growth and development affecting neighbourhoods.

A letter submitting comments was added to this item from Kathleen Aikens, Chair, Saskatoon Environmental Advisory Committee.

Moved By: Councillor Gersher

1. That the report of the A/General Manager, Corporate Performance Department, dated June 12, 2017, be forwarded to City Council for information;
2. That the Administration undertake preliminary engagement of residents and primary stakeholders to gauge initial impressions and feedback on any proposed private vehicle idling initiatives. Any budget implications should be included in the 2018 Business Plan and Budget deliberations; and
3. That the report of the A/General Manager, Corporate Performance Department, dated June 12, 2017, be forwarded to the Saskatoon Environmental Advisory Committee for comment.

In Favour: Councillor Loewen, Councillor Gough, Councillor Gersher, Councillor Hill and Mayor C. Clark
Against: Councillor Davies

CARRIED

Vehicle Idling Bylaw Implications

Recommendation
That the report of the General Manager, Corporate Performance Department, dated June 12, 2017, be forwarded to City Council for information.

Topic and Purpose

The purpose of this report is to provide information on policy options that could reduce vehicle idling in Saskatoon.

Report Highlights

1. Pursuant to subsection 8(1) of *The Cities Act*, the City of Saskatoon (the "City") has jurisdiction to enact a bylaw addressing unnecessary idling of vehicles within the city's limits and has bylaws today that indirectly relate to certain aspects of vehicle idling in the community.
2. A vehicle idling bylaw would involve considerable resources and be difficult and costly to enforce. As a practice, the City does not enact bylaws that cannot be enforced.
3. Other jurisdictions in Canada have vehicle idling bylaws, with varying approaches to enforcement including no enforcement.
4. Education and signage have been effective in other jurisdictions and could be an option for reducing idling in Saskatoon.
5. The idling of vehicles, through the combustion of fossil fuels, contributes directly to air pollution locally and climate change globally. Fuel combustion associated with transportation also contributes significantly to the community's Ecological Footprint.

Strategic Goals

This report supports the strategic goals of Asset and Financial Sustainability, Environmental Leadership, and Moving Around. Specifically, reductions in fossil fuel combustion by vehicles related directly to the long term priorities of reducing the gap in funding required to maintain the City's infrastructure and reducing greenhouse gas ("GHG") emissions tied to City operations.

Background

On May 23, 2006, City Council received an enquiry from Councillor T. Alm, requesting a report on anti-idling programs in other Canadian municipalities and to bring forward recommendations to implement a vehicle idling program in Saskatoon. In response, a report from Administration was considered by City Council on July 16, 2007, outlining the City's current initiatives relating to vehicle idling and proposing specific stages for "idle-free" implementation. A bylaw on vehicle idling did not proceed at that time due to identified issues related to enforcement of a vehicle idling bylaw. However, the City did introduce idling guidelines relating to all owned or leased municipal vehicles and

equipment to its own policy on October 1, 2008 (Administrative Policy #A07-020: Civic Vehicles – Operating Protocol).

On January 25, 2016, City Council received a response to a letter from the Saskatchewan Environmental Society ("SES") that included 21 recommendations to reduce GHG emissions in the community; the SES letter included a recommendation to adopt an idle-free bylaw which read:

> "Many cities in eastern Canada have adopted bylaws to limit vehicle idling. Idling is typically not allowed for more than 3 minutes on private property, municipal property or while parked on the side of the road within city limits. Exemptions are usually provided for police, fire or ambulance vehicles or any other vehicles responding to an emergency situation. There are usually several other categories of exemptions such as armoured vehicles, vehicles that need to preserve cargo onboard with heating or refrigeration, and vehicles where idling is required in order to service the engine, conduct repairs or refuel. The Saskatchewan Environmental Society urges the City of Saskatoon to adopt an idle-free bylaw that will apply in the spring, summer and fall months (when temperatures are above freezing), and that will limit vehicle idling to no more than 3 minutes."

The response from the Administration highlighted the City policy for restricting idling on civic vehicles, but that no restrictions are placed on private vehicles. At this meeting, an enquiry from Mr. Gary McCallum was also received. City Council resolved:

> "That the letter from Mr. Gary McCallum be referred to the Administration and that the Administration report on the implications of idling bylaw enforcement of private vehicles."

Report

Jurisdiction to Enact a Vehicle Idling Bylaw

Arguably, the City has jurisdiction under *The Cities Act* to enact a bylaw relating to idling of private vehicles; however, this does not mean that this bylaw cannot be challenged as being beyond the power of a municipal government. In order for the City to validly enact a bylaw, the bylaw must address a municipal purpose or a municipal issue, such as the health, welfare or protection of citizens. While case law has held that every level of government has a role to play in addressing environmental issues, the idling of vehicles is often seen as a significant contributor to air pollution and climate change, which, by their nature, have local and global implications.

Enforcement Implications

The majority of the City's bylaws are enforced on a complaint basis. A vehicle idling bylaw would be similar to the City's *Noise Bylaw No. 8244* in that a more proactive approach would be required to catch offenders "in the act". This might include monitoring or "staking out" specific areas where complaints have been received.

Should time limits be introduced into a bylaw respecting idling, timing offenders to prove the offense would also be required. This approach would be resource intensive and may not even result in successful enforcement.

Typically the City has not enacted a bylaw that it has no intention to enforce or cannot be enforced.

Vehicle Idling Bylaws in Other Communities

Municipalities across Canada have addressed vehicle idling in a variety of ways.

The City of Calgary does not have a bylaw specific to anti-idling, but they do have a bylaw (Bylaw #5M2004) targeting trucks idling in residential areas, similar to our local *Noise Bylaw No. 8244*. Idling reduction has resulted from "No Idling" signs posted in target areas, with complaints of vehicles idling dropping by approximately 80% in response to the signs, even though these signs have no means of being enforced.

The City of Edmonton has a vehicle idling bylaw but the municipal prosecutor has not prosecuted a ticket to date, and would not prosecute a ticket unless the times and detailed notes of the idling infraction were provided by an enforcement officer.

The City of Brampton enforces its vehicle idling bylaw and has prosecuted a small number of tickets. Enforcement officers are required to time the idling vehicle for 5-6 minutes (bylaw specifies three minutes) and document details including the times the enforcement officers arrive and leave the scene. Violators typically plead down for a lesser fine and do not proceed to trial. The City of Saskatoon's bylaws set out legislative fines and, as such, do not allow for a reduction in the fine amount like Brampton's bylaw.

Options for Reducing Idling in Saskatoon

In 2011, the SES produced a report entitled 'Clearing the Air' (see Attachment 1). The findings of this report indicate that education and outreach, in the form of Community-Based Social Marketing, is a best practice approach to reducing idling in communities. A combination of education (awareness campaigns) and signage ("No Idling" signs) could be effective for reducing idling in Saskatoon as has been seen in other municipalities. Signage could be placed in target areas such as school zones and near hospitals.

City of Saskatoon Vehicle Idling Policy

The development of an anti-idling program and potential bylaw were identified in the City's Energy & Greenhouse Gas Management Plan, as recommended actions to reduce community-scale greenhouse gas emissions. Initiatives to reduce emissions have been implemented at the corporate and community levels, with an idling policy relating to civic vehicles and anti-idling messaging relating to select school zones. At the corporate level, new employees are introduced to the policy at Corporate Orientation, and Directors have been reminded to discuss the policy with their staff. At the community level, anti-idling campaigns have been piloted by several public

elementary schools; however, it is not a division-wide policy and it is unclear if the participating schools are still monitoring idling in their respective school zones.

The *Noise Bylaw No. 8244* already addresses circumstances associated with vehicle idling. Subsection 6(c) of the *Noise Bylaw* states the following as a prohibited noise: "Idling Trucks: In residential districts, the idling of any truck or power unit or the operation of any motor, "reefer" or similar device on a semi-trailer for more than twenty (20) minutes."

Environmental Impacts of Vehicle Idling

According to Natural Resources Canada's Office of Energy Efficiency, the average car produces about 2.3 kilograms of carbon dioxide for every litre of gasoline consumed. There were 256,737 vehicles registered in Saskatoon in 2014 (all body types), and GHG emissions resulting from the transportation sector represented 31% of total community emissions – the largest increase in tonnes of emissions compared to the 2003 emissions inventory. GHG emissions from private vehicles represent 86% of the transportation sector total, followed by emissions from the aviation, public transit (Saskatoon Transit), public service (City of Saskatoon), rail, and waterborne sectors.

Combustion of fossil fuels by private vehicles results in air and noise pollution locally and in associated impacts with climate change globally. Opportunities to reduce emissions associated with private vehicle use will be an important part of plans for GHG reduction and climate change mitigation as it is a significant contributor to Saskatoon's environmental footprint.

Public and/or Stakeholder Involvement

A preliminary engagement of residents and primary stakeholders – Saskatoon Health Region, Saskatoon Public Schools and Greater Saskatoon Catholic Schools – may be required to gauge initial impressions and feedback on any proposed private vehicle idling initiatives.

Communication Plan

The first stage of a vehicle idling bylaw involves stakeholder engagements. If the City proceeded with a bylaw program, communications could include direct mail to stakeholders, open houses, an online survey, and print and social advertising to communicate the stakeholder opportunities.

Administration is increasing its efforts to ensure the civic policy is broadly understood and complied with by City staff. Communications will include e-mail messages, posters and face-to-face reminders (i.e., safety meetings).

Policy Implications

City Solicitor's Office has identified that a vehicle idling bylaw is possible under *The Cities Act*; but may be subject to challenges.

Financial Implications

In order to enact a bylaw, education, engagement and enforcement costs would be incurred. Initial resources and costs would include an Environmental Coordinator to develop and deliver educational materials and a communications/engagement plan ($50,000), communications/engagement materials ($80,000) and applicable signage ($45,000). Additional resources and costs would include a Bylaw Inspector or Environmental Protection Officer ($90,000 per year) and ongoing education and communications components of the campaign ($10,000 to $40,000 per year).

An education and signage program alone (i.e., no enforcement) would not come without its costs. It would cost approximately $205 per sign, $10,000 to $40,000 per year for educational materials and campaigns, and $20,000 for an Environmental Coordinator (0.2 FTE). For example, if the City were to place two signs each in the 3 hospital zones and 107 school zones, it would cost roughly $45,000. On top of this, citizen complaints may lead to further sign installation in other areas of the City.

The incorporation of a Community-Based Social Marketing strategy – for either of the approaches outlined above – would require additional resources that have not yet been identified.

Financial Benefits to Citizens

According to the Office of Energy Efficiency, if all Canadian drivers reduced unnecessary idling by just three minutes a day, they would save more than $630 million annually (assuming an average fuel cost of $1/litre). For an individual driver, this is about $33 a year attributable to three minutes of idling.

Environmental Implications

If an anti-idling program were developed to reduce idling by as little as ten minutes each week, 0.72 kg of GHG emissions could be saved per vehicle or approximately 7,500 tonnes per year for every 200,000 vehicles. This is the equivalent of removing 1,585 vehicles from our roadways and would begin to address community GHG emissions resulting from the transportation sector, which represented 31% of total community emissions in 2014.

Other Considerations/Implications

There are no privacy or CPTED implications or considerations.

Due Date for Follow-up and/or Project Completion

No follow-up report has been identified at this time.

Public Notice

Public Notice pursuant to Section 3 of Policy No. C01-021, Public Notice Policy, is not required.

Attachment

1. Clearing the Air

Report Approval

Written by:	Matthew Regier, Environmental Coordinator
Reviewed by:	Amber Weckworth, Manager of Education and Environmental Performance
	Brenda Wallace, Director of Environmental & Corporate Initiatives
Approved by:	Jeff Jorgenson, A/General Manager, Corporate Performance Department

Vehicle Idling Bylaw Implications – June 12.docx

Clearing the Air:

Using Community Based Social Marketing strategies to foster an Idle-Free Saskatoon

Thilina Bandara

Saskatchewan Environmental Society
July, 2011

TABLE OF CONTENTS

APPENDICES

Appendix A.....McKenzie-Mohr, D. *Quick Reference: Community-Based Social Marketing*.

Appendix B..... Lura Consulting. 2005. *The Carrot, the Stick, and the Combo: A Recipe for Reducing Vehicle Idling in Canadian Communities. Case Studies.* Prepared for Natural Resource Canada & Clean Air Partnership.

*** For all province/municipal-specific program facts in text refer to Appendix B unless otherwise referenced.**

1.) Introduction:

Vehicle idling is a problem that is on the rise across Canada. As a contributor to air pollution and climate change, idling is a considerable target to address in the effort to reduce the human impact on the environment and to remedy public health concerns around air pollution. In a time where sustainable living is gaining precedence in the public mind-share, many jurisdictions in Canada are implementing policy strategies to reduce vehicle idling using evidence-based indicators and sound research. Although vehicle idling reduction is a relatively recent policy target, Natural Resources Canada provides a robust resource hub that outlines the most recent policy developments in this arena. What is most evident in their reports is the importance of employing Community-Based Social Marketing (CBSM) techniques to change idling behaviours across the large and varied Canadian vehicle operating demographic. This paper will outline these strategies and other components of idle-free policies across North America and provide recommendations to make Saskatoon idle-free.

2.) Why do Canadians Idle?

The most common reason for Canadians to idle is the warm-up and cool-down of the vehicle. Other reasons include: Waiting for passengers, stopping at railway crossings, waiting to park, running quick errands, drive-thru lanes, waiting to refuel or for car-wash bays, stopping to interact with someone, or preparing to leave the house. Fundamentally, vehicle idling is a wasteful *behaviour* that is influenced by two factors: Temperature and vehicle-wear myths. The latter refers to the commonly held belief that start-up is more damaging and more expensive than idling. This has proven to be untrue, as the engine wear is minimal as a result of starting; only amounting to $10 a year in repair costs on the battery or starter, for example – a cost made up several times over by the fuel cost savings of not idling. Idling can actually damage engine parts, as idling does not allow the engine to run at its peak temperature. This consequently leads to incomplete combustion of fuel, allowing for harmful fuel condensation on cylinders and deposition on spark plugs. (NRCan 2009) Idling can also cause water vapours to condense in the exhaust, causing corrosion and degradation of the exhaust system (LeaP 2011).

Demographic survey indicators show that idling duration is proportional to number of people in a household and inversely proportional to age (NRCan 2002). It is also more prevalent in rural areas than in urban centres, and nationally, idling is lowest in British Columbia. On average, in the peak winter season, each vehicle idles about 8 minutes per day. Nationally this translates into: 75 million minutes, 2.2 million litres of fuel, and 5 million kg of greenhouse gases per day (NRCan 2009).

3.) Why is it a problem?

Vehicle idling wastes fuel and money: Two point two million liters of fuel wasted roughly translates to 630 million dollars of potential savings for Canadians. Cost-savings is a valuable marketing vector in the effort to change idling behaviors and is considered largely in the literature.

Idling depletes a non-renewable resource: With the increased awareness of the finite supply of fossil fuels, responsibility in resource management is imperative going forward.

Needlessly increases greenhouse gases: Because greenhouse gases accelerate global warming, reducing purposeless emission will slow the anthropogenic contribution.

Health concerns: Vehicle emissions have short-term and long-term health consequences. Immediate symptoms associated with air pollution include burning eyes, lung pains, breathing difficulties, wheezing, coughing, headache, and an irritated breathing tract (Friss 2007). As illustrated in Figure 1, idling one's vehicle close to children (at a school for example) allows these substances to be inhaled into an immature respiratory system, which is more susceptible to damage. Overall, vehicle emissions contribute to air pollution, and consequently the following major health effects:

Lung cancer, the number one cause of death due to cancer in Canada, is associated with chronic air pollution (Lung Association 2010). A Swedish study reported that vehicle emission specifically may increase the risk of lung cancer. Vehicle emissions release polyaromatic hydrocarbons, a known family of carcinogens (Tsia et al 2004), as well as many other components of overall air pollution - many of which have also shown statistically significant association with lung cancer.

Asthma is one of the most substantial public health concerns in the world due to its high prevalence. Symptoms of asthma include shortness of breath and tightness of the chest caused by both aggravated airway muscle contractions and mucous build up. Susceptibility to childhood asthma is largely dictated by pollution exposure during the fetal stage and throughout the first three to five years of life (PHAC 2008). Epidemiological studies also correlate high concentrations of particulate matter and nitrogen dioxide – both byproducts from vehicle exhausts - with asthma occurrence (Friss 2007).

Coronary Heart Disease is often an overlooked serious illness associated with air pollution. Those with ischemic heart disease, with heart arrhythmias or coronary heart failure may be more sensitive to motor vehicle emissions, and aggravation is synergized in extreme temperatures. Carbon monoxide, a common substance emitted by vehicles, is an ambient

pollutant molecule often associated with heart problems where outdoor-working, urban populations are most at risk. (Friss 2007)

These illnesses are potentiated by the long-term impact of climate change. Carbon dioxide largely makes up the 27% of the total GHGs contributed by the transportation sector (NRCan 2009). Along with other catastrophic effects on health like severe weather and environmental degradation, the creation of smog is accelerated by rising temperatures. Smog refers to a mixture of pollutants, of which is largely the result of burning petroleum-based fuels. It reduces visibility and adversely affects overall respiratory health by triggering asthma attacks, cardiovascular aggravation and contains nasal-cavity and skin irritating pollutants (Friss 2007). Smog often limits the ability to leave ones house for exercise purposes, leading to more vehicle operation and contributing to a sedentary life style, which in itself adversely effects health.

Figure 1: Natural Resource Canada Idle-Free street sign (Appendix B)

4.) What is Community Based Social Marketing?

Community Based Social Marketing (CBSM) is a framework with which behaviour-changing programs are designed, predicated on the assumptions that "behaviour change is most effectively achieved through initiatives delivered at the community level which focus on removing barriers to an activity while simultaneously enhancing the activities benefits." (CBSM workshop handout – Appendix A) As outlined by Dr. McKenzie, the current forefront advocate for CBSM, there are explicit steps (in detail in Appendix A) to successfully changing behaviour using CBSM.

The steps are best illustrated through exploring a case study of a recent idle-free policy in British Columbia. In November 2008, the British Columbia and Washington State governments collaborated in the *Greening the Border* initiative, where work was done to reduce idling at the Peace Arch Canada/U.S. border crossing. The resulting initiative involved an awareness campaign conducted by volunteer Idle-Free Ambassadors, as well as a new traffic light pilot project. (B.C. Ministry of Transportation and Infrastructure 2010) This targeted campaign serves as a microcosm for idle-free policy implemented in the spirit of CBSM.

1) Identifying the barriers and benefits to an activity:
In the case of idle-free policy, one would look for the barriers involved with *not* turning off the vehicle. These barriers vary between locations. As mentioned before, the two most common barriers are temperature and vehicle-wear myths, but as shown in B.C. example, specific locations can yield specific barriers. B.C.'s Youth Climate Leadership Alliance members conducted baseline surveys and observations, where they found the main barrier for drivers to not turning off their engine was 'traffic creeping' at the border. Based off of this preliminary data, they installed a carefully positioned traffic light that allows driver to turnoff their engines as blocks of vehicles cross the border. A sign reminding drivers to turn off their engines was also installed beside the newly erected traffic lights. (Figure 2) By identifying the specialize barriers with baseline surveying, they addressed the appropriate target. This initiative is projected to eliminate 639 000 kilograms (kg) of greenhouse gas (GHG) emissions per year.

Figure 2: Peace Arch Traffic signage (B.C. Ministry of Transportation and Infrastructure 2010)

2.) Developing a strategy that utilizes "tools" that have been shown to be effective in changing behavior:

Tools largely fall into four categories: Commitments, prompts, norms, and communication. At the Peace Arch Border, along with brochures and surveys (communication), the sign at the traffic light served as a useful prompt for those waiting to cross the border at the light.

3.) Piloting the strategy:

The traffic light project was a pilot project, meaning it was relatively small-scale. The purpose of a pilot project is to test whether extrapolating the scale would be effective.

4) Evaluating the strategy once it has been implemented across a community:

Published in April 2010, a review of the Peace Arch project uncovers the benefits of conducting a sound evaluation. As compared to baseline data, post-program observational data showed an 83% reduction in idling and a 45% reduction in greenhouse gases overall. However, it was only through a careful evaluation that they uncovered that poor sign visibility caused low compliance numbers among those farthest from the light. These indicators educated future recommendations, including increasing the number of signs as well over-sizing them to increase readability (Deogan 2010).

From a social marketing perspective, the engagement of drivers was ostensibly made easier by the installation of the new traffic light and signage. The employment of CBSM principles allowed the program to first recognize the primary barrier - traffic-creep, remedy the structural barrier, and carryout traditional education and awareness techniques. It is through sound evaluation that programs gaps can be recognized and repaired for future implementation.

Translating behavior-change into workable policy involves necessary engagement with those to whom a policy is being targeted. CBSM emphasizes that there is no one solution to any behavior change issues and that considerations emerge from active participation with the community. Pulling back the scope to a municipal level uncovers how CBSM fits into a larger scale context.

5.) Methods for municipal intervention:

In 2005, Lura Consulting separated current anti-idling strategies into three categories: Voluntary approaches, regulatory approaches, and a combination of both voluntary and regulatory (Lura 2005). The following are summaries of these strategies:

Voluntary:

Idling is largely a behaviour change issue and empowering citizens allows for change to occur without the need for legal intrusion. This vector is primarily driven by community-based social marketing initiatives where persuasive information is distributed to the citizens and/or staff of an organization, in an effort to normalize healthy behaviours. At an operational level, the voluntary approach can be implemented through many methods including education, incentivization, and organizational policy.

Voluntary-based idle-free policies are commonly implemented through partnerships between governmental, non-governmental, and private organizations. As voluntary citizen commitment is an important goal in behaviour change, it is essential that the partners demonstrate leadership to the community by instituting their own internal idle-free policy. Better Environmentally Sound Transportation (BEST) and the Jack Bell Foundation launched a campaign in the Greater Vancouver Area to specifically target *employees* in an effort to reduce business-fleet idle emissions. Along with media advertising, and on-site campaigning, the task force of volunteers incentivized business to come on-board by providing them with custom estimates on fuel savings. Employees at participating companies were given lunch-and-learn presentations as well as idle-free stickers and commitment forms (CBSM tools). While fleet-owning businesses were the primary target, the media advertising also reached over 1 million citizens in the Greater Vancouver Area. The voluntary method is used to ultimately help foster

sustainable behaviour choices into the public mindset, and by setting an example at an organizational level, idle-free practice can successfully be normalized (Appendix B).

Though not resulting in a municipality-wide idle-free control bylaw for either Edmonton or Calgary, Alberta's voluntary method-based educational program in 2003 is largely cited as particularly well-implemented, large-scale idle-free programs in Canada. The *Alberta Reduce Vehicle Idling Campaign*'s formal goal was: "…to reduce engine idling by raising public awareness on the negative impact of idling and the benefits of idling less. The campaign highlighted the links between vehicle engine idling, greenhouse gas emissions, poor air quality and health problems." (Appendix B) Through key partnership between many governmental, non-governmental and private parties, a council was formed to coordinate a month-long educational blitz. Along with media promotion, the voluntary method - using the principles of CBSM – was employed in 3 categories of locations:

- Nine **schools** in Calgary; 7 in Edmonton
- Eleven **gas stations**
- Four **municipal/regional organizations**: City of Calgary, City of Edmonton, Alberta Transport, and Calgary Health Region.

Brochures, presentations, surveys, website information and displays were used for educational purposes, delivered one-on-one or in a group setting by ambassadors. Indicators tracked before and after the month blitz uncovered the following:

- More than 100 drivers were reached using community-based social marketing events at 27 sites during the campaign.
- There were statistically significant changes in behaviour at six individual school sites.
- The transit bus advertising campaign reached more than 85% of drivers in four communities.
- There was generous and favourable media coverage in Edmonton and Calgary.
- Awareness of the campaign increased from 16% to 27% overall. In Calgary, 39% of respondents were aware of the campaign, while in Edmonton 14% of respondents were aware of it.

Results in terms of awareness were considered modest, while the largest gains were made in the formation of key partnerships in the initiative. Upon a program evaluation, Climate Change Central's Paul Hunt outlined specific lessons learned and recommendations regarding the voluntary method including:

- Increasing the use of Community-Based Social Marketing: Although results were modest, the use of CBSM was recommended to be expanded, especially at schools, gas stations and other idling hot-spots.
- Including more schools and gas stations in outreach: The role of these very willing partners was crucial to the scope of the outreach, and increasing the gains from these partnerships will provide more of an impact.

- Recruiting more ambassadors: Increase the number and time commitment of volunteers and possibly paid ambassadors.
- Explicitly outlining a long-term strategy: Be mindful of raising awareness before proposing a bylaw.
- Taking political timing into consideration: Implementing a bylaw soon after a smoking bylaw hindered regulatory progress.
- The use of clear communications: More emphasis must be placed on communicating child health concerns to parents idling at schools.

Regulatory:

Presently in Canada idle-free bylaws are implemented at the municipal level, differing from the United States and European jurisdictions, which are handled at the state-level and national level, respectively. Legal prohibition and regulations exist either as stand-alone idle-free bylaws, as part of bylaws concerning more general transportation laws including air pollution (London, Ontario) or overall danger-avoidance policy (Germany tied it with cell-phone driving policy) (Lazlo 2003).

Toronto was the first municipality in Canada to enact an idle-free bylaw. Starting from a 3 minute permitted idling time in 1996, the City of Toronto has since amended their bylaw in 2010 (Bylaw 775-2010) to only allow 1-minute of idling within a 60-minute interval. It also lists exemption circumstances, including idling of emergency vehicles, mobile workshops, and police. Violators face a $120 fine and court summons for repeat offenders. Before the amendment, Toronto's *The Star* described the bylaw as "'toothless'… with an average of only 76 tickets a year being written for idling longer than three minutes" It is clearly outlined in the proposal for the amendment in 2010 that the City of Toronto recognized the need to educate the public on the matter as a part of ultimately reducing idling. Data on enforcement since the amendment is forthcoming. With low enforcement numbers, the board members behind the program stressed that regulation alone is not particularly effective by itself, and they hope to increase the intensity of educational programs and enforcement 'blitzes' at idling hot spots. (The Star 2010) One such blitz organized in 2003 in tandem with a month-long media promotion/community-based social marketing campaign yielded 120 tickets, 195 warnings and 3 summonses. (Appendix B)

Regulations are very well outlined in New York's Idle-Free policy where a recent 2009 Bylaw 40-A granted ticket enforcement rights to employees of the Department of Park & Recreation, Department of Sanitation, on top of the Department of Environmental Protection and the Police. Along with this expansion of enforcement, bylaw 631-A reduced permitted idling time from 3 minutes to 1 minute, as well as requiring annual reports on the number of violations by the Environmental Control Board & the Department of Finance. Repercussions are most severe in California, where fines range from $300-$10,000 dollars, with jail time for repeat offenders. (Global Climate Law 2009)

A review of idle-free regulations consistently reveals that timing of regulation is critical to its successful implementation. Abruptly proposing idle-free bylaws to a population who have not yet normalized idle-free behaviour can lead to its immediate rejection. The City of Calgary introduced a bylaw too quickly after their voluntary campaign, as well as too closely to their anti-smoking bylaw. Both factors contributed to the stagnation of the bylaw, as public support was not yet attained.

Combining Voluntary and Regulatory Approaches:

Municipal bylaws are formed democratically, and as such, citizen involvement is an essential variable to consider when attempting to regulate a new norm. It has been shown that a successful voluntary campaign must firstly be put in place to create a social environment conducive to the acceptance of regulation, and to mobilize citizens to formalize the new norm. Returning to the Calgary example, a review of their history on idle-free policies shows that implementing bylaws before voluntary educational programs resulted in the following:

a.) A lack of public understanding of the issue
b.) No time for public discussion on the formation of a bylaw
c.) No chance to address barriers to reducing engine idling (stigma, transportation alternatives, ignorance on idling practices, etc.). (Appendix B)

Having a strong voluntary method in conjunction with regulatory action is essential to changing behaviours, and consequently in the formation of successful idle-free policy.

6.) How does all of this fit into developing an Idle-Free Saskatoon?

According to Statistics Canada, Saskatoon was the fastest growing municipality in all of Canada in 2009-2010, with the 2011 estimate at over 265,000 persons (City of Saskatoon 2011). At the same time, the number of vehicles in Saskatoon has eclipsed the number of people: in 2010, as the population was at 220,000, the number of vehicles registered in the city was almost 229,000 (The StarPhoenix 2010). With early action against idling, the City of Saskatoon can greatly delay smog creation and general air pollution hazards. As seen in the Calgary example, organizations and businesses must also come on-board if large-scale idling initiatives are to be successful. The following are some example of initiatives that are either in place, or have been conducted in Saskatoon:

i.) As work is being done on developing their formal Campus Sustainability Policy, the University of Saskatchewan has embarked on a few environmental initiatives, one involving idle-free zone implementation. So far, the campaign has involved only signage in specific locations, but next year they will be increasing the number of zones on campus. There has yet to be any formal impact evaluation, though anecdotally, there has been progress. Once the overarching policy is complete, a solid anti-idling initiative with enforcement elements can be enacted.

ii.) In 2008, the City of Saskatoon instated a formal policy restricting idling of their fleet to 3 minutes. Exceptions to the policy include emergency vehicles, vehicles being maintained, and for temperatures above 27 ^{o}C and below 5 ^{o}C.

iii.) At the provincial level, the Government of Saskatchewan, as part of their *goGreen* initiative, encourages schools, health facilities, recreation & community centres, municipal offices, and governmental facilities to apply for free street signs through their website. The website also highlights idle-free success stories, with the following being the only school initiative in Saskatoon, to date:
In spring 2006, The Saskatchewan Environmental Society (SES), funded by SaskEnergy, organized an educational program with students of Silverwood Heights School and Sister O'Brien School on idling and climate related information. The students of the school then educated 46 parents outside the school at the end of the school day about the benefits of not idling. Education was used in conjunction with anti-idling signage, posters, newsletter inserts and presentations between students. Based on comparisons of pre and post-program data, there was a 51% reduction in total idling time among parents waiting for their children outside of the schools (SES 2006).

7.) Recommendations:

#1: Create partnerships between many organizations:

A diverse, inter-disciplinary partnership between governmental, non-governmental and private groups will provide a clear unified vision for a large-scale idle-free initiative. A representative council can craft a formalized *commitment* for all partners to 'go idle-free'. Every partner will be a part of a large initiative, spearheaded by the City of Saskatoon. It would be up to the city as to how large of a scope an idle-free initiative would be. The scale of the initiative would depend on resources and ambition of the City and the organizations involved. An initiative can be specific to idling (*Idle-Free BC*), overall air quality (*Clean Air Partnership Toronto*), or a part of a larger 'green' initiative involving other environmentally friendly activities (*Green Calgary*). A discussion on which of these branding scopes of an idle-free campaign to use would wholly depend on the perceived marketability of each to the Saskatoon public specifically.

Strategic partnerships with those organizations most associated with idling hot-spots in Saskatoon would provide the most impact. Particularity high-impact partners include: City Saskatoon, Saskatoon Health Region, Saskatoon Public and Catholic School Divisions, Time Horton's, and drive-thru banks. Survey work must be done to quantitatively find where exactly in the city there are idling hotspots.
These partners can contribute in two ways:

1. They can create policies for their own fleet and employees, thus becoming "Idle-Free" themselves.
2. And/or allow for signage, and even idle-free information to be distributed by volunteer ambassadors at their locales.

Saskatoon already hosts many environmentally conscious parties that can be leveraged in an idle-free initiative. Examples include: RoadMap 2020 Saskatoon, Climate Change Saskatchewan (Gov. of Sask.), Saskatchewan Environmental Society, and The Lung Association.

#2. Use Natural Resource Canada's Idle-Free Zone information and Toolkit to design a voluntary-based campaign:

Anti-Idling initiatives have been so successful and reproducible across Canada that Natural Resource Canada created a resource hub, the *Idle-Free Zone,* providing information, case studies, and recommendations for every level of intervention: Individuals, businesses, and community/government. They provide ready-to-use tool-kits for idle-free campaigning at the work place, as well as tools to use for the general public. The tools provided by Natural Resources Canada are low cost methods of operationalizing community-based social marketing principles in the idle-free context.

It is important to consider that every organization, at each level, must carry out a barrier/benefit analysis (Appendix A) before committing a large amount of resources into any one tool. Pragmatic use of the tools provided will lower costs and take less time. This pre-program activity involves asking the target population (employees, customers, etc.) why it is they do not turn off their vehicles once at rest. This would be done with volunteer ambassadors using the simple surveying materials provided in the toolkit (NRCan 2007). The collection of this data will ensure that appropriate tools will be employed in a suitable manner.

#3. Conduct a robust evaluation of the voluntary-program:

A citywide idle-free program must have a built-in evaluation plan. As idling will not be completely eliminated by any one program, especially in a city growing as quickly as Saskatoon, inevitable future initiatives will benefit greatly by having in–depth, summative data and lessons learned from past programs. Compliance and surveying materials are provided in the tool-kit, as well as a timeline for baseline, midterm and final compliance measures in *Section 3 Program Scheduling and Budgeting* (NRCan 2007).

The NRCan toolkit specifically recommends internal ambassadors at every organization, but the principles behind it have been adapted to a larger scale. In B.C., the Ministry of Environment's Youth Climate Leadership Alliance program created 10 positions for ambassadors, who were then dispatched to deliver the materials to organizations. The difference in Saskatoon's (and Saskatchewan's) case is that there is no formal large air quality initiative for which these ambassadors would represent. This can be addressed by creating a cohesive vision when forming a collaborative partnership across many organizations (Recommendation 1). The forms and surveys to be used by ambassadors are provided in the toolkit. The results must be collected and submitted into a final report.

#4. Upon evaluation, draft a formalized City-wide Idle-Free bylaw, with regulatory elements:

An anti-idling bylaw can be a particularly powerful tool in reducing vehicle idling at a citywide level and must be the last step in a successful idle-free campaign. It is clear through the literature that idling regulation is time sensitive. The target population must first be convinced that idling is a substantial issue *before* being presented a bylaw. The evaluation of the voluntary program must have survey data indicating the level of anti-idling sentiment among the community. If significant acceptance is present, then bylaw formation should be pursued.

Vehicle idling is a harmful activity to both citizen health and the environment. Confronting the issue at a large scale is an important step in cleaning up the air and proliferating the public's environmental conscience. The reproducibility of community-based social marketing techniques in idle-reduction initiatives have allowed for a large breadth of resources to be

available to program planners and policy maker. Applying these tools in a Saskatoon context will take strong partnerships, committed volunteers, careful planning and sound evaluation. As exhibited across the country, actions against idling have been successful, giving communities the opportunity to directly contribute to the betterment of the environment. Saskatoon's organizations and citizens are long overdue to commit to the same goal.

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JOHNSON SHOYAMA
GRADUATE SCHOOL OF PUBLIC POLICY
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JOHNSON SHOYAMA POLICY SHOP:

REPORT ON SUSTAINABLE CIVIC BUILDING POLICIES

PRODUCED FOR: CITY OF SASKATOON – ENVIRONMENTAL AND CORPORATE INITIATIVES

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FINAL DRAFT

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ABOUT THE POLICY SHOP

Based out of the Johnson Shoyama Graduate School (JSGS), the Policy Shop is a student-run policy analysis and research organization. It provides JSGS students with hands-on policy analysis experience to help them grow professionally and build their credentials. Through its student volunteers, the Policy Shop provides local organizations with professional-quality research services at no cost.

All JSGS students are welcome to participate. As Policy Shop volunteers, students meet as a team and are introduced to a local organization with a problem to solve or a question to explore. Within an academic year, the team produces a professional report—from initial brainstorming to final submission—to present to the organization.

DISCLAIMER

The views expressed in this report belong to its authors and no other individuals, including Policy Shop members not included in this study, Policy Shop's faculty supervisor, or any JSGS personnel.

EXECUTIVE SUMMARY

In December 2016 and January 2017, Johnson Shoyama Policy Shop and the City of Saskatoon Environmental and Corporate Initiatives (ECI) discussed policy options to increase the level of the City's sustainable practices. Among the options discussed, ECI identified city-owned buildings as a priority. Specifically, they desired a policy that required buildings to have greater energy efficiency, fewer GHG emissions, and enhanced impacts on employee productivity. Such a policy would complete an objective outlined in the City of Saskatoon's Environmental Policy. This report includes research and analysis on sustainable building best practices and policy options.

To begin, we took an in-depth look at the sustainable building policies governing the design and construction of city-owned buildings in Winnipeg, Victoria, Ottawa, Thunder Bay, and Edmonton. We compared the rationale, requirements, and exemptions of these policies, as well as considerations unique to each location. Policy Shop found that all policies are guided by their community's strategic plans. These plans contained guiding principles, objectives, or values. Winnipeg and Thunder Bay solicited sustainable community objectives through citizen engagement and outreach, Victoria declared its sustainable goals in its Corporate Strategic Plan, and Ottawa in its environmental strategy. Life-cycle cost assessments and environmental assessments also supported the development of Edmonton's, Victoria's, and Thunder Bay's policies. All sustainable building policies require or aspire to LEED certification. Winnipeg and Edmonton allow equivalent building rating systems in place of LEED. Edmonton and Thunder Bay require energy efficiency targets on top of certification requirements.

Next, Policy Shop conducted a multicriteria analysis of LEED v4, and three other sustainable building rating systems and standards that provide similar benefits: ASHRAE 189.1, Green Globes, and the Living Building Challenge. Policy Shop found that ASHRAE 189.1, Green Globes, and LEED v4 provide similar scope and benefits, including marginal improvements to electrical and heating energy use, water reduction, and indoor environmental quality. These three all reference ASHRAE 90.1, an energy standard for buildings similar to Canada's Model Energy Code for Buildings. Finally, they all use a prescriptive or performance-based approach, where compliance is evaluated during the design phase of building projects. The Living Building Challenge is much different. It is an outcome-based rating system that evaluates and certifies projects based on their performance and materials. It requires buildings to produce more energy than they consume, to use only collected water and return used water to the natural water cycle. Living buildings can not contain materials made with known carcinogens. While the Living Building Challenge is the most environmentally sustainable rating system, it is not feasible for many building types owned and operated by the City of Saskatoon. The result of the analysis determined that ASHRAE 189.1 was the most suitable standard to include in Saskatoon's sustainable building policy because it addresses every criterion desired by ECI, has fewer transaction costs than the rating systems, and because it is on a path to net-zero by 2020.

Following the sustainable building rating systems and standards assessment Policy Shop examined the legal risks associated with these systems, revealing many risk factors. The literature review found that contracts between sustainable building proprietors and industry must clearly define project terms instead of relying on loose designations, such as 'build to LEED Silver'. Failing to define contract terms diligently can lead to confusion of privity, and jeopardize contract

enforceability. Sustainable building standards have also caused issues in the procurement process. Bid callers must declare how proposals will be scored, including experience with sustainable building practices (such as Green Globes), otherwise they may incur damages owed to declined bidders. Claims made by sustainable building rating system issuers (like the Canada Green Building Council) can also come under scrutiny for fraud and false advertising. Rating system trademark holders are likely to be weary of parties who appropriate their brand, but evidence for illicit consequences 'shadowing' are sparse. Emulators can only guarantee trouble if they advertise their products in the same vein as the mimicked brand (e.g. "LEED-lite"). It is recommended that bid issuers use standard contract documents from industry associations, prioritize transparency in the bidding process, and ensure sustainable building practice requirements do not conflict with internal policy or external law.

The final chapter contains a discussion on the critical role of high-quality data to each stage of developing a sustainable building policy. The case is made that properly collecting, estimating, utilizing, and managing data is advantageous to goals around sustainability, policy improvement, climate leadership, and economic prosperity. The chapter goes on to presents a range of best practices around conducting an ex-ante policy impact assessment while stressing the importance of high-quality data to this process. With increasing adoption of digital building management systems more and better data is becoming available, enabling better management of GHG inventories in cities.

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1 INTRODUCTION

Governments of all levels are recognizing the urgency to act on climate change. Increasingly, municipal governments are responding to the growing concern of climate change where regional and federal governments are unresponsive. The paramount example of municipal climate change action is the Global Covenant of Mayors for Climate & Energy, a coalition of municipal governments that strives toward greenhouse gas (GHG) emission reductions and climate change resiliency.[i]

The International Energy Agency (IEA) notes that energy consumption in the public service sector is mainly affected by economic activity, with growth in economic activity leading to increased energy demand. Growth in energy demand can be counterbalanced, and potentially reversed, by energy efficiency. In buildings, energy efficient design and practices can reduce energy consumption and GHG emissions, while providing return on investment and a healthier environment for occupants. Policies that require higher levels of energy efficiency in buildings are critical for reducing energy consumption and GHG emissions in the building sector.

1.1 The Policy Issue

Buildings are the largest contributor to the City of Saskatoon's ("the City") corporate greenhouse gas (GHG) emissions, representing 42% of total emissions.[ii]

1.2 Actions to Date

On June 14th, 2012, the Saskatoon Environmental Advisory Committee (SEAC) submitted a report to City of Saskatoon Administration and Finance Committee recommending the adoption of a Civic Building Sustainability Policy for new and existing City-owned buildings. In this policy, SEAC recommended adopting LEED Gold as the standard for new construction, and that new and existing building achieve a 40% improvement in energy efficiency compared to the 1997 Model National Energy Code. Administration concurred with the SEAC report recommendations (with amendments), but the Leadership Team requested more research to justify the adoption of LEED Gold within the Civic Building Sustainability Policy.

1.3 The Policy Context

Saskatoon City Council took two important actions in 2015 to create a foundation for future policy actions. First was the adoption of an environmental policy to guide the environmental practices of its operations city-wide (see Appendix D – City of Saskatoon Environmental Policy). The policy sets objectives for corporate operations so that future generations do not have their quality of life or environment diminished (City of Saskatoon 2015). The second action was a pledge—via Compact of Mayors (since subsumed under the Global Covenant of Mayors)—to create an inventory of the City's GHG emissions, set a GHG target, and develop a policy response.

In 2016, the City released its Greenhouse Gas Inventory, completing Phase 2 of the Compact.[iii] Prior to signing the Compact of Mayors, the City set a GHG emissions target in 2013 of 30% below 2006 levels by 2023.[iv] This target was updated in June 2017 by the Standing Policy Committee on Environment, Utilities, and Corporate Services: 40% of 2014 levels by 2023, and 80% by 2050.[v]

Legislation governing building standards should also be considered. Building standards in Saskatchewan are regulated through the *Uniform and Accessible Building Standards Act* (the "*Act*" hereafter). The *Act* specifies the *National Building Code of Canada* ("NBC" hereafter) as the minimum standard newly constructed buildings must meet.

At the time of writing, the Government of Saskatchewan stated that they propose to adopt the National Energy Code for Buildings 2015 on July 1, 2017, and put into force January 1, 2019.[vi]

1.4 The Policy Response

In December 2016 and January 2017, Johnson Shoyama Policy Shop and the City of Saskatoon Environmental and Corporate Initiatives (ECI) discussed policy options to increase the level of the City's environmentally-friendly practices. Among the opportunities to reduce negative environmental impacts, ECI identified city-owned buildings as a top priority. Specifically, they wished to develop a policy that that exceeded provincial building standards, producing greater energy efficiency, fewer GHG emissions, and enhanced impacts on employee productivity. The purpose of this report is to examine options to include in such a policy.

A policy requiring minimum efficiency and sustainability standards in civic buildings is non-regulatory requirement intended to overcome nonmarket supply. That is, sustainable buildings are not the norm in the local building market, so intervention is needed.

Buildings create negative externalities to Saskatoon—and society—such as GHG emissions, poor air quality, the urban heat island effect, and depletion of natural resources. The intent of a non-regulatory requirement such as the proposed Sustainable High Performance Civic Building Policy (see Appendix C) is to set enforceable rules that abate these negative externalities.[vii]

While corporate policies are non-regulatory, they function as internal regulations, because they set compulsory rules of action. Regulations are useful in many ways. First, they allow governments to predictably ensure public goods are being provided to citizens—clean air, for example. Second, they discourage undesirable behaviour when independent actors fail to respond to incentives. Lastly, they provide timely government response to issues that require quick action.[viii]

However, regulations are not without their disadvantages. Some regulatory policies can lead to economic inefficiency through regulatory capture when they benefit small groups who control a significant share of a market.[ix] Regulatory capture can occur when regulators (who provide service) become sympathetic to regulated groups than to politicians (who requested service). Private companies—or governments—can be sheltered by regulations, stifling innovation. Innovation may also be stunted if regulations set standards too low. Finally, regulations are known for their rigidity, failing to permit exceptions in special circumstances.[x]

1.5 Report Structure

In initial meetings between Policy Shop and the City of Saskatoon Environmental and Corporate Initiatives Branch (ECI), four areas of focus were identified to collect information that could support ECI's proposal for a Sustainable High Performance Building Policy. These included:

1) Current sustainable civic building policies from cities similar to Saskatoon
2) Differences between sustainable building rating systems
3) Building performance measurement systems
4) Implications of constructing to trademarked or copyright building standards without applying for certification

This report will proceed by examining each area of focus in the above order. Each chapter will conclude with policy recommendations. Finally, general conclusions and recommendations for future study will bookend the report.

2 RESEARCH METHODOLOGY

This report employs a qualitative methodology, with varying methods in each chapter. Chapters 3 and 4 contain comparative analyses, while Chapters 5 and 6 contain literature review.

In Chapter 3, Policy Shop selected five Canadian cities that were similar in climate zone or population to Saskatoon and compared different aspects of their sustainable civic building policies. Several factors were chosen for comparison to provide social and institutional context. These included policy objectives and rationale, policy requirements and exemptions, personnel responsible for implementation and enforcement, and success stories. Common themes between these policies were then identified, as well as additional considerations unique to each location.

Chapter 4 contains an analysis of four sustainable building standards and rating systems (ASHRAE 189.1, LEED v4, Green Globes, and Living Building Challenge). Prior to the selection of these standards, ECI and Policy Shop identified fifteen characteristics of a desirable sustainable civic building policy. Once these criteria were identified, Policy Shop selected the building standard and rating systems noted above based on their ability to meet these objectives. Other rating systems, such as Passive House and the WELL Building Standard were considered for analysis but not included since they did not address all desired objectives. The chosen building standards were assessed based on their ability to meet each of the fifteen policy objectives identified by ECI and Policy Shop. A detailed explanation of the multicriteria analysis can be found in Appendix A.

Chapter 5 contains a review of legal and ethical risks associated with sustainable building rating systems. Policy Shop conducted a literature review of green building case law to highlight known and prominent risks of green building.

Chapter 6 contains a literature review of data management practices within the policy context. The point of entry for the material examined in the chapter was a webinar on the role of data in policy evaluation. A snowball method was used to gain additional sources.

3 COMPARISON OF CIVIC BUILDING POLICIES

The focus of this chapter are the policies adopted by Winnipeg, Victoria, Ottawa, Thunder Bay, and Edmonton that incorporate above-code sustainable design elements into the buildings each city owns and operates. Policy Shop examined the purpose of these policies, their specific requirements, and policy considerations unique to each location. The locations were selected from a list of green building policies currently in place in Canada (see Table 1 below), which was submitted in response to the Saskatoon Environmental Advisory Committee recommendations for a civic green building policy by the City of Saskatoon Environmental and Corporate Initiatives. Thunder Bay was added to the analysis based on climate zone.

The chapter examines the policies, rationale, implementation personnel, success stories, and considerations unique to each location. A summary of key civic building policy features can be found in Table 2. The chapter concludes with themes common across all policies, and policy recommendations.

Civic LEED Policy and Practice in Major Canadian Regions
(Metro Population above 200,000)

Metro Area	Population (2011)	Year Adopted	Silver	Gold	TOTAL	CATEGORY
Toronto (Ont.)	5,583,064	2010?	17	16	33	CIVIC GREEN BUILDING POLICIES AND BUILT PROJECTS LEED SILVER OR ABOVE
Vancouver (B.C.)	2,313,328	2004	7	11	18	
Ottawa - Gatineau (Ont./Que.)	1,236,324	2005	9	4	13	
Calgary (Alta.)	1,214,839	2008	3	8	11	
Edmonton (Alta.)	1,159,869	2007	6	4	10	
Kitchener/Waterloo (Ont.)	477,160	2008	6	2	8	
Hamilton (Ont.)	721,053	2008	2	2	4	
Montréal (Que.)	3,824,221	2010	0	3	3	
Winnipeg (Man.)	730,018	2010	1	2	3	
Victoria (B.C.)	344,615	2007	1	2	3	
Halifax (N.S.)	390,328	2005	0	1	1	
Thunder Bay (Ont.)	108,359	2014	2	2	4	
Québec (Que.)	765,706		2	0	2	NO POLICIES, BUT BUILT PROJECTS LEED SILVER OR ABOVE
Windsor (Ont.)	319,246		2	0	2	
St. Catharines - Niagara (Ont.)	392,184		1	0	1	
Regina (Sask.)	210,556		0	1	1	
London (Ont.)	474,786		0	0	0	NO POLICIES, NO BUILT PROJECTS LEED SILVER OR ABOVE
Oshawa (Ont.)	356,177		0	0	0	
Saskatoon (Sask.)	**260,600**		**0**	**0**	**0**	
Sherbrooke (Que.)	201,890		0	0	0	

Table 1 Environmental & Corporate Initiatives 2012 ("Tables from Eric")

Summary of Compared Civic Building Policies					
City	**Policy Requirement**	**Exemptions**	**Policy Target**	**# Certified Civic Buildings**	**Year Adopted**
Winnipeg, MB	LEED Silver, 3 Green Globes, or equivalent for new civic buildings and additions >500m^2	Temporary or unoccupied buildings, or if incompatible with policy. Audit required.	20% reduction in corporate GHG emissions by 2019	LEED Gold = 3 LEED Silver = 5	2010
Victoria, BC	LEED Silver, with a goal of LEED Gold for new buildings and additions >500m^2	LEED audit required	33% reduction in corporate GHG emissions by 2020	LEED Gold = 2 LEED Silver = 1	2007
Ottawa, ON	LEED Certified for new buildings >500m^2	Where structure of historic buildings may be compromised	20% reduction in corporate GHG emissions by 2020	LEED Gold = 4 LEED Silver = 11 LEED Certified = 8	2005; revised 2015
Thunder Bay, ON	For new civic buildings: LEED Gold >2000m^2 LEED Silver >500m^2	Process facilities	Reduce GHG emissions by 20% from 2009 levels	LEED Gold = 2 LEED Silver = 2	2014
Edmonton, AB 2007	LEED Silver for new buildings, major renos, and maintenance	Explanation to city council if LEED Silver not practical	30% or greater energy efficiency than MNECB		2007
Edmonton, AB 2017	LEED Silver or equivalent for new civic buildings, additions >500m^2	Lifecycle cost analysis required showing costs>benefits	40% or greater energy efficiency than NECB-2011	LEED Gold = 3 LEED Silver = 2 LEED Certified = 2	2017

Table 2 Summary of Compared Civic Building Policies

3.1 City of Winnipeg, Manitoba

3.1.1 Sustainable Building Policy Overview

The City of Winnipeg is committed to exemplary leadership in environmental, economic, and social stewardship. To advance this mission, the City of Winnipeg created a Green Building Policy in 2010 to maximize corporate building energy performance using third-party building rating systems (City of Winnipeg 2011).[11] The city desired third-party certification so that civic building designs are credible and verifiable, and so that they excel at meeting the goals of their triple bottom line.

The policy applies to new construction, major additions, capital lease agreements, and public-private partnerships (City of Winnipeg 2011).[12]

3.1.2 Policy Rationale

The City of Winnipeg solicited community opinions about Winnipeg's future through a citizen outreach program named "SpeakUpWinnipeg" (City of Winnipeg 2010). Winnipeggers identified sustainability as an important goal, and a green building policy as an action that aligns with that goal. The Green Building Policy fulfills the commitment made through these consultations (City of Winnipeg 2011).

Greenhouse gas (GHG) reductions also prompted the creation of the Green Building Policy. In 2009, the city set a corporate emissions reduction target of 20% by 2019.[a] The city's corporate GHG emissions were 54,624t CO2e in 2009, 31% (16,679 tonnes) of which was emitted from civic buildings (City of Winnipeg 2009).[13]

3.1.3 Policy Requirements

The Green Building Policy applies to new construction and major additions of civic buildings whose footprint is larger than 500m^2. These buildings must:

1. *Be certified by one of the following green building standards:*
    - ***a.*** *Leadership in Energy and Environmental Design (LEED) at the Silver level or better;*
    - ***b.*** *Green Globes Design at the 3 Globes level or better;*
    - ***c.*** *Other such third-party verified standards that fulfill the policy targets of the Chief Administrative Officer or designate.*
2. *Deliver improved energy performance and be certified by the Manitoba Hydro Power Smart New Buildings Program.*[14]

3.1.4 Exemptions

Exemption considerations may be given where there are no plans for a building addition to be inhabited, or if the building is temporary, or can be shown to be incompatible with this policy (City of Winnipeg 2011). Exemptions must be supported by an audit.

3.1.5 Implementation and enforcement

The chief operating officer (CFO), departmental directors and chiefs are the principal staff members responsible for administering the Green Building Policy (Winnipeg 2011).

The CFO allocates an additional 5% capital to building projects seeking third-party certification to cover the cost premium required to include sustainable features. (ibid).

[a] Media reports indicate that according to the City of Winnipeg's climate change working group "corporate emissions rose 20.5% between 2007 and 2013" (Winnipeg Sun 2016).

Project managers handle building documentation, making sure documents needed for third-party certification are completed and submitted on time, and creating an archive that proves Green Building Policy compliance.

The environmental coordinator manages and updates a GHG inventory of civic buildings, conducts a policy performance review twice yearly, and updates internal staff.

3.1.6 Additional Considerations - Savings that Work

In addition to developing civic facilities that perform to a high standard, upgrading existing buildings has also been a priority. There are over 600 buildings in the City of Winnipeg's portfolio, and most are over 30 years old (Winnipeg Council Minutes 2011).[15] Some of these buildings under went retrofits to improve their energy efficiency. Retrofits were partially funded through Manitoba Hydro's Power Smart Agreement, which allowed the city to finance the cost of the retrofits through their utility savings. The retrofits resulted in more than $900,000 in savings annually. With the savings, the Standing Policy Committee on Property and Development recommended the savings be channeled into an energy efficiency fund, which would finance new retrofit projects and would exist in perpetuity (ibid).[16]

3.2 City of Victoria, British Columbia

3.2.1 Sustainable Building Policy Summary

Like Winnipeg, the City of Victoria founded their Green Buildings Policy on environmental, economic, and social stewardship and leadership (Committee of the Whole 2007).[17] The policy is part of the City of Victoria's vision to be "the most livable city in Canada" (ibid).[18]

New civic construction must achieve LEED Silver at minimum under the policy, with a goal of LEED Gold Civic building renovations and operations are also within the purview of the policy (City of Victoria 2007).[19]

SUCCESS STORIES

Pan Am Pool

The Pan Am Pool, one of the City's premier Civic facilities, had a stuffy, open-air weight room that was receiving humid air from the swimming pool. The air was impacting guests' workouts and damaging exercise equipment. A retrofit was ordered to remedy the problem. The weight room was properly sealed from pool air, and air condition was installed. New isolated air delivery zones between the weight room and pool resulted in reduced energy use. (Winnipeg.ca 2016).

City Hall Complex

Winnipeg City Hall completed a comprehensive energy retrofit in 2006, and received BOMA certification in 2008 under its old Go Green program. The retrofit upgraded everything from the building envelope to HVAC upgrades to new lighting and water fixtures. Electricity usage saw a modest reduction of 23445 kWh. Natural gas usage was not provided. (Winnipeg.ca 2016).

Other City of Victoria green initiatives—such as improved recycling and environmentally friendly cleaning products—compliment the Green Buildings Policy by ensuring that the gains made in site and building design are not lessened by practices that contradict broad sustainability objectives (Stantec 2007).[20]

3.2.2 Policy Rationale

The Committee of the Whole (2007) report emphasized the benefits of green building as justification for a Green Buildings Policy.[21] These benefits included natural resource conservation, reduced operational costs, improved well-being of occupants, and supporting local industry. The report provided estimated energy and water savings for adopting various LEED levels (see Table 3).[22] While this may have provided rationale for the recommendation of LEED Silver

specifically, the Green Buildings Policy is situated in a broader policy context.

Foremost was the City of Victoria Corporate Strategic Plan 2007 – 2009, which stated "the environment is sustained and enhanced through sound leadership and stewardship of natural resources" (Committee of the Whole 2007). [23]

LEED Rating	Energy Savings	Water Savings	Capital Cost Premium
Certified	22%	15%	0.6%
Silver	31%	22%	1.2%
Gold	40%	27%	2.0%
Platinum	48%	27%	
Average	30%	20%	

Table 3 LEED Performance and Cost in BC[24]

3.2.3 Policy Requirements

LEED Silver provides the minimum standard for new civic buildings or additions over 500m^2.[b] However, the policy has a goal of LEED Gold, and potentially Platinum, suggesting the feasibility of these tiers are tested before settling on the LEED Silver baseline (City of Victoria 2007). [25] New building projects under 500m^2 do not require third-party certification, but are recommended to use LEED New Construction documents to guide the project from design to operation. Renovations are not required to achieve third-party certification either, and are evaluated for certification on a case-by-case basis (ibid). [26]

The Committee of the Whole (2007) recommended that whether or not new construction projects pursue third-party certification they should include an integrated design process, life cycle assessment, and building commissioning. [27] These three practices help achieve desired energy performance and low operation costs.

SUCCESS STORIES

Burnside Gorge Community Centre

Victoria's Burnside Gorge Community Centre, a 1200m^2 structure, was completed in 2007, and LEED Gold certified in 2009 (Canadian Green Building Council 2017 **– Website reference**). "This project is unique in that it is built into a hillside and features an accessible green roof to maximize greenspace. There are special storm water management considerations due to the adjacent creek" (ibid).

3.2.4 Exemptions

No new buildings or renovations are exempt from the Green Buildings Policy without proof provided by an audit of the LEED level sought. However, the Committee of the Whole (2007) noted that LEED may not apply practically to all facilities, such as heritage buildings. Exemptions may be considered in this case. [28]

3.2.5 Implementation and enforcement

When the Committee of Whole tabled their report on green buildings in 2007 they did not identify who would be responsible for implementation of the Green Buildings Policy. Rather, administrative staff would be directed by city council to implement the policy (Committee of the Whole 2007). [29]

However, the policy was put forth by the Facilities branch manager, and the Engineering Director.[30]

3.2.6 Additional Considerations – Policy Integration

Policies like the Green Buildings Policy govern actions within a narrow scope of government

[b] Municipalities in the Cascadia region have similar green building policies that use the 500m^2 cutoff.

activities. This is to avoid ambiguity in pursuit of objective goals (e.g. reduce building water use by 30%). Nevertheless, though policies can be narrow in scope they are often overlap with other policies created under the same broad strategy. The City of Victoria uses the triple bottom line of economic, social, and environmental performance as their guiding framework, and their corporate strategic plan gives strategic direction. Such a broad framework necessitates multiple policies. The Victoria Sustainability Framework, Climate Action Plan, Urban Forest Master Plan, and Integrated Storm Water Management Plan are a few of the policies have arisen from the above framework, and all of them inform aspects of the Green Buildings Policy (Governance and Priorities Committee 2010).

LEED takes a whole-building approach to building construction, awarding points for site, landscaping, waste and storm water, and indoor environment quality features. However, not all LEED Silver projects will be sited near active transport corridors, have large trees, or collect rain water. Do other policies impose requirements on new building projects not covered under the Green Buildings Policy? What policy requirements should administrators prioritize? How can city administration satisfy Green Buildings Policy requirements at a reasonable cost without impeding the goals of the other policies? These were some of the challenges faced by City of Victoria administration. They were tasked with finding a way to integrate these policies so that all their requirements could be implemented within a reasonable timeframe (Governance and Priorities Committee 2010).

While the Governance and Priorities Committee (2010) stated integrating these policies is challenging, they all support the city's bottom line. As these supporting policies and strategic plans are updated, so too should the Green Buildings Policy to maintain policy coherence (ibid). Ultimately, the committee felt the Green Buildings Policy had not conflicted with the goals of other policies.

SUCCESS STORIES

Kanata West Fire Station No 46

Constructed in 2011, this 1138m2 fire hall achieved LEED Silver certification at a cost of $5.7 million (City of Ottawa 2017). The facilities include offices, meeting and training rooms, exercise facility, and on-site storm water management. Specific sustainability features include (City of Ottawa 2017):

- *Reduced energy consumption – target 40 percent cost savings*
- *Advanced storm water management to control run-off via bio swales and landscaping*
- *High energy efficient windows and doors along with passive solar design*
- *Robust building envelope and durable building material selection and detailing*
- *Use of natural, renewable, recycled and regionally produced materials*
- *Elimination of CFC refrigerants via a higher engineering goal and program*

3.3 City of Ottawa, Ontario

3.3.1 Sustainable Building Policy Summary

The City of Ottawa's Green Building Policy for the Construction of Corporate Buildings ("Green Building Policy") was adopted in 2005. The goal of the policy is to provide leadership in green building design to the Ottawa community, reduce corporate operating costs, and lessen the negative environmental impacts of buildings (City of Ottawa 2017). To achieve these goals, LEED Certified was adopted as the minimum certification new civic buildings must achieve. The city's administration believes LEED Certified certification "clearly demonstrates improved fiscal, environmental and corporate responsibility" (ibid).

3.3.2 Policy Rationale

The City of Ottawa's environmental strategy set the direction for sustainable initiatives within the city. The Green Building Policy

follows through on the commitments made in the environmental strategy. The policy addresses other sustainable initiatives like improving storm water management, construction waste management, and increasing building infrastructure near public transit corridors (City of Ottawa 2017).

3.3.3 Policy Requirements

LEED Certified is the minimum requirement for new civic buildings with footprints larger than 500m^2. New buildings must be designed, built, and certified to this standard, ensuring energy efficient features are included.

Retrofits are not required to achieve third-party certification, but are encouraged to use "sustainable design principles" (City of Ottawa 2017).

A 2010 report from the Corporate Services and Economic Development Committee states that the Green Building Policy requires city staff to pursue LEED Silver if a simple payback of the cost premium can be achieved within 7 years (City of Ottawa 2010). This stipulation is absent in the 2015 version of the policy. However, the number of civic LEED Silver (11) compared to LEED Certified (8) buildings in Ottawa (City of Ottawa 2017) suggests such a commitment—either explicit or implicit—was established.

3.3.4 Exemptions

Historic building upgrades are not required to receive LEED Certified status, though the policy urges project teams to include as many LEED Certified criteria as possible.

As well, the general manager of the Infrastructure Services Department possesses "Delegation of Authority" (City of Ottawa 2010). This authority allows the general manager to exempt projects from the LEED requirement if projects are not financially feasible.

3.3.5 Implementation and enforcement

Generally, the Green Building Policy applies to "all City of Ottawa employees involved in the design and construction of new municipal buildings" (City of Ottawa 2017).

City of Ottawa departmental managers must include 5% of the project cost in their project budgets to fund LEED certification (City of Ottawa 2017). Project managers are responsible for the certification of LEED projects. The Supply Branch and Finance Department must include the appropriate LEED requirements in all public tenders.

3.3.6 Additional considerations - Inability of Projects to Reach LEED Certification

Requiring all civic buildings to achieve LEED certification can be a set up for failure before such a requirement is implemented. There are two reasons for this. The first is that cities own and operate a variety of buildings that serve many purposes, from offices to warehouses to fire stations to leisure centres. These building types require vastly different designs, features, and equipment. The second reason for failure is that previous versions of LEED applied to few building types. The result is that some buildings, while useful for city operations, are unable to meet LEED prerequisites. For example, the Navan Vehicle Storage Facility is not a building type that is compatible with LEED, and is unable to meet Energy and Atmosphere prerequisites (City of Ottawa 2010). Kinburn Arena was compatible with LEED New Construction, but not its energy simulation tools. The arena would have been unable to achieve LEED certification given the modeling challenges presented by the ice surface. Importantly, upgrades to lower energy consumption were included despite being unable to fulfill the certification requirement of the Green Building Policy (City of Ottawa 2010).

3.4 City of Thunder Bay, Ontario

3.4.1 Sustainable Building Policy Summary

The City of Thunder Bay city council adopted a sustainable civic building policy in 2014. Entitled "Facility Design Standards" the policy's intent is to support improvements to the city's triple bottom line by using sustainable building strategies (City of Thunder Bay 2014). Other goals of the policy include reducing long-term operating costs and GHG emissions, enhancing occupant health and productivity by improving environmental quality, and be a community leader in sustainable development.

The Facility Design Standards require an energy use reduction of 40-45% for all new buildings greater than 500m^2. LEED certification is required for a subset of the corporate building stock, and LEED principles are applied to other buildings that are not as compatible with the rating system (ibid).

3.4.2 Policy Rationale

A 2008 environmental assessment found that the City of Thunder Bay's corporate buildings accounted for 58% of corporate emissions in 2005, which had $9.4 million in energy costs (Earthwise Thunder Bay 2008). Shortly following the 2008 assessment, the city set a corporate GHG reduction goal of 20% by 2020 based on 2009 levels (City of Thunder Bay 2015). The 2008 review identified the need for energy efficiency, especially in Thunder Bay's cold climate (Earthwise Thunder Bay 2008). Additional green building benefits also justified the policy including storm water management, waste reduction, improved air quality, and resiliency to extreme weather.

3.4.3 Policy Requirements

The Facility Design Standards use a tiered framework to determine the design requirements of new building projects (see Table 4 below). Foremost in all new construction is the energy use reduction requirement. Regardless of building size, all new construction that will is municipally owned or funded must reduce energy use by 40-45%. It is not stated in the policy if this reduction in energy use is based of existing corporate buildings, building code, or another baseline.

It is important to note that buildings are only required to be designed to the LEED certification shown in the above table. LEED certification is only pursued when requested by city council (City of Thunder Bay 2014). If

Category	Energy Performance Reduction*	Internal Design Influences	Gross Building Size < 500 m 2	Gross Building Size >500 m 2	Gross Building Size >2000 m 2
Operational	40-45%	All Applicable	LEED Principles	LEED Principles	LEED Principles
Administrative	40-45%	All Applicable	LEED Principles	LEED Silver	LEED Gold
Public Assembly	40-45%	All Applicable	LEED Principles	LEED Silver	LEED Gold

Table 4 *City of Thunder Bay Facility Design Standards Performance Criteria (City of Thunder Bay 2014)*

certification is not pursued, a performance evaluation of the building project will be conducted at the design and request for proposal stages using the LEED checklist.

3.4.4 Exemptions

Buildings not compatible with the LEED rating system are exempt from this policy, specifically process facilities such as water treatment plants. As above, any project is potentially exempt if it is not approved by city council. Criteria for approval or rejection to pursue LEED certification was not given (City of Thunder Bay 2014).

3.4.5 Implementation and Enforcement

City project managers are required to give two presentations on new construction larger than 500m^2, and administrative and public assembly buildings of all sizes (City of Thunder Bay 2014). The first is to the Clean Green and Beautiful Committee, and the second is an "informal presentation" to city council. This allows city council to make final additions to the building design.

The Facility Design Standards originate from the Facilities, Fleet & Transit Services department, though the policy indicates that all city departments are affected (ibid).

Finally, there does not seem to be a process—other than council approval—to enforce LEED certification or guarantee energy performance beyond the design stage.

3.4.6 Additional Considerations - Sharing Local Knowledge

When local governments take a leadership role in green building design and construction they create opportunities for designers, builders and the public to share experience and knowledge about sustainable design. The City of Thunder Bay recognized these opportunities in their Community Environmental Action Plan (2008) and created several recommended actions for community collaboration including:

- *Work with provincial regulators to encourage compliance with legislation regarding waste diversion on construction sites*
- *Develop an online guide that compiles local sources, practical strategies, incentives and programs for energy/water conservation initiatives for residential and commercial sector*
- *Develop a sustainable design and technology centre of excellence in partnership with the educational and ICI (Industrial, Commercial, and Institutional) sector to encourage research and development, and testing of new building technologies*
- *Encourage demonstration of green building technologies through partnerships with local groups such as Habitat for Humanity, the Rotary Club, and the Kinsmen* (EarthWise 2008) [31]

The City of Thunder Bay put this plan into action, partnering with Union Gas to fund a how-to workshop on building green roofs for storage sheds. The aim was to foster the

SUCCESS STORIES

Seeing Results

Through a number of upgrades to their civic facilities including energy audits and LED lighting replacements, the City of Thunder Bay achieved a 7.4% reduction in corporate emissions between 2009 and 2016 (EarthCare 2016). City-owned buildings saw a 7% decrease in electricity use between 2009 and 2015, and a 9% decrease in natural gas use during the same period (EarthCare 2015).

The City of Thunder Bay achieved GHG emissions reductions in spite of an increase in diesel and gasoline use (EarthCare 2016), highlighting the importance of sustained efficiency in building operations.

economic development potential of green building materials and products.[32]

3.5 City of Edmonton, Alberta

3.5.1 Sustainable Building Policy Summary

The City of Edmonton originally adopted their Sustainable Building Policy in 2007. It was recently updated in the summer of 2017. This chapter focuses on the current policy, though some differences between the two are highlighted in Table 2.

The City of Edmonton Sustainable Building Policy ensures the sustainability of city-owned buildings by integrating numerous sustainable design requirements into City operating procedures. This policy supports the City's environmental policy goal of achieving carbon neutral emissions.[33] Within this policy the City plans to:

- Reduce capital and operating expenses using life cycle costs
- Minimize environmental impacts associated with building construction and operation
- Reduce GHG emissions
- Gain from the health and productivity benefits sustainable buildings provide
- Support the local building economy
- Drive uptake of sustainable building practices throughout the community[34]

3.5.2 Policy Rationale

To fully understand the costs and benefits of constructing to the LEED standard, HDR Corporation conducted a Sustainable Return on Investment (SROI) analysis of three recently completed civic buildings for the City of Edmonton.[35] The study found that LEED Silver generates positive financial returns compared to standard construction, and that LEED Gold generates more financial benefits than LEED Silver.[36]

3.5.3 Policy Requirements

Effective May 9, 2017 all new City-owned or -leased buildings and major renovations greater than 500m^2 will strive to achieve the highest LEED rating possible, but must attain LEED Silver certification at minimum—or an equivalent alternative (Edmonton City Council 2017).

Additionally, newly constructed buildings require significant improvements over the NECB-2011, including:

- 40% greater energy efficiency
- 40% fewer GHG emissions than an NECB-2011 reference building
- 50kWh/m^2 annual heating demand for office buildings
- 80 kWh/m^2 annual heating demand for non-office buildings

SUCCESS STORIES

Edmonton City Hall

City Hall was awarded a BOMA BESt Level 1 certification following an energy retrofit. Efficienct lighting was installed and the HVAC system was upgraded. Other environmental initiatives in the retrofit included replacing carpet and switching to green cleaning products (City of Edmonton Green Building Plan 2012).

City hall employees are engaged about their environmental impact, and are asked to turn off lights when unneeded and recycle all materials possible.

Edmonton Police Service – Southeast Division Station

In 2007, the Edmonton Police Services' South East Division Station became the City's first LEED Gold-compliant project and the first police station in North America to achieve the standard. The police station has many environmentally responsible features such as the use of recycled building materials, certified wood, use of greywater from the showers for flushing toilets, storage of two months of site rainwater, operable windows to increase natural ventilation and a thermal chimney. It achieved a 43 per cent energy savings compared to a code compliant design (HDR Corporation 2014).

- Dedication of 1% of capital budget to on-site energy generation systems[37]

Projects less than 500m² will show how they will meet the intent of the Sustainable Building Policy.

The policy also contains requirements for sustainable building operation and the development of a retrofit strategy.

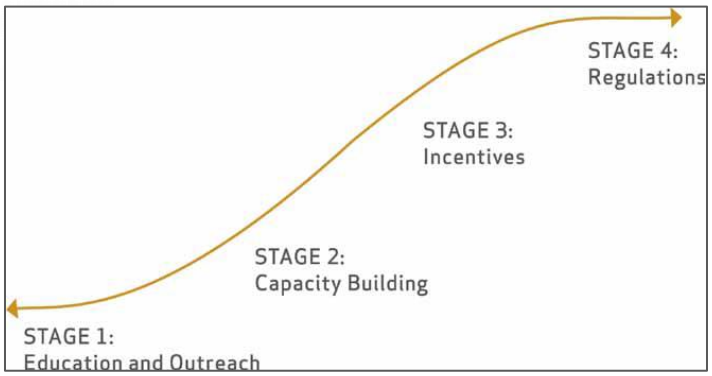

Figure 1. Market Transformation Curve *(City of Edmonton 2012)*

3.5.4 *Exemptions*

In circumstances where LEED Silver is not practical—particularly when costs of achieving certification fall short of expected benefits—the Deputy City Manager(s) responsible for implementation of the Sustainable Building Policy will demonstrate the need for exception through a lifecycle cost benefit analysis.[38]

3.5.5 *Implementation and enforcement*

Deputy Manager(s) who are responsible for all phases of facility planning, from design to construction to demolition, shall implement the requirements of the Sustainable Building Policy. A Sustainable Building Team within the City's Administration oversees policy implementation and evaluation, maintains sustainable building expertise of Administration staff, and reports to the Deputy Manager(s). Other areas of city administration support policy implementation through the development of operational procedures, performance standards, and best practices.[39]

3.5.6 *Additional Considerations – Market Transformation*

The City of Edmonton recognized the opportunity for leadership in sustainable building not only with city-owned property, but Edmonton-wide. The City applied market transformation theory to plan policies that encourage greater numbers of sustainable buildings in the private sector (see Figure 1). First, government must be knowledge about energy efficiency technology and benefits through educational outreach. Second, building industry professionals must have the capacity to deliver improved energy efficiency technology. Municipal governments can help build capacity through procurement and sustainable building policies, creating demand for energy efficiency that may not have existed otherwise. Third, because energy efficiency retrofits and construction have cost barriers, governments can provide additional financial incentives to encourage adoption. Incentives can include grants, tax exemptions, building permit fee rebates, financing programs, or other policy tools. Finally, industry-wide regulations can be put in place to ensure full market transformation.

While regulations may be a municipal government's first policy choice, there must first be capacity within industry and local government to meet regulation requirements.[40]

The City of Edmonton included these considerations for local governments on the path to market transformation:

- Encourage people in trades to participate in green technology training
- Focus spending on green products and services to encourage suppliers to supply more
- Hold sustainability competitions between neighbourhoods, community groups, or businesses
- Support building energy labeling programs

- Build government capacity to enforce regulations.[41]

3.6 Conclusion

3.6.1 Cross-Cutting Themes from City Comparisons

Policy Shop examined five sustainable civic buildings policies in this chapter. While each policy contains sections unique to their city of origin they contained many common themes, including:

A) Sustainability: All sustainable civic building policies address environmental, economic, and social stewardship (triple bottom line) through ensuring energy efficient facilities, minimizing GHG emissions, seeking cost savings through reduced operating costs, providing a healthy environment for the community, and protecting, conserving, and enhancing resources and civic infrastructure.

B) Policy Goal: The policy goals are the same across the various municipalities: reduce operating costs, set a positive example for the private sector, and reduce environmental impacts caused by buildings. Some of these goals are tied to timelines, (GHG emissions) others were not (reduction of operational costs). Few of these goals were quantitively defined.

C) Policy Model: There is no "one size fits all" program for municipalities to improve the energy efficiency of new buildings. However, there is an array of possible measures that municipalities can implement related to energy efficient buildings. Alternative sustainability initiatives that are part of current facility operations include: lighting and mechanical system retrofits, enhanced recycling programs in City buildings, using green cleaning products, use of low-carbon or renewable energy sources, use of non-toxic, low-carbon, recycled, regional and sustainably produced building materials, and storm water conservation measures.

D) Green Building Policy Requirements: All new City-owned buildings, major renovations and maintenance with varying stipulated sizes for each municipality, are designed and constructed to meet LEED Silver or equivalent, or be formally LEED certified. The LEED rating system remains a useful tool for promoting green building in most municipalities. LEED's market visibility, established certification infrastructure and continuous improvement provide a useful lens for considering specific measures to encourage green building.

E) Exemptions: All policies allowed exemptions to the sustainable building policy. Some are granted after audit reports explaining the reason for which certification is impractical, some specify building types that are exempt (e.g. historical buildings).

F) Provincial Policy Context: The cities examined in this chapter are all situated in provinces that have adopted the Model Energy Code for Buildings (MECB) (NRCan 2014). The MECB is the minimum energy standard in these provinces and is compulsory for new construction.

3.7 Policy Recommendations

1. Limit exemptions by setting clear conditions for exemption. Commitment to a policy's principles are important for municipal governments looking to establish a leadership role in budding sustainable building markets.
2. Set a clear policy goal and measurable target. It is difficult to measure how well a policy helped reduce GHG emissions from buildings without a target to measure success against. Effective policies clearly define how they will be evaluated.
3. Set a policy review date. Provincial building code is continuously updated, and it appears the MECB will come into force within the next two to three years. Reviewing the sustainable building policy will allow for responses to a changing policy, and perhaps business context.

4 ANALYSIS OF SUSTAINABLE BUILDING STANDARDS AND RATING SYSTEMS

The cities examined in the previous chapter all adopted LEED as the minimum standard for civic buildings. Equivalent rating systems are acceptable in some sustainable civic building policies, but there are several sustainable construction standards and rating systems to choose from. Some, like National Energy Code of Canada for Buildings, the International Green Construction Code, or LEED span vast geographical areas that accommodate needs of varying climate zones. Others, like the Toronto Green Standard, California Title 24 Part 6, and the Vancouver Building Bylaw are highly region-specific, with the purpose of responding to each location's unique (environmental, social, and political) climate. All of these standards and rating systems intend to reduce the environmental impact of the built environment. Please see Appendix B for a complete list of existing sustainable building standards and rating systems.

This chapter proceeds as follows: First, differences between sustainable building standards (SBS) and sustainable building rating systems (SBR) are highlighted, as well as their advantages and disadvantages. Second, an in-depth analysis of ASHRAE 189.1, Green Globes, LEED v4, and the Living Building Challenge using the multicriteria analysis method (Communities and Local Government 2009) is presented.[42] These SBSs and SBRs were chosen for their suitability to achieve 15 policy objectives identified by ECI, and their familiarity in North America.[c] Finally, the chapter concludes with a discussion and recommendations for the Sustainable High Performance Civic Building Policy.

4.1 Sustainable Building Standards and Rating Systems

Sustainable building standards are consensus-based requirements produced by recognized organizations that set minimum standards for building construction and design.[43] These standards are written in imperative language, making them easily enforceable if incorporated into policy or legislated. Three types of standards exist:

1) *Prescriptive* – Quantitative minimum requirements are listed and defined. Prescriptive standards can be conservative and inflexible, but do not require energy modeling or certification, which can lower administrative and transaction costs. They may be biased toward some technologies (e.g. ASHRAE 189.1), stymying opportunities for innovation.

2) *Performance-based* – An approach that requires building designs to be performance tested prior to construction. The method of performance testing is sometimes prescribed, and documentation of testing is required. Performance-based standards require additional labour, but provide greater flexibility in design (e.g. Green Globes, ASHRAE 189.1).

3) *Outcome-based* – These specify energy targets using clear metrics that must be achieved after construction. Outcome-based standards also allow for flexibility in design, and necessitate diligence during construction so that predicted performance levels are achieved (e.g. Living Building Challenge).[44] A shortcoming of this type of standard is that it requires occupancy for performance verification, and occupancy requires that buildings are first safe and healthy for occupants.[45]

[c] See Appendix A for further detail on methodology for this section.

Sustainable building rating systems are usually supplied by third parties who verify that buildings were designed to a level of quality above baseline code. These systems rate multiple building attributes (often using a point system), but not with the amount of granularity seen in prescriptive standards. SBRs can be performance- or outcome-based, and incur certification costs.

Performance-based SBSs and SBRs can suffer from poor modeling due to large fluctuations in reference building parameters.[46] This makes 'percent better' targets—common in performance-based standards and rating systems—unreliable.[47]

Desired Policy Objectives	LEED v4	ASHRAE 189.1	Green Globes	Living Building Challenge
Reduces GHG emissions compared to building code	*	*	**	***
Reduces water use	**	**	*	***
Reduces space heating and cooling energy use	*	*	*	***
Improves employee productivity	**	*	**	*
Diverts and minimizes waste from landfill	**	**	**	***
Minimizes exterior light pollution	**	**	**	*
Building envelope commissioning process	***	***	*	*
Accommodates future sustainable energy generation		***		***
Positions Saskatoon as a sustainable building leader in cold climates	*	*	*	**
Standard is updated regularly	***	***	*	**
Trustworthy and reliable	*	*	*	**
Simple and intuitive	*	**	**	*
Flexible	**	**	***	*
Calculable life cycle costs	*	*	**	*
Transparent	*	**	**	***
Total (# of points)	23	27	23	30
Doesn't Meet (# of objectives)	2	0	1	0
Partially Meets (# of objectives)	7	6	7	6
Meets (# of objectives)	5	6	6	3
Exceeds (# of objectives)	2	3	1	6

Table 5 *Multicriteria Analysis of Sustainable Building Standards and Rating Systems Summary*

4.2 Multicriteria Analysis of Sustainable Building Standards and Rating Systems

In the following four subsections, evidence is presented to demonstrate if an SBS or SBR fulfills the fifteen policy objectives identified by ECI. Descriptions of the conditions required to meet the objectives can be found in Appendix A.

<blank>	Does not meet the objective
*	Partially meets the objective
**	Meets the objective
***	Exceeds the objective

The policy objectives are listed using subheadings for each SBS or SBR. Beside each subheading is a rating:

Many building design elements influence occupant productivity. Policy Shop identified five conditions that should be met to improve productivity. These conditions are rated separately to provide greater detail, and inform the overall rating for the Improves Employee Productivity objective.

Readers may refer to Table 3 for a summary of results of the analysis.

4.3 ASHRAE 189.1-2014[d]

ASHRAE 189.1 Standard for the Design of High Performance Green Buildings 2014 outlines prescriptive and performance based approaches to set minimum acceptable standards of energy efficiency. The standard is written so that it can be enforced by authoritative organizations through policy or building code.[48] The purpose of the standard is to "balance environmental responsibility, resource efficiency, occupant comfort and well-being, and community sensitivity" and "support the goal of development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[49] The policy applies to new buildings, additions, and their systems. Most sections follow this format:

i. General
ii. Compliance Paths
iii. Mandatory Provisions – These provisions must be met and can not be superseded by other sections
iv. Prescriptive Option – This compliance path contains provisions that must be met to achieve code compliance. This is a simple option that requires minimal calculations.
v. Performance Option – This compliance path requires building modelling and simulations to provide evidence of performance equal to or greater than the prescriptive path.[50]

[d] Specific versions of this standard are denoted by year. If no year is identified, reference is to ASHRAE standard in general.

4.3.1 Reduces GHG emissions compared to building code *

It is unclear that this standard will reduce GHG emissions by 30% in its current version. However, as noted below, ASHRAE 189.1 is continuously improved toward the goal of achieving net-zero carbon emission by 2030. Adopting this standard would achieve the City's objective of reducing GHG emissions compared to building code.

Suh et al. conducted a life-cycle cost analysis (LCA) of ASHRAE 189.1-2011 to assess its environmental impacts over 40 years based on 15-30 key inputs.[52] Using a typical US 3-storey office building as a baseline model, they found that ASHRAE 189.1 2011 would reduce global warming impact by 20% over baseline. However, the climate zone assumed for the baseline model was not indicated. It is possible that additional global warming impact reductions could be realized if ASHRAE 189.1 was applied in Saskatoon.

A limit to the Suh et al. study was the number of inputs used in the lifecycle assessment (LCA), which were fewer than the number of prescriptions present in the ASHRAE 189.1 standard.[53] Also, the 2011 version of ASHRAE 189.1 was examined, not the 2014 version. Policy Shop did not find information during research to indicate that the site EUI for ASHRAE 189.1-2014 is significantly superior.

4.3.2 Reduces water use **

Both mandatory and prescriptive or performance requirements for water use in ASHRAE 189.1 2014 meet this objective.

Suh et al. also examined the impact of ASHRAE 189.1-2011 on water use compared to a baseline building (described above).[54] Water use declined by approximately 7% using the ASHRAE 189.1 model when compared to a 3-storey US office building.

ASHRAE 189.1-2014 has notable upgrades on mandatory water-using equipment. For example, an automated landscape irrigation system is required that adjusts watering schedules based on environmental conditions.

ASHRAE 189.1 MAIN SECTIONS
Administration and Enforcement
Site Sustainability
Water Use Efficiency
Energy Efficiency
Indoor Environmental Quality (IEQ)
The Building's Impact on the Atmosphere, Materials, and Resources
Construction and Plans for Operation

Table 6 ASHRAE 189.1 Sections[51] (ASHRAE 2014)

Plumbing fixtures such as bathroom toilets and faucets have stringent flow rates (4.8L/flush and 1.9L/min respectively). Mandatory requirements for HVAC systems (including cooling towers and evaporators) minimize water use, and require measurement of high water consumption processes.

4.3.3 Reduces space heating and cooling demand *

This standard partially meets the objective of reducing space heating and cooling demand. A 40% reduction in space heating and cooling demand compared to the NBC is possible with ASHRAE 189.1-2014, but unlikely. It likely that future iterations of this standard will meet the objective.

The best obtained evidence for this objective is a comparison of EUIs between ASHRAE 189.1-2011 and the US commercial building stock. According to the presentation, ASHRAE 189.1 achieves a 47% reduction in EUI compared to existing commercial buildings, and a 33% EUI reduction compared to ASHRAE 90.1-2004. No information about the climate zone(s) used for comparison, or whether the values used for comparison represented averages, medians, or otherwise was provided. Additional research from the National Renewable Energy Laboratory found

ASHRAE 189.1-2009 provided a 31% energy savings over ASHRAE 90.1-2007 in office buildings.

Countering the preceding findings, Rosenberg et al. observed that energy efficient options in both prescriptive and performance compliance paths of ASHRAE 90.1-2013 (on which ASHRAE 189.1 is based) give too little credit to design elements that would out-perform others.[55]

ASHRAE 189.1-2014 requires that building envelope materials must be 10% more resistant to thermal transfer than what is required by ASHRAE 90.1. There is a strong focus on continuous insulation, which minimizes thermal bridging. A continuous air barrier throughout the building envelope is also required, which also prevents thermal transfer. Other energy efficiency requirements that influence space heating and cooling include minimum thermal energy recovery of at least 60% (via heat exchangers), high Energy Star ratings for HVAC equipment, automatic occupancy controls to reduce energy use, and plumbing insulation.

The performance compliance path for building envelope and HVAC systems require software simulations of energy costs, CO2e emissions, and annual electricity load of the designed building.[56] As noted above, this type of modeling is subject to high variance.[57]

Absent from the prescriptive options are building orientation strategies in cold climates (Zones 7 & 8) that maximize solar heat gain. Also, the formulas used to calculate allowable window area do not require south-facing window area to be less than north-facing window area—a strategy that reduces space heating demand.[58]

*4.3.4 Improves employee productivity **

ASHRAE 189.1-2014 requires only some of the building design elements that affect occupant productivity, and additional measures are not incentivized or suggested. This objective is partially met.

ASHRAE 189.1-2014 relies heavily on ASHRAE 62.1 (Ventilation for Acceptable Indoor Air Quality), which sets minimum standards for ventilation and indoor air quality. Persily & Emmerich criticize ASHRAE 189.1 for doing too little to improve upon the minimal standards set by 62.1, especially regarding moisture control.[59] However, these authors state that additional measures are more important in hot and humid climates. ASHRAE 189.1 relies on the 62.1 for moisture control measures, and requires construction materials to be protected from moisture. An air tight barrier around building insulation—which this standard requires—can help manage moisture, but Persily & Emmerich insist that moisture problems persist despite the implementation of vapour barriers.[60]

- **IAQ** ** – ASHRAE 189.1 must equal or better that provided by ASHRAE 62.1. The goal of 62.1 is to limit contaminants so that 80% or more of building occupants are not dissatisfied with the IAQ. Ventilation systems built to 62.1 may operate below minimum outdoor air intake rates if adequate filtration of indoor air is provided. This standard also requires acceptance testing of HVAC systems to ensure acceptable IAQ. Continuous testing of IAQ is required throughout a building's lifetime.
- **VOCs *** – The prescriptive compliance path for building materials outlines acceptable VOCs from surface coatings, floor coverings, wood, wall and ceiling materials, and office furniture set by a variety of standards set by respective material industries. The performance path requires modeling of VOC concentrations, which Persily & Emmerich and Bourbeau et al. have noted the limitations of. MERV 8 ventilation upstream of cooling coils is required.
- **Thermal conditions **** – These are designated by ASHRAE 55, which aims to achieve 80% occupant satisfaction with indoor thermal temperature. Temperature variations must be limited to a maximum of 3.3C over 4hrs. The standard does not require occupants to

have access to thermal controls, but may provide design elements to adjust air speed. Minimization of air conditioning is not mentioned in this standard.

- **Lighting** * – Buildings in Saskatoon are exempt from requiring 50% of the floor space of 1-3 storey buildings be daylighted. ASHRAE 189.1 does not specify where daylighting must occur, leaving the possibility that work spaces remain underlit. However, limits to direct workspace lighting are included in the performance compliance path to limit glare and thermal discomfort.
- **Sound** ** – A composite sound transmission class (STC) rating of 50 or greater must be achieved. At this level very loud sounds such as musical instruments, traffic, or planes can be faintly heard.

*4.3.5 Diverts and minimizes construction waste from landfill ***

A construction waste management plan is required before a building or demolition permit is obtained. A limit on total waste per floor area is required (35 m3 or 6000 kg per 1000 m2). A minimum of 50% of non-hazardous waste from construction materials must be diverted from landfill. Excavated soil and debris is not required to be diverted, however.

Spaces for the collection of recyclable and hazardous materials is required, including for reusable goods, electronics and batteries, and items containing mercury.

*4.3.6 Minimizes exterior light pollution ***

Allowable light pollution per lighting zone is set based on BUG (backlight, uplight, glare) ratings. Allowable light pollution may still be high in areas where people are used to higher light levels. Also, ASHRAE 189.1-2014 (via ASHRAE 90.1) requires exterior lighting to be turned off when sufficient daylight is available, and during part of night-time hours.

Several exceptions to exterior lighting requirements are allowed for property types and installations the city may own or operate, including advertising signage and swimming pools.

*4.3.7 Building envelope commissioning process ****

A commissioning process must be performed for buildings over 500m^2 in gross floor area. This process must take place during predesign, design, construction phases and the first year of occupancy.

*4.3.8 Accommodates future sustainable energy generation ****

This is a mandatory provision of ASHRAE 189.1. Minimum generation per roof area is quantified and explicitly stated. The area designated for sustainable energy generation installation and access must be indicated in the building design.

*4.3.9 Positions Saskatoon as a sustainable building leader in cold climates ***

ASHRAE 189.1-2014 offers advantages over SBRs, which have been adopted by other cold climate cities for their civic building policies (see Chapter 2). The primary advantage being that it has more mandatory requirements in each sustainability category, providing performance upgrades across all building aspects. Also, since it is a standard and not a points-based system, it is not subject to 'gaming'.

Adopting a mandatory sustainable building standard will provide leadership for Saskatchewan and the Atlantic Provinces who have not adopted an energy efficient building code. It will provide leadership for cold climate provinces and cities who want to move beyond energy efficiency and view building design and construction holistically, considering the entirety of a building's impact on the environment.

While the standard may not provide substantial improvements over LEED Silver and Gold in the near term, ASHRAE 189.1 will be continually updated in relatively short intervals with the goal of achieving net-zero

energy by 2030.[61] This target likely outpaces the speed at which LEED will improve, since it is based on ASHRAE 90.1, which is not on a path to achieve net-zero energy.[62] Buildings with net-zero energy by 2030 is an ambitious goal with a clear target that is not present in other cold climate cities' sustainable building policies. This goal and timeline is in alignment with the City of Saskatoon's Strategic Plan, which strives to be an energy efficiency leader in cold climates by 2023.[63]

*4.3.10 Is updated regularly ****

This standard was updated in 2009 and 2011, and future updates will be conducted. The goal of the ASHRAE Standard Project Committee is to design the ASHRAE 189.1 standard to reach zero energy use intensity by 2020, and net-zero energy and carbon by 2030.[64]

*4.3.11 Trustworthy and reliable **

The questionable reliability of ASHRAE 189.1 is not due to poor design, but problems inherent in prescriptive and performance-based standards. Rosenberg et al. (2015) note several, including variation in EUI, failure to incentivize greater energy efficiency than the standard, the speed and number of provisions added to standards, and a deluge of performance models.[65]

Rosenberg et al. noted that when using the prescriptive path of ASHRAE 90.1 (and 189.1 by association) energy cost index varied by $0.16/ft^2, which is enough to negate the supposed improvement of ASHRAE 90.1-2013 over previous versions.[66]

Using annual energy cost assessments for energy efficiency (preserved in ASHRAE 189.1) presents the additional problem of leaving greater potential for poorer energy efficiency improvements in jurisdictions with low energy prices.

*4.3.12 Simple and intuitive **

ASHRAE 189.1 meets the objective of being simple and intuitive when following the mandatory and prescriptive compliance paths. The standard is highly structured, allowing for easy navigation of both mandatory and optional requirements. Some third-party standards are referenced, included other ASHRAE standards, for compliance purposes. Performance compliance paths in the standard usually require software modeling of building design elements, which would be time consuming.

*4.3.13 Flexible **

This standard meets the objective of flexibility.

The standard has several mandatory requirements to ensure minimum energy efficiency levels are achieved. However, several sections contain options for prescriptive or performance paths, and there are little mandatory requirements for building design. This preserves customizability without sacrificing performance.

A representative from the US National Association of Landscape Professionals has noted restrictions to "turfgrass" limits provided by the standard.

*4.3.14 Calculable life cycle costs **

The standard requires a life-cycle assessment of a building's impact on the environment in the performance compliance option only. It is not a mandatory requirement.

*4.3.15 Transparent **

ASHRAE 189.1 meets the objective of providing transparent information to stakeholders.

The owner's project requirements must be distributed to all members of the building design and commissioning authority teams in the pre-design, design, construction, and operation phase as it is updated. Both the owner's project requirements and basis of design documents must be reviewed multiple times throughout design and construction. No consultation is required outside of the owner, and building design and commissioning authority teams.

The standard clearly states which requirements are mandatory and which elements are included from the prescriptive or performance compliance paths.

4.4 Living Building Challenge (version 3.1)[e]

Endorsed by the Canadian Green Building Council, the Living Building Challenge markets itself as a sustainable building rating system that challenges building designers to think about how buildings can have positive environmental effects instead of limit negative environmental effects. It is an incredibly stringent, outcome-based building rating system from which it is difficult to achieve certification. The rating system was created in 2006, and since then only 15 buildings have received the Living Certified rating.

Building projects can achieve one of three certifications: Living Certified, Petal Certified, or Net Zero Certified:

- **Living Certified** buildings must meet all 20 imperatives through measured building performance 12 months after construction. Building designers can implement any features they wish so long as they achieve the performance required by the imperatives.
- **Petal Certified** buildings must meet the imperatives of at least three out of the 7 Petals, including one of Water, Energy, or Materials.
- **Net Zero Certified** buildings require 100% of their annual energy needs to be produced on site with renewable energy.

PETAL	IMPERATIVE
PLACE	01. Limits To Growth
	02. Urban Agriculture
	03. Habitat Exchange
	04. Human-Powered Living
WATER	05. Net Positive Water
ENERGY	06. Net Positive Energy
HEALTH + HAPPINESS	07. Civilized Environment
	08. Healthy Interior Environment
	09. Biophilic Environment
MATERIALS	10. Red List
	11. Embodied Carbon Footprint
	12. Responsible Industry
	13. Living Economy Sourcing
EQUITY	15. Human Scale + Humane Places
	16. Universal Access To Nature + Place
	17. Equitable Investment
	18. Just Organizations
BEAUTY	19. Beauty + Spirit
	20. Inspiration + Education

Table 7 Living Building Challenge Categories

*4.4.1 Reduces GHG emissions compared to building code ****

The energy imperative requires buildings to produce 105% of their annual energy using sustainable sources. Energy sources must be renewable, and must produce the energy on site. Combustion is not permitted, even for cogeneration. There are also other imperatives for responsible use of materials that embody carbon, or produce little carbon when manufactured.

This imperative limits sources of GHG emissions to agricultural practices, transportation to and from the facility, and embodied carbon from the building materials. The latter is addressed in Imperative 11. "The project must account for the total embodied carbon (tCO2e) impact from its construction through a one-time carbon offset from an approved carbon offset provider." Carbon offsets throughout a building's lifespan to

[e] While the Living Building Challenge has been endorsed by the CaGBC, it has received little attention in the academic community. Analysis of the rating system relies on the outcomes it demands, rather than estimations of what outcomes it could produce.

offset maintenance materials are recommended, but not required.

*4.4.2 Reduces water use ****

One hundred percent of a building's water must be supplied by rain water harvesting, or other closed loop water systems such as groundwater or surface water supply. Water supplied by these sources must be replenished (e.g. through transpiration, infiltration), and replenished water must be purified and temperature controlled so that water sources are not contaminated. Any recycled water must be purified without the use of chemicals. Any storm water or waste water that is not recycled must be treated on site and disposed through a closed loop system or infiltration.

Buildings may use municipally supplied water for fire protection and where other regulations (such as health) require it. However, utility supplied water must only be used where potable water is required. Other water uses must be met by water collected on the building site, and water storage systems that can provide 100% of the building's water must be developed.

While these criteria exceed the objective of reducing water use, water supply may lack resiliency during times of abnormal weather patterns. Additional challenges exist for winter climates.

*4.4.3 Reduces space heating and cooling demand ****

To achieve net positive energy production, passive building strategies must be incorporated to minimize the space heating demand. The Energy Petal guidebook emphasizes that minimizing space heating demand through building envelope design is paramount for powering building systems with sustainable energy. If this design strategy is not used, projects run the risk of implementing large solar systems to compensate for poor envelope design.

*4.4.4 Improves employee productivity **

- **IAQ ** –** Ventilation design must following ASHRAE 62.1, which has a goal of 80 percent or greater building occupant satisfaction of IAQ. All regularly occupied spaces must have windows that can open and close. ASHRAE notes that sustainable and net zero buildings may degrade IAQ, implying that the goal over saving energy would minimize health and productivity goals. The authors of this article did not substantiate this claim with evidence, nor provide detail on the trade-offs between energy use and IAQ. Policy Shop concludes that IAQ will likely be satisfactory if ASHRAE 62.1 is followed.
- **VOCs ** –** Buildings must comply with the CDPH Standard Method for testing VOCs. The materials Red List prohibits the use of products that are harmful to human health, with the intent to minimize VOCs.
- **Thermal conditions** – Requirements for accessible thermal or air delivery controls are not present in the Living Building Challenge, particularly the Healthy Interior Environment Imperative. Passive heating strategies and natural ventilation are predictable strategies that could be employed by project teams. This can lead to greater fluctuations in indoor temperature. However, project teams have found solutions to maintain thermal comfort—for example, the Phipps Center's Aircurity system.
- **Lighting** * – There are no specific requirements for minimizing glare or workspace lighting levels. However, occupant access to windows is required. The requirement of an indoor biophilic environment also precludes daylighting, but not necessarily in areas where occupants work.
- **Sound** – There are no acoustic requirements for indoor spaces, only considerations for noise pollution created by the building.

While Living Certified buildings strive to produce spaces that benefit human health, the imperatives are not overtly focused on

productivity and do not include productivity as an imperative outcome. Also, Living Certified buildings may involve greater site maintenance, and restrict resources necessary for task efficiency (e.g. electricity supply for office/industrial equipment). For example, the Phipps Center (in Pittsburgh, PA) monitors electricity use from each plug, and displays electricity use to occupants to encourage energy savings. Therefore, while Living Certification provides some health benefits required for increased productivity, it can not be concluded employee productivity will increase overall.

*4.4.5 Diverts and minimizes waste from landfill ****

All recyclable construction materials must be diverted to these minimum thresholds (by weight):

- Metal 99%
- Paper and cardboard 99%
- Soil and biomass 100%
- Rigid foam, carpet, and insulation 95%
- All others – combined weighted average 90%

Hazardous materials are exempt.

In addition, project teams must create a Materials Conservation Management Plan that includes recycling protocols during building operation, and a salvaging and diversion plan during building demolition/deconstruction.

*4.4.6 Minimizes exterior light pollution **

There are no specific requirements to minimize exterior light pollution. However, the Equity Petal of the Living Building Challenge states "the act of building is a considerable environmental impact shared by all, there is an inherent responsibility to ensure that any project provides some public good and does not degrade quality of life."[67] Project teams must consider the impact of their building and site on the surrounding property, which could include light pollution considerations.

*4.4.7 Building envelope commissioning process **

Commissioning is not required by the rating system, but necessary to assess if a project meets the net-zero energy imperative. Commissioning documents can be submitted to Living Building Challenge auditors to support the verification of the project's energy use.

*4.4.8 Accommodates future sustainable energy generation ***

On-site renewable energy generation is required for Living and Net-Zero certifications. It is an optional requisite for Petal certification. Projects that do not use the Energy petal for Petal certification are not required to rough-in or designate space for future renewable energy generation installation.

*4.4.9 Positions Saskatoon as a sustainable building leader in cold climates ***

The Living Building Challenge is more than a tool to achieve energy efficiency, it is "a philosophy, certification and advocacy tool for projects to move beyond merely being less bad and to become truly regenerative." The sustainable civic building policies examined in Chapter 2 are not as ambitious as the Living Building Challenge, nor do they advance sustainability goals by the same magnitude.

Adopting this rating system in Saskatoon's Sustainable High Performance Civic Building Policy would provide leadership in energy efficiency, renewable energy, water use, sustainable materials, and transparent business practices. The Imperatives of the Living Building Challenge address every Environmental Leadership priority and strategy in the Strategic Plan 2013-2023.

*4.4.10 Standard is updated regularly ***

The Living Building Challenge launched in 2006, and have seen 5 updates since then. Future updates were not declared on the

Living Future Institute website at the time of writing, though it is reasonable to assume that future updates will be provided on a regular basis due to the growing number of Living Building Challenge certified buildings.

*4.4.11 Trustworthy and reliable ***

Because the Living Building Challenge is outcome-based, one can reliably expect certified projects to achieve net-positive energy and water, and satisfactory indoor environmental quality. The Equity, Beauty, and Health + Happiness Petals contain imperatives that leave room for interpretation, however. That said, *how* buildings are designed is largely up to each project team, giving opportunities for design variations, and thus different buildings.

Additionally, many imperatives contain exceptions to project teams overcome barriers for achieving certification. For example, municipal storm water connections can be permitted in high density urban areas that are unable to manage storm water on site without affecting surrounding properties. This exception would compromise a project's ability to achieve net positive water use. Such exceptions are declared by project teams so that certification

*4.4.12 Simple and intuitive **

Achieving all imperatives include in the Living Building Challenge is challenging. There is no set guide for Certified Living Buildings. Designers must find their own solutions to the challenges posed by the imperatives. To aid project teams, the Living Building Institute provides online resources—such as guidebooks, best practices, and webinars—that give examples of how to meet requirements. The institute also holds regular conferences where designers can learn about sustainable building techniques. A guide for documentation requirements is provided, too.

*4.4.13 Flexible **

Temporary exceptions to imperatives are permitted in many cases where they conflict with local regulations or market limitations. For these exceptions to be permitted, however, a project team must appeal regulatory requirements, or advocate for social action from suppliers. Only when appeals have been defeated can exceptions be allowed.

Property outside of and adjacent to a building site can be used to meet imperative requirements in some cases (referred to as "scale jumping"). If this is required, the area outside of the building site does not factor into other calculations.

*4.4.14 Calculable life cycle costs **

This is not required specifically, but the methodology challenges project teams to think cradle to grave. For example, the embodied carbon footprint requires project teams to calculate the amount of carbon used in manufacturing building materials, and offset that amount through a donation to third-party carbon offset program.

*4.4.15 Transparent ***

An integrated design process is required to engage the design team, building owner, and occupants. The Living Building Institute requires projects to register on their website and upload data about their project in case study format. This information is viewable by the public.

The Materials petal requires building project teams to identify the entire ingredients list of each material they use to verify if any ingredients on the materials Red List (i.e., prohibited materials). Project teams may advocate for greater ingredients transparency from manufacturers, and may publish their materials research on Declare, a Living Future Institute web platform for materials transparency.

Project team members must register their organization with JUST, a social justice

labeling system that rates social quality of organizations.

4.5 Leadership in Energy and Environmental Design version 4 (LEED v4)

LEED has existed in Canada since 2002 as a sustainable building rating system to encourage the construction and renovation of holistically designed buildings. Over 7800 buildings in Canada have been LEED certified or registered.

Category	Points Available / 110
Energy and Atmosphere	33
Location and Transportation	16
Indoor Environmental Quality	16
Materials and Resources	13
Water Efficiency	11
Sustainable Sites	10
Innovation	6
Regional Priority	4
Certified: 40 – 49	*Silver: 50 – 59*
Gold: 60 – 79	*Platinum: 80 – 110*

Table 8 LEED Sustainable Design Categories (U.S. Green Building Council 2017)

LEED building projects can register with Canada Green Building Council so that they can achieve recognition before they become certified. A little more than half of new LEED buildings are certified (1734) compared to registered (1600).

LEED v4 uses a 110-point system to rate buildings, with four levels of achievement, and 8 design categories:

LEED is one of the most popular building rating systems in North America, which also makes it one of the most scrutinized. Several studies have been conducted about previous versions of LEED to test its efficacy. While these studies are valuable for analysis, they also provide disproportionate criticism compared to the other standards and rating systems examined in this report.

*4.5.1 Reduces GHG emissions compared to building code **

An Edmonton consulting firm calculated the sustainable return on investment of using LEED Silver or Gold NC 1.0 compared to the provincial building code.[68] They found that a fire hall (1660m^2) built to LEED Silver would prevent an estimated 158 tonnes of CO2e emissions per year [f], averaged over 30 years.[69] This estimate is based off a 51% difference in electricity use and 46% difference in natural gas use between the reference and designed buildings.[70] LEED Gold would avoid 177 tonnes CO2e per year.

An Edmonton police station (5575m^2) would avoid an estimated 485 tonnes CO2e per year using LEED Silver instead of the provincial building code (averaged over 30 years). These avoided emissions are based off a 35% reduction in both electricity and natural gas use compared to the reference building.[71] The LEED Gold design would avoid 664 tonnes CO2e per year.

Mohareb & Row state that the standard Canadian office building uses 380 ekWh/m^2.[72] A calculation conducted by Policy Shop[g] to found the EUI of the reference Edmonton police station was 567 ekWh/m^2, and the EUI of the designed LEED Silver Building to be 382

[f] This figure is based on the median value of modeled electricity and natural gas savings where all Energy and Atmosphere credits are awarded.

[g] This was done by converting the total energy use reported by HDR Corporation from megajoules to kilowatt-hours, then dividing by the floor area.

ekWh/m^2. An additional building considered in the HDR Corporation (2014) study was an administrative office.[73] The reference administrative office had an EUI of 512 ekWh/m^2, and the LEED Silver building an EUI of 333 ekWh/m^2.

Three of the five regional priority credits encourage GHG emissions reductions (but only one is for building operation energy use).

Building owners can earn points (1-2) by purchasing carbon credits from third-party certified products. These credits are not always true offsets, however. Some of the credits represent sustainable energy generation, energy efficiency, or methane capture. None of these activities offsets the carbon created by a building's energy use. Rather, they are simply low carbon activities. They do not sequester carbon. Forestry is the only activity listed by the third party that takes carbon out of the atmosphere. LEED v4 only requires the purchase of third-party certified carbon 'offsets', not forestry specifically.

While the HDR study provides important details about LEED design in a cold climate, it is concerning that the reference buildings have such large EUIs, and that the modeled LEED Silver buildings are near the Canadian average (which is likely lower than the prairie average). Additional credits are available for GHG emission reductions in LEED v4, but these do not specify quantified emissions targets. Due to these reasons, Policy Shop can not confidently claim LEED v4 will meet the City of Saskatoon's GHG emissions objectives.

*4.5.2 Reduces water use ***

Both indoor and outdoor water use must be reduced by 20% and 30%, respectively, compared to baseline figures. Up to 2 additional credits are awarded when outdoor water usage is reduced by 50% or more. Indoor water reduction receives 1 credit for each 5% improvement between 25-50% (maximum 6 credits). Water usage must also be submetered between different systems (e.g. irrigation, hot water, boiler water, process water).

The Edmonton police station modeled above would save 804,891 L over 30 using LEED Silver, and 1,303,116 L using LEED Gold. The Edmonton fire station modeled above would save 18,458 L over 30 years and 37,395 L using LEED Gold.[74]

*4.5.3 Reduces space heating and cooling demand **

There are three options for reducing energy used for space heating and cooling:

i. Use 5% less energy than ASHRAE 90.1-2010. The energy analysis performed to assess energy performance uses the total energy costs of the building from all sources.
ii. Follow the mandatory compliance path of ASHRAE 90.1-2010, and use HVAC and service water requirements of ASHRAE Advanced Energy Design Guide. This option emphasizes efficiency of plug and process loads over building envelope improvements.
iii. Comply with Sections 1, 2, and 3 provisions in Section 3 of the Advanced Buildings™ Core Performance™ Guide. This guide claims that when all provisions in the guide are followed they will produce a minimum of 20-30% energy savings compared to ASHRAE 90.1-2004.[75] However, LEED v4 is based on ASHRAE 90.1-2010, which achieves 30% energy savings compared to ASHRAE 90.1-2004, meaning that the Core Performance Guide will be less likely to produce the desired reduction in energy demand.[76]

HDR Corporation noted 46% and 35% less natural gas use in a LEED Silver designed fire hall and police station, respectively.[77] However, Turner & Frankel have noted the large variance in EUI of reference buildings used to obtain results similar to HDR Corporation.[78]

Pembina Institute noted shortcomings of the LEED v4 for incentivizing energy efficiency:

Normalization of massing dis-incentivizes passive design – Because the building shape is kept constant between the baseline and proposed models, the reference-building approach offers no incentive for optimizing form to reduce heat loss.

Energy saving strategies focused on mechanical systems – Most LEED buildings have tended to rely more on complex mechanical systems than on enclosure to achieve the energy cost savings required for certification.

Thermal bridging is underestimated – The energy standards referenced by LEED (NECB, 90.1) do not effectively address major thermal bridges such as slab edges, shelf angles, parapets, window perimeters, etc.. This is significant, since the contribution of these details can result in the underestimation of 20% to 70% of the total heat flowthrough walls.[79]

Too many options, unreliability of modeling methods, and low minimum standards do not suggest the rating system will achieve a 40% reduction in space heating and cooling energy use.

*4.5.4 Improves employee productivity ***

- **IAQ** ** – Up to 8 credits can be achieved for IAQ-related measures. Minimization of air conditioning is not mentioned in this standard. Outdoor air intake must be monitored and kept within +-10% of the designed flow rate. Buildings that include natural ventilation require an alarm system that alerts building operators of low or excessive exhaust flow rates. This may limit the extent to which occupants can vary exhaust fan rates.
- **VOCs ** –** Up to 3 credits can be achieved for using products with low VOC emissions. High thresholds are set for product acceptability, and must be approved under a recognized third-party testing method.
- **Thermal Conditions ** –** Only 1 credit can be achieved for thermal comfort by adhering to ASHRAE 55.1, which aims to achieve 80% occupant satisfaction with indoor thermal temperature. Temperature variations must be limited to a maximum of 3.3C over 4hrs. The standard does not require occupants to have access to thermal controls, but may provide design elements to adjust air speed.
- **Lighting ** –** Lighting credits can be earned for occupant control of illumination at workspaces and/or minimization of glare with efficient lighting fixture spacing. Daylighting options reward designs that have a large portion of daylit floor area, 90% or more achieving maximum credits (2-3). This percentage can be reduced to 75% or greater if direct daylighting is minimized.
- **Sound ** –** Acoustic performance credits are optional, but minimum required sound transmission class ratings provide sufficient dampening for 90% of building occupants (Wikipedia 2017).

Altomonte & Schiavon[h] conducted a study of occupant satisfaction with indoor environmental quality (IEQ) parameters using a database of 65,000 surveys from the US, Canada, Europe, and Australia.[80] The study compared IEQ satisfaction in buildings of similar vintage (constructed or renovated in 1998 or after), which prior research showing IEQ improvements failed to consider. The researchers found no significant difference between occupant satisfaction of 15 IEQ parameters in LEED and non-LEED buildings from their sample of 21,477 workers. However, they noted a bias toward large

[h] Potential limitation of this study is that it analyses all types of LEED buildings, instead of the separate tiers, though 80% of LEED buildings were Gold and Platinum standard, and 20% were Certified and Silver tiers. Different LEED products were also included in this study. Also, nearly all buildings studied used LEED 2.1 or earlier.

buildings (> 18,580m^2) in their sampling. Overall, IEQ satisfaction was positive in LEED and non-LEED buildings, but negative with acoustic privacy, lighting, and thermal comfort, reinforcing findings from other studies.[81] Satisfaction with IAQ was higher in LEED buildings, which other studies support.[82]

While the findings of Altomonte & Schiavon cast doubt on the ability of LEED to deliver better IEQ than non-LEED buildings, other studies show a positive effect of LEED buildings on IEQ.[83] Despite the above, Policy Shop concludes the LEED v4 framework for IEQ improvement will likely lead to improved employee productivity.

*4.5.5 Diverts and minimizes construction waste from landfill ***

A construction and demolition waste plan must be created, and must include a minimum of 5 material types (excluding earth). Maximum credits (2) are awarded for diverting 75% of total construction waste—by weight or volume—of at least 4 material "streams", or by limiting total waste to 12.2kg/m^2. Dedicated areas for recyclable materials must be included, and two of batteries, electronic waste, or lamps containing mercury.

*4.5.6 Minimizes exterior light pollution ***

An optional credit (1) is available for reducing light pollution based on lighting zones. Allowable light pollution per lighting zone is set based on BUG (backlight, uplight, glare) ratings. Allowable light pollution may still be high in areas where people are used to higher light levels. Also, ASHRAE 189.1-2014 (via ASHRAE 90.1) requires exterior lighting to be turned off when sufficient daylight is available, and during part of night-time hours.

*4.5.7 Building envelope commissioning process ****

LEED v4 requires an experienced commissioning expert to conduct building systems commissioning. The commissioning process must adhere to both ASHRAE Guideline 0–2005 and the National Institute of Building Sciences Guideline 3–2012, which requires commissioning in the pre-design, design, construction, and completion phases. An ongoing commissioning plan must also be developed. More credits (4) are awarded for HVAC, plumbing, and renewable energy systems commissioning than building envelope commissioning (2).

4.5.8 Accommodates future sustainable energy generation

Rough-ins or surface space for sustainable energy generation systems are not required or awarded credits. Credits are only awarded for realized sustainable energy generation.

*4.5.9 Positions Saskatoon as a sustainable building leader in cold climates **

LEED Silver and Gold have been adopted by other cold climate cities (see Chapter 2). If the environmental leadership goal of the City of Saskatoon is to construct buildings that outperform those in other cities, LEED Platinum is the remaining certification level that can help achieve that goal. However, this may not provide additional leadership in energy efficient buildings, since all energy and atmosphere credits could be attained in LEED Gold, and Silver, tiers.

LEED uses ASHRAE 90.1 as a reference code, which continuously improves but does not have a long-term energy efficiency target.[84] Other Canadian Green Building Council products have more ambitious energy efficiency goals, such as its Zero Carbon Building Initiative.

While adopting LEED may not provide energy efficiency leadership to large cold climate cities, it could provide leadership to smaller cold climate cities, Saskatchewan business owners, and home owners. The City of Saskatoon Strategic Plan 2013-2023 does not specify *who* recognizes the City as a "recognized leader in Cold Climate Energy Efficiency."[85]

*4.5.10 Standard is updated regularly ****

LEED is updated roughly every five years. The U.S. Green Building Council also maintains an online database of corrections to and interpretations of LEED.

*4.5.11 Trustworthy and reliable **

A 2008 study produced a wide variation in LEED building performance, where building EUI could be up to two-and-a-half times higher than modeled, or two times lower.[86] Also, 28-35% of the studied LEED buildings used more energy than their reference buildings.[87] Further, the Pembina Institute (2016) noted that ASHRAE 90.1, LEED's reference code, is "a consensus-based standard that reflects the concerns and priorities of its collective 'centre of gravity.'"[88]

Altomonte & Schiavon (2013) note that future iterations of LEED seek to address its limitations and inconsistencies.[89]

*4.5.12 Simple and intuitive **

Credit schedules, requisites, and scope are clearly defined in the LEED v4 Building Design and Construction manual. Multiple third-party standards are referenced for compliance options, especially performance-based, increasing administrative burden and systems modeling. Project teams are incentivized (with a credit) to hire a LEED consultant, sending mixed messages about the rating system's ease of use.

*4.5.13 Flexible **

Multiple compliance paths are offered for several credits. Both prescriptive and performance options are available.

*4.5.14 Calculable life cycle costs **

Life cycle costing of the entire building project is not required, nor optional. A maximum of 3 credits can be earned by conducting a whole or partial building life cycle *assessment* of the project's impact on the environment. This is different than life cycle costs, which calculate total costs (or benefits) of the building project throughout its expected lifespan. However, data obtained in a life cycle assessment could be used for a life cycle cost analysis.

*4.5.15 Transparent **

Assessments of the owner's project requirements and basis of design documents in the pre-design and design phases are given credit (1), though who is involved is not specified, which is why this objective is partially met.

4.6 Green Globes

Green Globes, a spinoff of the UK's BREEAM (Building Research Establishment Environmental Assessment Method) rating system, also uses a point system to rate building sustainability—using ANSI (American National Standards Institute) and ASHRAE standards for baseline compliance. A total possible score of 1000 over 7 categories can be awarded. Participating Canadian buildings receive 1 to 5 "Globes" based on the number of points they receive.

Category	Available Points / 1000
Project Management	50
Site	120
Energy	395
Water	110
Resources	125
Emissions, effluents & other impacts	50
Indoor environment	150
***1 Globe*: 250-390 points** ***2 Globes*: 400-540 points** ***3 Globes*: 550-690 points**	*4 Globes*: 700-840 points *5 Globes*: 850-1000 points

Table 9 *Green Globes Rating System (ECD Energy and Environment 2015)*

Over 1000 US buildings, and 150 Canadian buildings have received Green Globes certification. Green Globes has been endorsed

by the Government of Canada and the United States Government to certify new federal building construction or renovations.

The unique feature of the Green Globes rating system is its online assessment component. Questionnaires are provided to design teams to direct self-assessment. Once questionnaires are complete, project teams submit required documents and await approval. Consequently, project teams benefit from lower administrative and transaction costs.

*4.6.1 Reduces GHG emissions ***

Green Globes provides strong incentives to reduce energy use. Nearly 40% of the total points the rating system awards are for energy use and generation. A maximum of 150 of the total 1000 points are awarded specifically for low GHG emissions (e.g. < 18.13 kgCO2e/m2/yr for office buildings), which is the highest point total for any criteria in the rating system. These points are awarded in 15-point increments per roughly 16kgCO2e/m2/yr reductions. An additional 50 are awarded for reduction of direct emissions released by building processes. CO2 sensors and ventilation control equipment are also awarded points.

There are limitations to the Green Globes points system. First, there are clear points schedules for office, warehouse, retail, workshop, and multi-unit residential buildings, but none for leisure centres, arenas, or libraries. It is unclear how the latter building types would be awarded points. Second, CO2e emissions factor data, average electricity use, and average natural gas use in the Technical Reference Manual are outdated and unrepresentative of City of Saskatoon emission factors.[90] The manual states that emissions factors from Environment Canada are used to calculate average total emissions of Canadian office buildings, though these do not correspond with the emission factors in the City of Saskatoon's Greenhouse Gas Inventory.[91]

Despite the limitations, it is likely project managers would be sufficiently incentivized to reduce a new building's GHG emissions by 30% or more compared to benchmark levels.

*4.6.2 Reduces Water Use **

Water consumption must be reduced by a minimum of 25% or more against a benchmark level determined using the Green Globes Water Calculator (Green Globes 2015). The calculator is freely available on the Green Globes website (www.greenglobes.com), but few commercial inputs are included. For example, there is no input available for landscape irrigation, external water use, HVAC equipment, or other commercial equipment. In buildings where non-residential water fixtures are regularly used (such as fire halls and leisure centres) this calculator will be inadequate to accurately estimate a building's water use. Green Globes notes that updates to the calculator are "anticipated."

The objective is partially met due to the above limitations.

4.6.3 *Reduces Space Heating and Cooling Energy Use **

Green Globes recommends several features that reduce space heating and cooling energy use including greater building envelope insulation above and below grade, passive heating, materials with low thermal transmittance and high thermal resistance, and several HVAC efficiency improvements.[i] Two case studies of new construction receiving Green Globes certification showed improvements of 31% to 47% less space heating energy use compared to MNECB reference buildings. Other case studies published by Green Globes did not report space heating energy savings.

[i] The building envelope requirements are based on NECB thermal transmittance values, and HVAC requirements are based on ASHRAE 90.1-2007.

Some limitations to energy efficiency in Green Globes include: a lack of resources to conduct energy modeling, fewer points for awarded at higher levels of energy efficiency, outdated standards used for reference models.

Unfortunately, there is a lack of academic and independent research about the effectiveness of Green Globes providing energy efficiency. While the number of points devoted to energy performance in the Green Globes rating system encourages energy efficiency, there is little guarantee that the rating system will consistently achieve a 40% reduction in space heating and cooling energy use.

*4.6.4 Increases Employee Productivity ***

- **IAQ ** –** Several provisions for superior ventilation, distributed air supply, and sensing equipment indicate a priority on building occupant health, which are based on ASHRAE 62.1. Project owners should be cautious of ventilation rates under ASHRAE 62.1, which can be highly variable and fall below ranges (8-10L/s/person) that increase occupant productivity.[92] However, the goal of 62.1 is to maintain IAQ satisfaction of 80% of building occupants. The standard also requires continuous monitoring of IAQ, providing opportunities to correct underperformance.
- **VOCs ** –** A list of approved VOC-emitting building materials is provided, and whether these materials are included in the construction are well-rewarded if met. Points are also awarded for measure to mitigate mould, fungus, and bacteria growth.
- **Thermal conditions ** –** Compliance to ASHRAE 55 is rewarded. This standard aims to achieve 80% occupant satisfaction of indoor thermal temperature. Temperature variations must be limited to a maximum of 3.3C over 4hrs. The standard does not require occupants to have access to thermal controls, but may provide design elements to adjust air speed. Minimization of air conditioning is not mentioned in this standard.
- **Lighting ** –** More than 25% of occupied floor area must receive a minimum Daylight Factor (DF) of 2, with increasing awards to over 75% floor area. Additional awards are not given for higher DFs. Al Horr et al. state a DF of 1.5-2.5 is adequate for most office tasks.[93] More task areas near windows, sensors to control lighting levels, and glare mitigation are rewarded as well.
- **Sound ** –** Several acoustic measures are awarded, specifically to HVAC equipment, plumbing, and materials separating building spaces/rooms. These measures should permit occupants to have "clear, intelligible communication between sender and receiver within the space," though sound transmission class (STC) ratings are not identified.

If all productivity prescriptions were taken it is likely that occupant productivity would meet the target increase in productivity of 1%.

*4.6.5 Diverts Construction Waste from Landfill **

Fifty percent or greater of construction waste by weight must be recycled or salvaged. Heavier materials such as concrete and steel are more likely to be diverted than lighter materials such as wood and insulation, in this case. As a result, certain construction materials may end up in the landfill more than others.

Minimal use of raw materials and increased use of recycled or salvaged materials in construction are awarded points, as well as dedicated building space for recycling.

*4.6.6 Minimizes Exterior Light Pollution **

Building designers have the option of choosing a performance or prescriptive path to minimize exterior light pollution. The performance path must be verified by an accredited professional. The prescriptive path can be completed by the lighting designer. Light fixture trespass limits may not exceed

those set by the BUG (backlight up-light glare) method.

4.6.7 *Building envelope commissioning process **

A maximum of 17.5/1000 points are awarded for adopting a whole building commissioning process, and fewer points are awarded for specific building components (e.g. envelope, HVAC, plumbing). The points are awarded if these processes are included in the pre-design, design, and construction phases of the project. However, commissioning upon completion is not required, which does not fully meet this objective's requirements.

4.6.8 Accommodates Future Renewable Energy Generation

Buildings are not rewarded for renewable energy rough-ins. Only the installation of solar PV, solar thermal, or the purchase of offsite renewable energy is rewarded at the time of certification. Installation of renewable energy sources after the initial building rating is awarded would likely not improve the overall rating of a building, providing little incentive to include or prepare for the addition of renewable energy generation.

*4.6.9 Positions Saskatoon as a sustainable building leader in cold climates **

LEED Silver and Gold have been adopted by other cold climate cities (see Chapter 2). If the environmental leadership goal of the City of Saskatoon is to construct buildings that outperform those in other cities, a Green Globes rating of 5 Globes is the certification level that can achieve that goal. However, due to the flexibility of Green Globes, LEED, and other rating systems, certification levels do not provide guaranteed levels of energy efficiency

At minimum, the adoption of any sustainable building standard or rating system will provide some leadership to cold climate cities that are absent of any such policy (Regina, Windsor, and Sherbrooke, for example). However, Saskatoon must adopt an ambitious standard or rating system if it wishes to be a leader compared to larger cities (such as Victoria, Edmonton, and Winnipeg) who have adopted LEED Silver or higher.

*4.6.10 Standard is Updated Regularly **

As noted at the beginning of this section, Green Globes heavily references ANSI and ASHRAE standards, which see regular updates on 3-5-year cycles. However, no indication is made in any Green Globes or Green Building Initiative documents about when the Green Globes questionnaire, technical manual, or supporting tools will be updated. According to the Green Globes website (2017), the most recent update to the rating system was the incorporation of ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings and ASHRAE 90.1-2010.

*4.6.11 Trustworthy and Reliable **

Green Globes does not require minimum points in any section to achieve any of its five ratings, which allows for cost-per-point optimization that does not necessarily lead to a more energy efficient building. The Green Globes technical manual contends the weighted points system is distributed so that "each individual criterion reflects its environmental impact and/or benefit." However, each certification level allows for 140-point variation. This means it is possible that a building with the same award (e.g. Three Globes) at the high end of the spectrum (e.g. 680 points) has significantly higher—or potentially lower—performance than a building as the low end of the spectrum in the award category (e.g. 560 points). This type of variability has been noted with LEED-certified buildings.[94]

Green Globe ratings for new construction are valid for 18 months, half the time of LEED NC. After the 18-month certification period, Green Globes recommends obtaining a BOMA BESt assessment for existing buildings. If Green Globes intends to provide an ephemeral rating without putting a stake in its longevity, it begs the question of Green Globes' long-term viability.

*4.6.12 Simple and Intuitive ***

A questionnaire, scoring guide, and technical manual are provided by Green Globes to guide design, implementation, and evaluation. All documents provide itemized lists with point values for each. Project teams begin using the questionnaire during the pre-design phase and continue until occupancy.

ASHRAE's (American Society of Heating, Refrigerating and Air-Conditioning Engineers) manager of Research and Technical Services used the US Green Globes version for a renovation project of the ASHRAE headquarters. He said of Green Globes: "The process is self-paced and somewhat tutorial so I didn't have to read a manual before I could dive in, start compiling information and answer the survey" (Green Building Initiative 2017).

A drawback of the Green Globes requirements is that it references several building standards for some of their requirements. This will impose marginal increases to project labour and costs.

Policy Shop notes inconsistencies in the metrics used in the technical document for points awarded for GHG emissions. Points for GHG emissions levels are awarded in increments based on kg/m2/yr. Yet, examples given to calculate GHG emissions are given in kg/ft2/yr. Also, the use of kg/kWh to calculate natural gas emissions is deceptive. However, these drawbacks are not overly cumbersome compared to other rating systems.

*4.6.13 Flexible ****

This rating system does not require minimum point requirements in any category, allowing for vast combinations of trade-offs. Because there are no prerequisites, Green Globes has the advantage of being highly customizable to the needs of a project. This allows building designers can focus their efforts on energy performance, indoor air quality, materials, etc., or an even distribution amongst all categories. Also, some building components allow for multiple compliance paths.

Limitations to flexibility stem from the prescriptive nature of some provisions. Points are awarded only for the inclusion of specific design elements, and not for meeting performance targets or outcomes.

The trade-off between flexibility and reliability is apparent. A highly flexible rating system also means a less reliable one, meaning that two Green Globes buildings of the same rating are unlikely to be comparable.

*4.6.14 Calculable Life Cycle Costs **

A large amount of points (32) are awarded for the use of the Athena Impact Estimator, which calculates cradle-to-grave life cycle costs for several parts of the building design and construction including building envelope, materials used, and landfill impact.

*4.6.15 Transparent **

The distribution of points is diligently indicated throughout the Technical Reference Manual. Green Globes employs clear technical requirements for many of its design criteria such as quantified CO2e targets, and many prescriptions throughout the Green Globes Technical Reference Manual require or recommend the display of technical information in design documents.[95] Finally, project-long consultation with multiple stakeholders, including community representatives, are awarded.

These provisions are sufficient to provide transparency to building projects.

4.7 Policy Recommendations

Dozens more sustainable building standards, codes, and rating systems exist than were examined in this report, some of which may also be suitable to achieve the objectives declared by ECI. The recommendations given below exist only within the context of the four standards examined.

4.7.1 *Adopt ASHRAE 189.1 in whole, and as updated, as the guiding building standard for the Sustainable High Performance Civic Building Policy.*

The provisions of ASHRAE 189.1 addressed every policy objective of ECI. Though it did not fully meet all criteria, the standard is updated in regular intervals, and faster than the SBRs examined in this report. The quick updates mean that buildings designed to this standard will outperform updates to building code, which are on 4-to-5-year cycles.

Though ASHRAE 189.1 did not achieve the highest number of points in the multicriteria analysis, it is a feasible standard that sets minimum requirements in each sustainability category identified by ECI. The Living Building Challenge received the highest number of points in our analysis, but requiring all civic buildings to adhere to the standard is impractical at present.

Strengths of ASHRAE 189.1 include its long-term net-zero target and the absence of a points system. The goal of net-zero by 2030 aligns with the City of Saskatoon's long-term GHG emissions targets. An absence of a points system eliminates credit-chasing, and project teams can focus on achieving high performance.

The biggest shortcomings of the standard are that it favours building methods in warmer climates, and is only marginally more energy efficient than ASHRAE 90.1 and NECB (Halverston 2014, Caneta 2012). This results in an omission of passive design requirements, and inadequate energy modeling assumptions. However, the City may exceed these standards where appropriate, mitigating the above shortcomings.

4.7.2 *Set an energy use intensity (EUI) target*

ASHRAE 189.1 is a minimum standard. It does not require performance achievements above its mandatory provisions. This increases the risk of failing to reduce GHG emissions by the levels set by city council (40% of 2014 levels by 2023, and 80% by 2050).[96]

The City of Thunder Bay set energy efficiency targets for new construction in addition to LEED certification guidelines. The City of Saskatoon would benefit from adopting a similar target (40-45% energy reduction over baseline). A clearer option would be to set a specific EUI target using the kWh/m^2/year or GJ/m^2/year metrics.[j]

4.7.3 *Do not consider Green Globes for third-party certification*

Green Globes' ease of use is an attractive feature for organizations looking to save time and keep costs low. However, Policy Shop discovered two key areas of concern. The first is the use of outdated standards and emission factors. In some sections of the Green Globes Technical Manual these standards are outdated by 10 years, too big of a gap to expect significant performance improvements over NBC. The second concern is the long update time. Only two versions of the rating system have been released since its creation in 2000, and there is no indication of forthcoming updates.

[j] Recommending a specific target is beyond the scope of this report. However, the median EUI for Canadian office buildings is 253kWh/m2/year (Energy Star 2016). A 45% reduction from this value would be 139kWh/m2/year.

5 RISKS OF THIRD-PARTY CERTIFICATION

Sustainable building rating systems (SBRs) have grown in prevalence and variety in recent decades. While they offer many potential benefits to building owners, the benefits provided vary in quantity and quality. The variability and uncertainty of the outputs produced by SBRs have made them difficult to incorporate into traditional building construction and maintenance contracts.

SBRs present a novel conundrum for stakeholders in the building industry including property owners, building designers, contractors, rating system issuers, material suppliers, and tenants (BCCA 2011).[k] SBRs require the achievement of an outcome—either a level of certification or level of performance—instead of following a prescriptive code of design and materials. That is, builders in the construction industry agree to build an office according to a recipe, instead of agreeing to build an office that will win first prize. SBRs are requested by building owners and investors, shifting construction agreements away from the status quo. However, guaranteeing an outcome (e.g. three Green Globes) is more difficult than guaranteeing a recipe will be followed. The inclusion of SBRs in building construction adds more opportunities for legal and ethical entanglement as a result, and have not been without their growing pains.

Legal and ethical risks associated with sustainable building projects fall under these categories:

- Contract liability
- Tort liability
- Statutory liability
- Insurance liability
- Procurement liability
- Decertification
- Trademark dilution
- Greenwashing

In this chapter, we consider implications of the above risks associated with SBRs, summarize relevant legal cases, and conclude with recommendations for minimizing these risks.

ILLUMINATING CASES – LEED REQUIREMENT

Southern Builders Inc. v. Shaw Development LLC

In this case, the contract between Southern Builders and Shaw Development required the project to be constructed to LEED Silver specifications. However, Shaw Development provided few details on how to achieve the rating. Even in the presence of project specifications, LEED certification is not controlled by Southern Builders. This calls into question who should be responsible for achieving certification (BCCA 2011).

The two parties settled outside of court, so no legal precedent was set.

5.1.1 Contract Liability

Much of the legal risk encountered by parties wanting to achieve an SBR rating is embodied in the contracts they develop with designers and builders. Since building ratings are awarded by third-party organizations, it is difficult to assign responsibility and liability for achieving a declared rating to the build project parties. Clear and precise contract language is crucial in this sense. Legally binding relationships (or privity) rely on unambiguous terms and definitions. Likewise,

[k] The reader will note the frequent use of reference to the British Columbia Construction Association's (2011) "A Study on the Risks and Liabilities of Green Building". This was the most comprehensive report of legal risks surrounding sustainable building obtained by Policy Shop.

contracts are only enforceable when they are unambiguous and do not contravene statutory law (BCCA 2011).

The challenges of incorporating SBRs into building projects add a new twist to contact writing, but the potential risks are familiar. Parties may breach contract conditions in numerous ways, leading to termination of contract or damage claims (BCCA 2011). For example, completed building projects may see diminution in value if it fails to attain certification, or the level of certification desired (ibid). The inclusion of SBRs in building contracts are specifically prone to misrepresentation, whether intentional or unintentional, and failure to provide promised results. Misrepresentation is more likely to occur through advertisement by property owners or contractors than from SBR issuers like the Canada Green Building Council (though see Illuminating Cases below). Failure to provide promised results—either a rating level or performance level—can trigger breach of contract or warranty claims. However, the Illuminating Cases above indicates that the enforceability of these promised results may be difficult.

5.1.2 Tort Liability

Building green or sustainably may lead to complications where one or more of the involved parties must pay damages to another party. Liability, and therefore the responsibility to compensate damaged parties, increases as when project team members possess third party accreditation, and when there is incongruity between a buyer's expectations of a green or sustainable building and what the seller has claimed (BCCA 2011). Specifically, parties involved in a building project can expect to be liable in the case of negligence, breach of duty or standard of care, or misrepresentation (BCCA 2011).

Builders, engineers, or architects who are accredited by a third party SBR have a higher standard of care than builders without such accreditation because they are trained to use above-code building practices (BCCA 2011). These parties may be liable for negligence damages if it can be shown that they did not adhere to the standard of care expected of another prudent person with their accreditation (ibid). These parties may also be liable for immediate or future economic loss if the completed building does not perform as claimed, or does not achieved the rating level claimed or designed for (ibid).

Misrepresentation can also originate from building owners who are leasing or selling their property. If they make false claims about their property's SBR rating and its performance, they may be liable for any damages that result (ibid). SBR issuers may be guilty of misrepresentation as well (see Illuminating Cases – Misrepresentation).

ILLUMINATING CASES - MISREPRESENTATION

Henry Gifford, Gifford Fuel Saving, Inc. v. U.S. Green Building Council et al.

LEED has been scrutinized by researchers such as Turner & Frankel (2008) for failing to provide energy savings as advertised. Gifford applied the same scrutiny against the US Green Building Council in the court of law, suing the organization for monopolization through fraud, deceptive trade practices, and false advertising to name a few (BCCA, 2011). While Gifford's case was dismissed, the tenuous nature of sustainable building rating systems leaves opportunity for future cases to be opened.

The reader should keep in mind that contract and tort liability can originate simultaneously, such as when a contractor makes a negligent omission that leads to property damage. This could result in a breach of contract and breach of standard of care (ibid).

Finally, tort liability can be limited through the inclusion of limiting clauses in a project contract (ibid).

5.1.3 Statutory Liability

SBR issuers and property owners bare the most responsibility for adhering to federal

and provincial laws, especially those related to false advertising (BCCA 2011). The federal *Competition Act* and provincial consumer protection acts guard consumers against damages related to false advertising. Building owners must exercise caution when advertising the benefits of third-party certified buildings since the benefits achieved under the certification can vary.[1] That is, they should know the details of their building's benefits to avoid making false claims.

ILLUMINATING CASES – CODE COMPLIANCE

The Air Conditioning, Heating and Refrigeration Institute, et al. v. City of Albuquerque

In 2007, the Albuquerque City Council passed a series of building code requirements to commercial, industrial as well as in the residential sector. These requirements exceeded the federal building code. Building industry distributors and contractors challenged the new ordinance in court because it put local businesses at a disadvantage compared to businesses in other jurisdictions. The court ruled that federal code superseded conflicting sections of the Albuquerque ordinance, requiring the city to remove the conflicting sections (BCCA 2011).

5.1.4 Insurance Risks

Green and sustainable buildings include novel building components and designs that may be subject to faults and defects more than traditional buildings. These components may require additional insurance to cover faults, structural damage, or poor performance (BCCA 2011). For example, green roofs add the risk of structural or water damage to a building, which may not be covered by traditional insurance.

Insurance products that can cover risks associated with green or sustainable building include (BCCA 2011):

- Energy saving insurance: Covers costs of the difference between expected and actual building performance
- Reputation damage: Covers costs of responding to criticism through media, and of lost rent due to under-certification or lower than expected performance
- Indoor environment: Covers damages to building occupants caused by green building components or design (e.g. poor lighting, mould growth)
- Director and Officer Protection: Covers damages originating from an organization's governance or management structure
- ClimateWise Principles: Insurance companies can charge lower insurance premiums to organizations whose business practices reduce their contribution to climate change

5.1.5 Procurement Liability

Requiring a sustainable building rating system (SBR) for new civic buildings has implications for the tender process. Public authorities must honour the open competition process and declare any requirements from the sustainable rating system (The Free Dictionary 2017). Also, requirements from an SBR must not be so restrictive that they unfairly restrict eligible bidders from meeting project requirements (BCCA 2011). See the above Illuminating Cases box for a Canadian example of the liability faced by a non-profit organization, South Fish Creek Recreational Association, in a public tender process.

[1] For example, two LEED Gold buildings may differ in productivity gains and waste management.

In contrast to the Canadian case, in 2011 the Supreme Court of Pennsylvania ruled on a public tender requiring LEED experience (BCCA 2011). An electrical contractor disputed the awarding of a public contract to a company that had LEED experience, but was not the lowest bidder. The court upheld the contract since the request for tender stated that experience with LEED would be assessed in the tender's evaluation criteria.

ILLUMINATING CASES – PUBLIC TENDERS

Elan Construction Ltd. v. South Fish Creek Recreational Assn., 2015 ABQB 330

South Fish did not follow its duty of fairness when it awarded a construction contract to Chandos Construction Ltd. (Martin, Coyle, & Chasey 2016). Instead of Elan Construction Ltd.. South Fish had a duty to fully declare the criteria it would use to evaluate potential bidders. However, they failed to let bidders know, among other things, that LEED experience would be assessed under the previous experience criterion. Elan was awarded nominal damages for the breach but nothing more since Elan would have lost money on the contract awarded to Chandos.

5.1.6 Decertification

An unlikely risk to organizations requiring SBR certification for new buildings is decertification, where building owners lose third-party certification following a challenge of a building's components (BCCA 2011). The risk of decertification is low because challenges will likely lack evidence of deficiencies, especially post-construction. The flexibility of credit/point requirements in SBRs may put greater onus on plaintiffs as well. Public citizens in Wisconsin contested the LEED Gold certification of a high school, claiming that its HVAC system did not meet LEED requirements (BCCA 2011). Plans for the original HVAC design were publicly available, and deficient in meeting LEED prerequisites. However, the designers responsible for the HVAC plans allayed concerns of the reviewing party by giving adequate responses to the reviewing party's questions. Ultimately, the high school kept their LEED Gold certification.

5.1.7 Trademark Dilution

Acquiring third-party certification invokes additional transaction costs to sustainable building projects (e.g. consultant fees, registration, inspection, enhanced project integration, length of review, etc.). These added costs may be prohibitive (Hryhul 2012 – Globe and Mail), and entice property owners and investors to reference third-party SBRs without applying for certification ("shadowing"). Alternatively, property owners and investors may be attracted to the marketability SBRs provide, but may not be willing to pay the cost. These actors must be aware of the risk of trademark infringement that can arise from emulating SBRs or using their trademarks in advertising.

Trademarks are the symbols used by the organizations to identify and advertise their products, to ensure that public or consumers receive a consistent level of quality in the goods and services they purchase in the market place (McCabe 2000). The purpose of trademarks is to assure consumers they will receive the same product each time it is purchased (ibid). Trademarked SBRs include LEED, Green Globes, and the Living Building Challenge.

Trademark dilution is the weakening of a trademark's force by copying or approximating an established trademark (ibid). An example in the sustainable building space would be a building owner advertising their property as "LEED-lite" (Hrykul 2012). The established trademark, LEED, is used without permission, and is evoked in the approximating term. A consumer seeing the term "LEED-lite" is likely reminded of LEED™, which does not represent the same product.

The Canada Green Building Council (CaGBC) has stated that they will not tolerate

trademark dilution (Hrykul 2012). If a project does not comply with trademark guidelines, CaGBC will contact the offending party. If the violation is not remedied the CaGBC will send a cease and desist letter to the owner (CaGBC 2015).

In Canada, trademarks are protected by the Trade-marks Act. This act states:

> *22. (1) no person shall use a trade mark registered by another person in a manner that is likely to have the effect of depreciating the value of the goodwill attaching thereto.*
>
> *(2) In any action in respect of a use of a trade mark contrary to subsection (1), the court may decline to order the recovery of damages or profits and may permit the defendant to continue to sell wares marked with the trade-mark that were in his possession or under his control at the time notice was given to him that the owner of the registered trade-mark complained of the use of the trade-mark* (Canada 1985).

The above issues only occur when a trademark is used without permission to advertise a product. The CaGBC has stated that using LEED design guidelines is not a problem (Hrykul 2012). An absence of case law related to SBR shadowing suggests SBR issuers like the CaGBC are not concerned with shadowing, perhaps because the product they offer is not easily replicated or verified. However, a US engineer cautioned that shadowing can lead to cost-cutting, which can lead to performance deficiencies (Berning 2012). According to Berning (2012), it certainly does not indicate to the public nor business partners that project teams are serious about corporate social responsibility.

5.2 Risks of Green Washing

Conducting business in sustainable buildings is a way for organizations, property owners, and investors to enhance their corporate social responsibility (Gillespie 2008). Actors such as these looking to improve their image through corporate social responsibility must advertise their initiatives carefully to avoid greenwashing. Broadly, greenwashing is "the act of disseminating disinformation to consumers regarding the environmental practices of a company or the environmental benefits of a product or service" (Baum 2012). Sustainable building owners, buyers, and tenants should be aware of the following (Gillespie 2008):

- False labels - claiming third-party endorsement when none exists
- Fibbing - claims about a building project that have no evidence, or are outright false
- Irrelevance – making truthful, but superficial claims in the face of larger, more impactful elements
- Vague or jargon-y language – using words or terms that are poorly defined, or are only familiar to experts
- Green images – pictures that use nature-themed imagery in inappropriate contexts
- Poor comparisons – when a company's/product's environmental features are compared to those whose environmental performance is poor

5.3 Policy Recommendations

The recommendations provided in this chapter have been adopted from the British Columbia Construction Association's (2011) "A Study on the Risks and Liabilities of Green Building". They do not constitute legal advice.

1. Use standard contract documents

Standard contracts supplied by the Canadian Construction Association serve a few purposes. First, they simplify contract negotiations. Owners and contractors can use a standard template to negotiate the terms of a project without having to define contract categories or sections (Barnes 2012). Second, they allow project roles to be clearly defined (Barnes 2012). Clear roles allow clear liability (BCCA 2011). Third, they allow for flexibility of interpretation, which can improve the ease of reaching consensus (Barnes 2012).

2. Review internal and external regulations and policies

Requiring contractors to build to a sustainable building standard or rating system can restrict the number of viable contractors, change the type of bidding process, and require additional administrative resources (BCCA 2011). Conflicts may arise with federal or provincial legislation, or with internal policy. It is important that a sustainable building policy works in harmony within existing frameworks and resources.

3. Use a transparent bidding process

It is in the best interest of both the bid-issuer and contractors to accommodate a range of bidders for sustainable construction projects. Bid-issuers should clearly define terms related to sustainable building, define evaluation criteria and scoring rubric, and expected timelines.

4. Name the Policy "High Performance Civic Building Policy"

As noted by the Living Building Challenge (2016), the term "sustainability" can have various meanings that do not adequately describe how a product is sustainable. The near-term goal of the City is not net-zero energy or GHG emissions, but a reduction in the current level of emissions. According to the Living Building challenge, environmental sustainability requires net-zero GHG emissions. Therefore, it is prudent to avoid confusion, and potential greenwashing, about the purpose of the policy by removing the term "sustainable".

6 MEASURING BUILDING PERFORMANCE: BEST PRACTICES

Data will inevitably play a critical role in the efforts of society to confront climate change. Across the globe, the implementation of sustainable building policies and actions taken at the level of municipal government will amount to a considerable portion of the total effort necessary to reduce greenhouse gas (GHG) emissions by up to 72 percent below 2010 levels by 2050—the reduction in emissions necessary to ensure the global mean temperature does not exceed 2 degrees Celsius above preindustrial levels.[97] Among the world's cities and towns, the development and adoption of best practices around collecting, managing, and sharing data will likely be decisive in achieving the '72-percent emissions target' and ensuring we are on track along the way. Ultimately, achieving this will determine whether the planet's population and ecosystems will face an "increasingly unpredictable and dangerous" array of destabilizing environmental changes amounting to an unprecedented disruption to a mode of animal life that has otherwise remained undisturbed for ages.[98]

In June 2017, the Saskatoon Standing Policy Committee on Environment, Utilities, and Corporate Services set a new corporate GHG target: 40% of 2014 levels by 2023, and 80% by 2050.[99] The next step will be determining a set of policies and actions to achieve this. Toward achieving all desired outcomes, the collection, leveraging, and management of data will be critical. The intention of this chapter is to address a range of themes relating to the development of a sustainable building policy. It serves a general purpose of moving toward defining a consistent methodology that will be used to operationalize the City's broader sustainability objectives. More directly, the chapter introduces a discussion on the critical role of data, then goes on to outline best practices around performing an ex-ante impact assessment of sustainable building policies.

6.1 The Critical Role of Data

If the City of Saskatoon is to begin seriously moving toward the '2023 objective,' having the data to know whether we are on the right track will be critical at every stage. Initially, absent the necessary sensors and systems in place to measure emissions across a city-wide building portfolio, we are forced to merely estimate data values for existing civic buildings to determine a baseline GHG inventory. A baseline is "a representation of 'standard' or typical energy performance, used for comparative purposes."[100] It is used as a starting point from which 30 percent of emissions should be cut by 2023. Observing best practices around data sourcing is critical, as "[t]he quality of the GHG assessment depends on the quality of the data used to develop it."[101] The long-term objective of many sustainable building policies is to gradually eliminate the need to estimate building performance data as energy management information systems (EMISs) are embedded in new and retrofitted to old civic buildings. With more and more civic buildings featuring EMIS systems, increasingly accurate and complete building performance data can be collected to track progress and determine whether policy actions and projects have been effective.

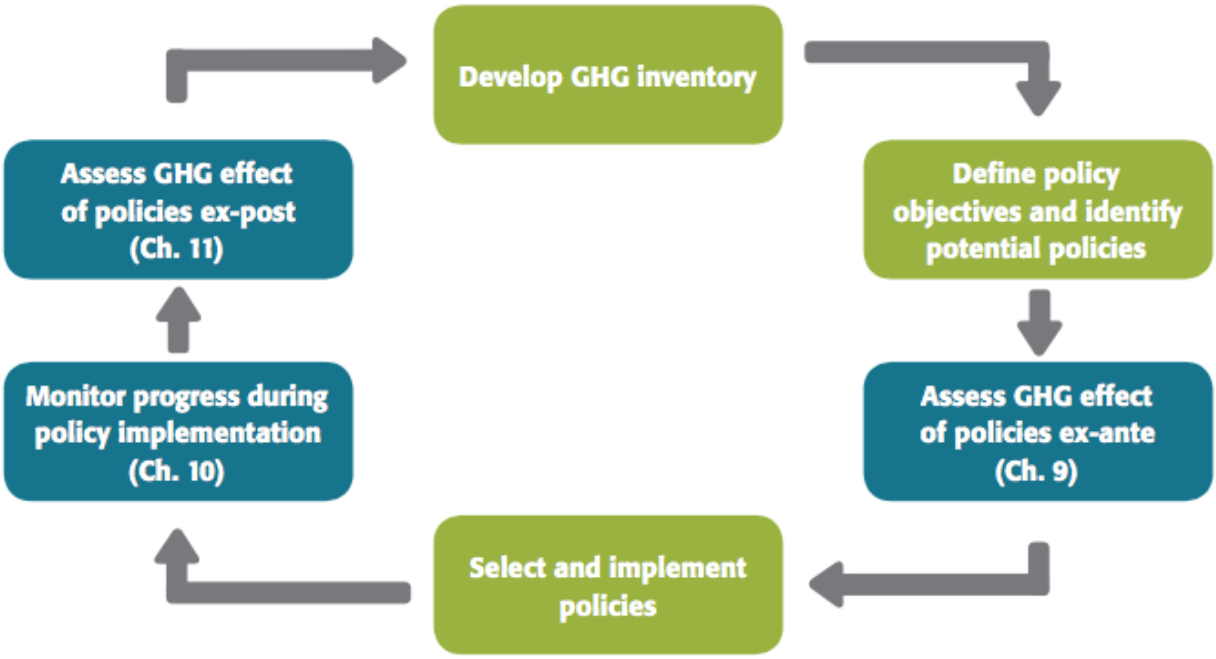

*Figure 2. Assessing GHG effects throughout a policy design and implementation process (**CITATION**)*

Determining precisely which data must be collected to meet objectives is outside the scope of this chapter. However, it is certain the City of Saskatoon's sustainable building policy should mandate, at minimum, data collection at the sub-meter level for most—if not all—newly-constructed civic buildings. Measuring energy performance at the systems-level enables much greater opportunity to determine where potential performance improvement and savings can be realized. Beyond this, the sustainable building policy should consider systems that measure and/or control water flow and natural gas demand as well as wastewater output. Such systems enable an even greater degree of measurement and control over the core factors contributing the GHG emissions, and meeting the '2023 object' will likely require managing consumption and outputs beyond mere energy performance.

Collecting and leveraging data on building performance also empowers policymakers to anticipate (ex-ante) and evaluate (ex-post) the successes or failures of specific drivers within a sustainable building policy. Data can also give rise to positive feedback effects within the policy process, whereby newly-collected data can not only fill existing data gaps but also improve estimation practices for data that are still missing (e.g. energy demand data for older civic buildings not yet retrofitted with performance measurement systems). Likewise, new data collected from retrofitted buildings over a sustained period may inform policymakers that past estimations based on 'proxy data' were inaccurate for comparable scenarios. Knowing this would indicate a higher energy demand from a portion of civic buildings than was initially estimated, therefore updating past city-wide GHG inventories and urging policymakers that more must be done to meet objectives. This is, of course, merely one example of the way in which newly-collected data feeds back into and improves ongoing evidence-based policy processes. Continuous data collection enables continual policy improvement as gradually less data is estimated and more local, accurate data is collected and leveraged for policy improvement.

In addition to improving performance and policy processes around sustainability, data is critical to not only practicing, but demonstrating climate leadership to other cities and organizations across the globe. There is no better way to demonstrate a commitment to sustainable policies and projects than by making the supporting evidence (i.e. data) open and transparent to all. Doing so would also open opportunities to collaborate with and gain recognition from leading climate action players, including the World Resources Institute, Copenhagen Centre on Energy Efficiency, Global Alliance for Buildings and Construction, World Business Council for Sustainable Development, and stakeholders in the United Nations' Sustainable Energy for All global initiative. Regardless of size, Saskatoon has an opportunity to be recognized globally as an innovative leader in sustainable practices with the data to prove it.

Last, data is critical to aligning the priorities of sustainability and economic prosperity. On the simplest level, the implementation of data collection and performance management solutions is a fixed-cost investment that will eventually pay for itself and save money in the long-term. The challenge is generally around having the capital available to commit to sizable investments within an abbreviated period. However, if institutional will and effective policy are in place, gradual adoption of sustainable solutions is possible such that costs are rendered feasible by being distributed over a protracted time horizon.

6.2 Best Practices Around Data Collection for Ex-Ante Assessment of Policy Impact

Data is critical to every stage in the life of a sustainable building policy—from development to implementation to evaluation. This section presents a handful of data-related best practices pulled from the Policy and Action Standard, an authoritative guide to the development of sustainable building policies. Figure 2 depicts these stages, each of which is often data-intensive. 'Assess GHG effect of policies ex-ante,' which is expounded in Chapter 9 of the Policy Action Standard, pages 94-109. This stage arrives after having first defined several prior considerations such as policy objectives, the details of the policies and projects, potential policy effects, and the greenhouse gas assessment boundary in play. The next stage of the project, to which we will now turn our attention, focusses on collecting data and using it to conduct calculations that estimate the impact of a policy on GHG emissions.

Conceptually, there are two types of data involved in an impact assessment: (1) activity data and (2) emissions factor. Given as an equation:

GHG emissions = activity data x emissions factor

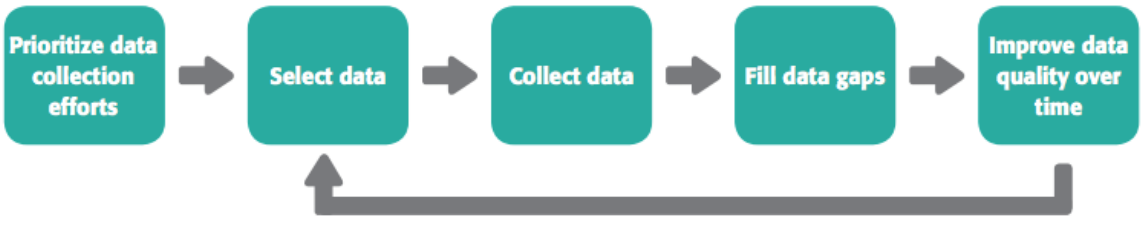

Figure 3. Iterative process for collecting data (from the Policy and Action Standard, Appendix A: Guidance on Collecting Data, pages 156 to 159.)

Activity data is defined as "a quantitative measure of a level of activity that results in GHG emissions within a given period of time."[102] *Emissions factor* is defined as the mass of GHG emissions produced by a unit of activity. For example, if we applied this method to determine the GHG emissions produced by a single car, the *activity data* would represent the number of liters (L) consumed by a car while the *emissions factor* would represent the mass of CO_2 emitted (perhaps measured in kg) per liter of fuel consumed. Thus, estimating the impact of a policy targeted toward reducing the quantity of GHG emitted by a single car would require estimating both its effect on reducing the liters of fuel consumed (i.e. *activity data*) and the average mass of CO_2 emitted per liter of fuel consumed (i.e. *emissions factor*).

Of course, Saskatoon's sustainable building policy aimed at reducing GHG emissions will inevitably be far more complex and the *activity data* and *emissions factors* involved in its calculations harder to estimate or otherwise determine. A sustainable building policy necessarily includes the analysis of activity data that are causally related, both directly and indirectly, to GHG emissions. For example, many furnaces and boilers run on natural gas (directly contributing to GHG emissions) while others run on electricity (indirectly contributing to GHG emissions by using electricity that is produced off-site through GHG-intensive processes). Determining the total GHG emissions resulting both directly and indirectly from the sum of civic building activities will necessarily involve locating a range of variables that determine the scale of *activity data*, such as the number of energy- or fuel-consuming units (e.g. furnaces) in use, the average frequency of use per unit, and the average energy use intensity per unit (i.e. how much fuel or electricity is used to heat a given space to a certain temperature relative to heating or cooling load).

To tie this all together using the same example, determining the GHG emissions resulting from all electric furnaces used in all civic buildings would require locating a range

Level of accuracy	Emissions estimation method	Other policies or actions included	Non-policy drivers included	Assumptions about drivers and parameters	Source of data for drivers and parameters
Lower ↓ Higher	Lower accuracy methods (such as Tier 1 methods in the IPCC *Guidelines for National GHG Inventories*)	Few significant policies	Few significant drivers	Most assumed to be static or linear extrapolations of historical trends	International default values
	Intermediate accuracy methods	Most significant policies	Most significant drivers	Combination	National average values
	Higher accuracy methods (such as Tier 3 methods in the IPCC *Guidelines*)	All significant policies	All significant drivers	Most assumed to be dynamic and estimated based on detailed modeling or equations	Jurisdiction- or source-specific data

Table 10 Range of methodological options for estimating baseline emissions

of less easily determinable data points including:

- an estimate of the number of operating furnaces used to heat civic buildings;
- the percentage of furnaces in civic buildings powered by electricity rather than natural gas;
- the average number of hours per day during which the average electric furnace is in use
- the average unit of electricity consumed per electric furnace within a given period (perhaps measured in kilowatt-hours (kWh));
- and last, the average mass of GHG emitted to generate the average unit of electricity consumed by each electric furnace

To complicate matters further, none of these variables account for the energy lost in transporting this electricity and fuel to site, nor a host of other important considerations.

However, when assessing a real-world sustainable building policy, it is critical that policymakers strive to be as comprehensive as possible in their data sourcing, which can involve "gathering existing data, generating new data, and adapting remaining data necessary" to accurately assess policy impacts. Data collection activities should begin with "an initial screening of available data sources, keeping in mind that data should be from reliable and robust sources" as well as "[temporally] and geographically specific to the assessment boundary."[103] Searches can begin with "government departments and statistics agencies, universities and research institutes, scientific and technical articles, environmental books, journals, reports, and even sector experts and stakeholders that you work with."[104]

Policymakers tend reliably to face a tradeoff between data availability and accuracy. Where policymakers face time constraints that limit the collection of accurate data in all areas, efforts should prioritize *activity data* relating to activities expected to have the greatest impact on GHG emissions. In general, the level of data accuracy required is dependent on pre-established policy objectives; some objectives require less precise and non-source-specific data. Policies of lesser importance may not warrant expending considerable resources to ensure high data quality. The Intergovernmental Panel on Climate Change has defined three tiers of data accuracy, 'Tier 1' being the least and 'Tier 3' the most accurate. Table 10 offers a brief set of classification criteria provided in the GHGP.

While it is not advised that compromises on data accuracy and completeness be made easily, barriers related to data availability are inevitable and require sourcing data related to a sufficiently similar activity—often referred to as 'proxy data.' Such data, often similar in geographical origins, should also be strongly correlated with the relevant parameter (i.e.

Procedures	Description
Data compilation	The processes that have been followed to compile the data should be clearly described. This may include a description of how the data is compiled, who has compiled the data, and where the data is stored.
Data processing	The steps taken to further process the data should be clearly described. This should include details of any modifications or corrections that have been made to the data, including the cleaning of data sets, the removal of outliers and any other adjustments. These changes should be documented, along with a brief justification for any key decisions.
Quality assurance / quality control	For key data sources or data sets, users should provide a judgment on the overall quality of the analysis. This may require a subjective assessment, but the aim is to provide an indication of the overall quality of the data and the main uncertainties. Established QA/QC procedures should be clearly followed.

Table 11 Data Collection Procedures (CITATION)

action) from which we are intending to measure GHG emissions.

After selecting which data to collect at which tier of accuracy, policymakers may move on to the data collection phase. This phase features three sub-phases: data compilation, data processing, and quality assurance/quality control. Best practices for these phases are summarized in Table 11 above.

For filling in data gaps—as well as across the entire process—approaches to data collection can be categorized as bottom-up and top-down. Bottom-up data are collected or measured from source in processes such as energy building audits, while top-down data can include "macro statistics collected at the jurisdiction- or national-level then scaled down to appropriate size."[105] Last, drawing reference back to Figure 2, it should be stressed that data collection is an iterative process wherein lower quality data at all stages should be replaced as newer, more accurate data become available. This is highly germane to the policy improvement objectives discussed in the previous section.

6.3 Conclusion

Data is critical to measuring and communicating progress against policy objectives. Including data collection in policy design will ensure that the tools needed for accurate policy evaluation are implemented. The Policy and Action Standard outlines a six-step process for sustainable building policy design, implementation, evaluation and revision. This chapter focused on anticipating the effect of sustainable building policies on GHG emissions, and including data collection systems within policies so they can be evaluated. Also discussed was the iterative data collection process through which data are selected, collected, compiled, analyzed, and some eventually replaced.

It must be stressed that implementing EMISs in newly-constructed civic buildings is optimal for the collection of accurate, source-specific data to replace older, less-accurate data. Such measurement and management systems similarly facilitate iterative policy improvement, indicating to policymakers when and where strategic adjustments are necessary.

6.4 Policy Recommendations

This report recommends that, with regard to their sustainable building policy, the City of Saskatoon:

1. Mandate, at minimum, data collection at the sub-meter level for newly-constructed civic buildings.
2. Include and budget for the inclusion of an energy management information system (EMIS) in the construction of all new major structures that are municipally owned and operated.
3. Use the Policy and Action Standard to guide sustainable building policy implementation and evaluation.

7 CONCLUSION

Buildings embody materials, labour, and energy. They are also resource intensive, producing negative societal effects—as the City of Saskatoon's corporate GHG emissions show. The consequence of maintaining the building status quo is the continued production of unpriced social costs related to energy use (which impacts air quality and water use) and storm water runoff (which impacts water quality).

The City's past effort to adopt a corporate building policy that reduced GHG emissions failed in part because it lacked foundational environmental policies that required action. Now that those policies are in place and an updated GHG emissions reduction target has been set, actionable policies have a better chance of adoption.

This report provided research and analysis to further the development and adoption of a sustainable building policy. Considered were sustainable building policy objectives identified by Environmental and Corporate Initiatives, sustainable building rating systems and standards most compatible with these objectives, and steps taken by other Canadian cities to develop similar policies. The report also discussed policy outcomes like legal and ethical risks, and data management practices for policy evaluation.

The cities of Winnipeg, Victoria, Ottawa, Thunder Bay, and Edmonton—among other Canadian cities—have all adopted sustainable building policies to forward their environmental strategies. Though the catalyst to these policies was largely environmental, they all included environmental, economic, and social considerations. Cost savings and a healthy community were considered alongside minimizing GHG emissions. LEED certification was also a fixture in each city's building policy. However, it is unclear whether the performance of buildings constructed under policy requirements achieved the desired performance.

LEED v4, as well as ASHRAE 189.1, Green Globes, and the Living Building Challenge were examined for their compatibility with a Saskatoon-based sustainable building policy. The results of the multi-criteria analysis found that the Living Building Challenge is the most likely to achieve ECI's policy objectives, though it is not the most feasible. It's requirements of net-positive energy and water would not be compatible with many building types. Out of the four building standards examined, ASHRAE 189.1 is the most likely to achieve ECI's policy objectives that is also feasible. Its main advantages are that it is comprehensive in scope, requires collaboration between project teams, and will achieve net-zero emissions by 2020.

Policy Shop found an array of academic and non-academic literature about LEED and ASHRAE standards, but little to none about Green Globes and the Living Building Challenge. LEED being the most popular building rating system has also drawn the most academic attention. The most critical study found that a significant portion of LEED buildings used *more* energy than similar buildings constructed to code. However, other studies show it is capable of meaningful gains in energy performance and occupant productivity.

Requiring sustainable rating system certification adds additional complexity to construction projects that accumulates risk. Additional liability is present in contract development and the tendering process. Third-party building certification can not be guaranteed by any project member. Thus, developers must have a deep understanding of the certification process and clearly define project members' responsibilities. Public organizations must state how experience with sustainable building practices will be rated when releasing tenders. There are insurance options to help protect against lawsuits that arise from disputes related to the above contract and tender issues.

Trademark dilution and greenwashing should be considered in addition to more prominent legal risks. Policy Shop did not find

consequences for using a building rating system for building design and not certification, and such practices seem to be of minor concern to rating system issuers. Using trademarks related to rating systems (e.g. "LEED-lite"), however, are more likely to draw a response from issuers. Greenwashing, providing misleading claims about pro-environmental qualities, creates confusion in the sustainable building market, and should be avoided.

The role of data is critical to estimate the impact of sustainable building policies. Policy implementation and enforcement are easiest when the connection of sustainable building standards to an energy-efficiency or emission reductions goal is clear. Accurate and reliable data eliminates guesswork that goes into estimating the effect of a policy on policy goals. The long-term objective of many sustainable building policies should be to eliminate the need to estimate building performance data and GHG emissions using energy management information systems, which generate building performance data necessary for policy evaluation. Clear results from policy evaluation will feed back into policy design, informing revisions to the sustainable building policy and lead to improvement. Traversing the path toward data collection and increasingly data-informed policy making will be a gradual process. In the meantime, there are numerous best practices that policymakers can adopt to ensure that their policy design represents and matches the quality of the best available data. These practices are outlined in the Policy Action Standard, which establishes a conceptual framework for measuring GHG emissions resulting from industrial actions (i.e. *activity data* and *emissions factor*), and outline steps to collect the best available data. Collection at the sub-meter level appears to be the most appropriate strategy for newly-constructed civic buildings, which requires dedicated funding in project budgets.

7.1.1 Additional findings and discussion

Studies of the effect of sustainable building design and indoor environmental quality on occupant productivity provided mixed results. A common confound was the difficulty of measuring productivity. Some studies used employee surveys whereas others used directly measurable outcomes like absenteeism or typing speed. The take home message from these studies is that employee productivity may improve in sustainable buildings, but in varied ways, and not equally across all employees.

Building in Canada is a highly regulated space. Designers must build to construction standards, developers must apply for building permits, construction workers must follow safety rules, contractors must follow statutory and contract obligations. In a world of rules and structure it is difficult to encourage innovation. Corporate building policies fit within these sets of rules, capitalizing on the familiar way of business. Organizations like ASHRAE and CaGBC have heralded the coming of net-zero buildings. Indeed, net-zero buildings exist today, yet they are far from the norm because their design elements—thick insulation, passive solar orientation, elimination of thermal bridging—are not embedded in the regulatory and statutory structures that frame the building industry.

The Living Building Challenge is perhaps the most sustainable building rating system on the market, but it, too, illuminates limitations inherent in the building industry. Paint, adhesive, and surface coating companies do not share their full list of ingredients because legislation does not require them to. Lumber producers are unwilling to disclose the chemicals used for treating. Dense urban landscapes make it impossible for each building site to store and treat its storm water run off. It is important for sustainable builders to be ambitious, but they should also be aware of limitations beyond their control.

The City of Saskatoon wishes to be a leader in sustainable building in cold climate cities. Our examination of Winnipeg and Edmonton show

that leadership has already been established. This is not surprising, since both cities have greater civic capacity to create and evaluate sustainable building policies. It is prudent, however, to revisit to whom Saskatoon should be a sustainable building leader. Saskatchewan does not yet have a mandatory energy code for new construction. Though the provincial government intends to bring the MECB into force by 2019, the City of Saskatoon can show provincial leadership by stepping ahead of the mandatory minimum standard. Does the city wish to show leadership in the commercial and institutional building sector, or does it want to extend its reach to the industrial or residential building sectors? Does it want to show leadership to building designers, contractors, investors, or building occupants? Prominence does not cause leadership status. Rather, it is the sincere and ardent commitment to a set of principles that drive leadership.

The set of principles outlined in the City's Environmental Policy do not show a commitment to environmental sustainability. Statements like "…the City of Saskatoon has a responsibility to facilitate and provide programs and services that **move toward** sustainability" (City of Saskatoon 2015) and "To design, construct, retrofit, and operate new and existing City facilities so that reduced environmental impacts are **considered** through all phases of life…" (ibid)[m] are not strong statements of commitment. Instead, they remove any condition of accountability. For leadership to be effective it must also be accountable for its actions.

The proposed "Sustainable High Performance Civic Building Policy" (see Appendix C) acts as an internally imposed regulation. It sets minimum requirements for city-owned buildings. The way it sets these requirements is important. Prescriptive regulations such as those found in the proposed policy are useful for ensuring safety levels and standardizing policy output. They are very rigid, too. Prescribing building components at a granular level (e.g. effective R-value for insulation) will likely result in requirements that are not appropriate for certain building types. Creating an exhaustive list of policy provisions is an onerous task, too. The policy designer—City administration in this case—will incur labour costs for future policy updates. Project teams will incur labour costs to request and provide justification for trade-offs.

Some of the most effective regulations are outcome-based. In the automotive industry, GHG emission regulations are outcome-based. A GHG target is set by regulators for a given year, then it is up to vehicle manufacturers to decide how best to meet that emissions target (Environment and Climate Change Canada 2017). The cities of Edmonton and Thunder Bay have leaned toward this type of policy in recent years, setting energy efficiency targets that are a percentage improvement over a defined baseline. Converting these percentages into energy use intensity values would provide building designers a clear target to meet. These targets are useful ways to push building design beyond the status quo.

Policy Shop noticed that the proposed policy in Appendix C lacked a GHG emissions target. If the City is committed to lowering its GHG emissions by 40% of 2014 levels by 2023, and 80% by 2050 its policies should be harmonized to actively pursue those goals. [106]

7.1.2 Limitations of the report

The most obvious limitation of is the expertise of its authors. As public policy students, we do not possess technical knowledge of sustainable building practices. Reporting or analysis errors may be present related to technical matters.

Small sample size (i.e., # of civic building policies, building standards, articles reviewed) was present in each chapter, which limits the confidence of the conclusions made. However, purposive sampling was used to

[m] Bolding added by Policy Shop in the two preceding quotes.

counteract the effect of small sample size as much as possible.

When comparing civic building policies we wanted to see how buildings constructed under these policies performed compared to similar buildings, or other buildings in a city's portfolio. Unfortunately, this information was not attainable. Also, it is methodologically difficult to see if something like reduced corporate GHG emissions is directly attributable to policy implementation.

The available literature on the four sustainable building rating systems and standards examined in Chapter 4 skewed analysis in favour of standards or rating systems that were not well-studied. LEED and ASHRAE drew the most criticism as a result. Because the standards and rating systems differed in structure it was difficult to rate each equally across all criteria. For example, LEED and Green Globes have minimum requirements for water usage, but can award additional points for better performance. Does the analyst rate on what is mandatory, possible, or likely? How does that decision allow for comparison to prescriptive or outcome-based standards? Suffice it to say, the reader may notice inconsistency in the analysis.

Finding sustainable building case law in the Canadian context was another challenge. Most source Policy Shop found are based in the United States. There are enough similarities between Canadian and American legal systems to warrant inclusion. However, Canadian case law would provide the best insight.

A lack of academic literature on the outcomes of the Policy Action Standard, and on building data management methodology limited conclusions drawn in Chapter 6 to a single perspective. However, it should be noted that the Policy Action Standard is a compilation of best practices derived from sustainable building policies around the globe. for measurement and target-setting.

7.1.3 Summary of recommendations

1. Limit exemptions by setting clear conditions for exemption
2. Set a clear policy goal and measurable target
3. Set a policy review date
4. Adopt ASHRAE 189.1 in whole, and as updated, as the guiding building standard for the Sustainable High Performance Civic Building Policy
5. Set an energy use intensity (EUI) target
6. Do not consider Green Globes for third-party certification
7. Use standard contract documents
8. Review internal and external regulations and policies
9. Use a transparent bidding process
10. Name the Policy "High Performance Civic Building Policy"
11. Mandate, at minimum, data collection at the sub-meter level for newly-constructed civic buildings
12. Include and budget for the inclusion of an energy management information system (EMIS) in new civic buildings
13. Use the Policy and Action Standard to guide sustainable building policy implementation and evaluation

8 APPENDIX A: Detailed Description Of Multicriteria Analysis

Members of the City of Saskatoon Environmental and Corporate Initiatives and Johnson Shoyama Policy Shop met in Winter 2017 to identify desired objectives and characteristics of a Sustainable High Performance Civic Building Policy. Following consultations, fifteen policy objectives (see Table 10 below) were identified. Policy Shop selected one sustainable building standard—ASHRAE 189.1—and three sustainable rating systems—Green Globes, LEED v4, and the Living Building Challenge—that addressed sustainable building practices desired by ECI.

Reduces GHG emissions compared to SK building code	Reduces water use	Reduces space heating and cooling demand
Improves employee productivity	Diverts and minimizes construction waste from landfill	Minimizes exterior light pollution
Building envelope commissioning process	Accommodates future sustainable energy generation	Positions Saskatoon as a sustainable building leader in cold climates
Standard is updated regularly	Trustworthy and reliable	Simple and intuitive
Flexible	Calculable life cycle costs	Transparent

Table 12 Sustainable High Performance Civic Building Policy Objectives

The fifteen policy objectives were used as common points of analysis across the building standard and rating systems to assess their suitability and applicability with the City of Saskatoon Strategic Plan 2013-2023 (2013) and Environmental Policy.[107] This type of analysis is named a multicriteria analysis.[108] The fifteen objectives are the multiple criteria that were analyzed. The purpose of this analysis was not to compare technical performance between the building standard and rating systems, but to perform an analytical review of how each building standard or rating system can provide desired policy outcomes.

Evidence for this analysis was gathered from official documentation and technical manuals of authoring organizations, academic literature, non-profit and not-for-profit literature, and internal City of Saskatoon documents.

The success of a building standard's or rating system's ability to meet policy objectives were assessed using an ordinal scale. For each policy objective, a building standard or rating system received one of the following ratings:

<blank>	Does not meet the objective – no provisions present that are relative to the objective
*	Partially meets the objective – provisions relevant to the objective are present, but likely do not provide the desired outcome
**	Meets the objective – provisions relevant to the objective are present and sufficient to achieve the objective with reasonable confidence

***	Exceeds the objective – there are more provisions relevant to the objective than necessary, and likely provide greater than desired outcomes

Table 13 Multicriteria Analysis Ratings

8.1 Conditions to Meet Multicriteria Analysis Objectives

Below is a description of the content that must be present in a sustainable building standard or rating system to meet each policy objective. If there are no provisions in an SBS or SRS

8.1.1 Reduces GHG emissions compared to SK building code

Buildings produced by a sustainable building standard or rating system will meet the objective of reducing GHG emissions if their emissions are 30% less than buildings constructed to minimum standards legislated by the province of Saskatchewan (currently the National Building Code of Canada (NBC)).[n] [o]

8.1.2 Reduces water use

The objective of reducing water consumption is met if a building standard or rating system requires design elements that consume less water compared to the NBC.[p]

The City of Saskatoon 2013-2023 Strategic Plan (2013) states that percentage reductions in water consumption will indicate environmental leadership.[109]

8.1.3 Reduces space heating and cooling demand

This objective is met if the building standard or rating system will reduce energy used for space heating and cooling by 40% compared to the NBC. While this objective was identified by ECI, Policy Shop quantified the target of 40% for the following reasons:

Space heating and cooling account for 50% of energy end use in Canadian commercial and institutional buildings. This provides the biggest opportunity for energy efficiency within the scope of the Sustainable Civic Building Policy. Energy efficiency from electrical products is usually achieved by improvements made by manufacturers. Conversely, building envelope and HVAC design greatly influence space heating and cooling demand, and are within the control of building designers.

Reducing the demand for air heating and cooling contributes to the objective of

[n] Policy Shop notes that a sustainable civic building policy applying only to new construction will not contribute to the goal of reducing GHG emissions since new buildings add to the building stock, adding to total GHG emissions instead of subtracting. If new buildings under this policy replace existing civic buildings, then net GHG emissions reductions may be realized.

[o] In SK, more GHG emissions are produced from electricity consumption than natural gas (City of Saskatoon 2014). At present, building standards and rating systems that accommodate energy efficienct plug and process loads, and greater daylighting than artificial lighting, will provide a larget GHG emisisons reduction. But as sustainable energy becomes commonplace, natural gas will become the larger source of GHG emissions.

[p] The treatment and supply of water is an industrial process that is out of the scope of this report. However, the authors note the inextricable link between water use in buildings and the demands placed on the water and wastewater treatment systems, as noted in the City of Saskatoon Greenhouse Gas Inventory (2014).

reducing GHG emissions. It also provides reduction in the size and maintenance of HVAC systems.

8.1.4 Improves employee productivity

A building standard or rating system meets the objective of improving employee productivity if:

- **VOCs –** Indoor VOCs are lower than benchmarked civic buildings
- **IAQ** – The air distribution system minimizes use of air conditioning where possible
- **Thermal Comfort** – Indoor temperature is held within a 4C range not exceeding 25C, and HVAC and natural ventilation systems are responsive to changes in temperature, and occupants have some control over indoor temperature
- **Lighting** – Daylighting is provided appropriately to different building zones, and glare and direct lighting are minimized, and dimming controls are prescribed
- **Sound** – Background noise levels are kept at 40dB or lower

Al Horr et al. (2016) identified 8 factors that influence occupant productivity.[q][110] Among these factors, the following four are most relevant to the Sustainable High Performance Civic Building Policy:

Indoor air quality and ventilation
Thermal comfort
Lighting and daylighting
Noise and acoustics

Due to the inconsistency with which productivity is measured it is difficult to predict how much occupant productivity will increase if the above criteria are met.[r][111] However, Al Horr et al. assert that improvements in the four listed factors have a positive correlation with productivity.[112] Feige and Wallbaum provide additional support for the effect of these factors on productivity.

8.1.5 Diverts and minimizes construction waste from landfill

A building standard or rating system meets this objective if building construction waste is minimized and diverted from the landfill, and if waste generated during building operation is minimized and diverted from the landfill.

8.1.6 Minimizes exterior light pollution

A building standard or rating system that reduces exterior light pollution compared to NBC will meet objectives.

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[q] The remaining four building characteristics that affect office workers' productivity:
1) Office layout
2) Biophilia and views
3) Look and feel
4) Location and amenities (Al Horr et al. 2016)
are beyond the scope of this report and will not be considered in the analysis. Occupant productivity is affected by more than building structure. It is also affected by personal, social, and organizational factors, which can have noticeably larger effects on productivity than the physical structure of a building (Smith & Bayeh 2003). How these factors interact and their separate level of influence on productivity is still unknown (Al Horr et al. 2016).

[r] There are complications with defining productivity, how it is measured, and knowing what contributes to productivity. Productivity can be measured objectively through performance measures or subjectively through self-reporting measures (Pulakos 2007). Leaman and Bordass (2005) have posited that self-reporting measures are the most useful for researchers, but the information obtained from these measures is difficult to standardize due to several biases and confounds that affect data collection.

8.1.7 Includes building envelope commissioning process

The inclusion of a building envelope commissioning process in the design, construction, and completion phases in a building standard or rating system will meet the objective.

8.1.8 Accommodates future sustainable energy generation

A building standard or rating system meets this objective if it requires building designs to include structural, electrical, and plumbing design elements for sustainable energy generation systems.

8.1.9 Positions Saskatoon as a sustainable building leader in cold climates

To meet this objective a building standard or rating system must provide a notable improvement in energy efficiency compared to sustainable building policies of other cities' in the same climate zone or of similar size. This interpretation, provided by ECI, indicates sustainable building policies of cities like Edmonton, Regina, or Windsor would be comparable.

This objective aligns with the City of Saskatoon's Strategic Plan (2013) goal of becoming a "leader in Cold Climate Energy Efficiency" by 2023.[113]

8.1.10 Standard is updated regularly

To meet this objective a building standard or rating system must be updated by its authoring organization at regular 5-year intervals. Shorter intervals will exceed this objective.

8.1.11 Trustworthy and reliable

This objective is met by a building standard or rating system if the application of the standard or rating system produces the expected outcomes.[s114]

8.1.12 Simple and intuitive

The standard or rating system must be easy to use for designers and builders. Prescriptive requirements must be clearly stated and organized, and performance targets must have clear metrics that are easily measurable.

8.1.13 Flexible

This objective is met if the standard or rating system permits the building designer to make trade-offs between building design elements or materials to attain minimum performance. Alternatively, the standard or rating system meets the flexibility objective if it provides multiple compliance paths.

8.1.14 Calculable life cycle costs

This objective is met if life cycle costs are incorporated during the pre-design and/or design phases of the building standard or rating system.

8.1.15 Transparent

The standard or rating system meets the objective of transparency if it provides information reviewable by all stakeholders that indicates how design requirements lead to construction decisions, trade-offs, and outcomes.

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[s] Building rating systems award tiers of achievement for sustainable building design. However, there is variation in the amount of points required to achieve a certain tier of performance. This means that buildings of the same tier may vary widely in performance (Turner & Frankel 2008). The most useful standard or rating system will minimize this variance, providing predictability to building designers and trustworthiness to building owners and occupants.

9 APPENDIX B: SUSTAINABLE BUILDING STANDARDS AND RATING SYSTEMS

ARZ rating system	BEAM Plus	BERDE	BREEAM-LV
BREEAM-NOR	BREEAM	Casa (Colombia)	CASBEE
CEDBIK-Konut Green building certification system	DGNB System	EDGE	GBC Brasil CASA
Greenship	Green Building Index	Green Key	GreenSL
Green Star	Homestar	Green Star SA	Green Star SA Kenya
GRESB	Home Performance Index	HQE	ICP
IGBC	Korea Green Building Certification	LOTUS	LEED
NABERSNZ	OMIR	Parksmart	PEARL (Abu Dhabi)
PEER	Singapore Green Building Product/Services Certification	SITES	Swiss DGNB System
TARSHEED	Verde	The WELL Building Standard	Zero Waste

10 APPENDIX C – PROPOSED SUSTAINABLE BUILDING POLICY

CITY OF SASKATOON COUNCIL POLICY

NUMBER
C00-000

POLICY TITLE *Sustainable High Performance Building Policy – City Owned Facilities*	**ADOPTED BY:** *City Council*	**EFFECTIVE DATE** *XX, 2017* **UPDATED TO** *XX, 2017*
ORIGIN/AUTHORITY *Report No. XX-2017 of the Standing Policy Committee on Environment, Utilities and Corporate Services – Date, 2017.*	**CITY FILE NO.** *CK XX and XX*	**PAGE NUMBER** *1 of 4*

1. PURPOSE

Ensure that new civic buildings or significant renovations consider occupant safety, comfort, productivity, energy efficiency, indoor air quality and environmental impacts, and achieve high performance in the context of life cycle cost analysis for municipalities and approved budgets.

2. DEFINITIONS

2.X NECB

National Energy Code of Canada for Buildings.

2.X Environmental Impacts

Impacts to the surroundings in which a community is located and an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelations. The environment in this context extends from within the community of Saskatoon to the prairie region and the broader global system.

2.X Building

Any heated structure with a heated floor area greater than 500 m^2 and an Expected Life greater than 5 years.

2.X Expected Life

The expected number of years between the completion of the Project and demolition of the Building.

2.X Life Cycle Cost Analysis

See National Research Council Canada, Institute for Research in Construction, Life Cycle Cost Analysis as a Decision Support Tool for Managing Municipal Infrastructure, 2004 (NRCC-46774).

2.X Sustainable

Recognition of the connections between actions and the resulting impacts, considering a four pillars framework. This framework focuses on ecologic (the natural environment), social (society and justice), cultural (values and perspectives), and economic factors, today and into the long-term future.

2.X ASHRAE

American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

2.X ANSI

American National Standards Institute.

2.X USGBC

U.S. Green Building Council.

2.X IES

Illuminating Engineering Society.

2.X ASHRAE Standard 62

The most current version of ANSI/ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality, and ANSI/ASHRAE Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings.

2.X ASHRAE Standard 189

ANSI/ASHRAE/USGBC/IES Standard 189-2014, Standard for the Design of High-Performance Green Buildings.

2.X ASHRAE Standard 202

The most current version of ANSI/ASHRAE Standard 202, Commissioning Process for Buildings and Systems.

2.X LEED Gold Certification

The most recent version of Gold Certification as defined by the Canadian Green Building Council.

2.X HVAC

Heating Ventilation and Air Conditioning.

2.X Commissioning

As defined by ASHRAE Standard 202, Commissioning Process for Buildings and Systems:

> *"a quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements."*

2.X Owner's Project Requirements

As defined by ASHRAE Standard 202, Commissioning Process for Buildings and Systems:

"a written document that details the requirements of a project and the expectations of how it will be used and operated. This includes project goals, measureable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. (The term project intent or design intent is used by some owners for their Commissioning Process Owner's Project Requirements.)"

2.X Envelope

The assembly of materials that separates the conditioned environment in a Building from the exterior environment.

2.X Thermal Bridge

A material that significantly compromises the effective R-Value of an assembly. Examples include metal studs, continuous metal z-girts, balconies that pass through the Building Envelope, and metal spacers in a window assembly.

2.X R-Value

Thermal resistance in units of $ft^2 \cdot °F \cdot hr/Btu$.

2.X Effective R-Value

Thermal resistance of an assembly, taking into consideration all materials and the presence of Thermal Bridges.

2.X Average Effective R-Value

The weighted average Effective R-Value over the entire surface.

2.X Building Automation System

The building automation system (BAS) is the centralized digital control of Building HVAC systems and other equipment.

2.X Healthy

Indoor air quality, ventilation, off gassing, views.

2.X VOC

Volatile organic compounds.

2.X Project

New construction or major renovation of a Building.

2.X Process Equipment

Specialized equipment that would not normally be included in the typical scope of typical Building Commissioning. Examples would include equipment for the water, wastewater, and electrical utilities.

2.X Systems

The major mechanical and electrical components of a building, which may include but not be limited to: HVAC equipment, building automation system, life safety equipment, renewable energy equipment, XXX It is not intended to include Process Equipment as Process Equipment is assumed to have a separate Commissioning process.

2.X Energy Intensity

XXX

3. POLICY

3.1 General

The City of Saskatoon is committed to:

- constructing energy efficient buildings,
- being a leader in operating an energy-efficient city in a cold weather climate,
- increasing the use of renewable energy in City operations,
- eliminating the need for a new landfill by reducing waste and/or diverting waste for re-use,
- implementing energy-efficient practices in City buildings, transportation and operations,
- making health and safety a top priority in all that we do,
- increasing productivity,
- communicating the financial benefits of environmental initiatives, and
- being a leader when it comes to building an environmentally sustainable community.

The purpose of this policy is to outline a path to achieving the above commitments in the context of city owned Buildings.

The policy is not intended to cover Process Equipment, but rather the Envelope, HVAC, and other equipment (the Systems).

It may be the case that certain requirements cannot reasonably be accommodated for a specific Building. If this is the case then the Project must determine and report a way to exceed minimum performance in other areas, such that the net Environmental Impacts are the same as if the unmet requirements were achieved. When a requirement of this policy is not followed the lack of compliance and resulting trade off will be documented and reported.

3.2. Objectives

The following objectives guide the development and implementation of Projects with respect to this policy:

3.2.X To ensure asset and financial sustainability through life cycle accountability, risk management, and responsible environmental management.

3.2.X To continually improve overall environmental performance through ongoing research and appropriate revision to objectives and targets, as well as transparent plain language reporting.

3.2.X To design, construct, retrofit, and operate new and existing City facilities so that reduced environmental impacts are considered through all phases of the Building life.

3.2.X To comply with environmental requirements and meet or exceed other performance targets the City has committed to meet.

3.2.X To create meaningful stakeholder partnerships and civic collaboration.

3.2.X To achieve an integrated design process.

3.2.X To achieve an durability and adaptability.

3.2.X To achieve energy efficiency.

3.2.X To achieve water efficiency.

3.2.X To construct a durable, low maintenance and Healthy building.

3.2.X To achieve a thorough Systems and Envelope Commissioning process for all Projects.

3.2.X To achieve metering and monitoring.

3.2.X To achieve site sustainability.

3.2.X To achieve waste minimization/diversion in construction and operations. To reduce

construction and demolition waste being taken to the landfill,

3.2.X To achieve energy generation that reduces Environmental Impacts compared to conventional generation.

3.2.X Pollution prevention.

3.2.X To achieve indoor air quality.

3.2.X Design should maximize use of daylighting wherever practical.

3.2.X To reduce or eliminate light pollution and exterior up lighting.

3.2.X Support alternative vehicles.

3.2.X Healthy and productive staff and work environment.

3.2. Capital Budget Development

Capital budgets shall be developed such that the Objectives of this policy are included. At the time the Capital Budget is determined City Council shall decide if the project is to pursue Third Party Certification or the Specifications of this Policy.

3.X. Third Party Certification

Projects shall either pursue the Specifications of this Policy or LEED Gold Certification.

When pursuing LEED Gold Certification, emphasis will be on achieving points that result in meeting or exceeding the Specifications of this Policy.

3.X. Performance Evaluation and Reporting

After a year of operation the Digital Monitoring and utility bills shall be used to evaluate energy and water

performance and utility cost savings. The Building will be compared against existing City buildings and other benchmarks.

4. SPECIFICATIONS

4.X Integrated Design Process

XXX
Mechanical equipment simplified and envelope invested in.

4.X Durability and Adaptability

XXX

4.X Landscaping

Comply with ASHRAE Standard 189 section 5.3.3.1 Invasive Plants.

4.X Stormwater Management

Comply with ASHRAE Standard 189 section 5.3.4 Stormwater Management.

3. X Employee Physical Activity and Active Transportation Accommodation

Unless it is unwarranted based on building location and access to bicycle transportation networks, provide showers and secure bicycle storage and comply with ASHRAE Standard 189 section 5.3.7.2.

4.X Water

Comply with ASHRAE Standard 189 sections:

- 6.3.1 Site Water Use Reduction
- 6.3.2 Building Water Use Reduction
- 6.3.3 Water Consumption Measurement

4.X Energy Efficiency

Build to, at a minimum, meet the most recent version of the National Energy Code of Canada for Buildings.

Build to, at a minimum, meet the most applicable ASHRAE Advanced Energy Design Guide - Achieving 50% Energy Savings Toward a Net Zero Energy Building.

XXX

4.X Indoor Environmental Quality

Occupied buildings shall be designed to provide minimum ventilation levels 30% greater than ASHRAE Standard 62.

Comply with ASHRAE Standard 189 sections:

- 8.3.1.2 Outdoor Air Delivery Monitoring
- 8.3.1.3 Filtration and Air Cleaner Requirements
- 8.4.2 Materials
- 8.4.3 Lighting for Presentations
- 10.3.1.4 Indoor Air Quality (IAQ) Construction Management, a.
- 10.3.1.5 Moisture Controls

4. X Waste Diversion - Construction

Comply with ASHRAE Standard 189 sections:

- 9.3.1.1 Diversion
- 9.3.1.3 Construction Waste Management Plan

4. X Waste Diversion - Operations

Compost and recycling collection and removal will be provided. Space for their collection will be provided inside the building and also for automated container pickup.

Comply with ASHRAE Standard 189 sections:

- 9.3.4 Areas for Storage and Collection of Recyclables and Discarded Goods

4.1 Pollutants

Comply with ASHRAE Standard 189 sections:

- 9.3.3 Refrigerants
- 9.3.5 Mercury Content Levels of Lamps
- 10.3.1.3 Erosion and Sedimentation Control (ESC)

4.X Envelope - General

Minimize thermal bridging.

4.X Wall Insulation

Minimum Average Effective R-Value: 35

3.X Roof Insulation

Minimum Average Effective R-Value: 45

3.X Windows

Thermally broken, triple glazed.

3.X Light Pollution

Comply with ASHRAE Standard 189 section 5.3.6 Reduction of Light Pollution.

3.1 Commissioning

The Project Manager shall retain and manage a Systems Commissioning consultant and an Envelope Commissioning consultant for the duration of the Project.

Both the Systems Commissioning consultant and Envelope Commissioning consultant shall provide Design Review reports to the Project Manager.

3. X HVAC

Metering

3. X Building Automation System

Open BACNET communications shall be used for integration of all equipment.

Provide an energy, water, and performance monitoring dashboard with Building performance trends and graphics.

3. X Digital Monitoring

Metering shall be installed such that whole building water, natural gas, and electricity usage is recorded on at least an hourly basis. Electricity and water shall have additional sub-meters when warranted. Meters shall be connected to a digital monitoring system that can be accessed remotely. Data storage capacity shall be a minimum of two years.

3. X Electrical Demand Management

XXX

3. X Renewable and Alternate Energy

Design to structurally accommodate and minimize cost of future addition of solar photovoltaic (PV) panels. Provide empty conduit from the future panel installation location to the main electrical room and provide breaker space and capacity in the main electrical distribution for the future addition of PV.

CHP ready?

3. X Alternative Vehicles

The design process shall include consideration for the future addition of 240 V electric vehicle charging

stations. Evaluate a reasonable number of future charging stations to be added and provide an empty conduit run from main electrical room to the future charging station locations and include sufficient breaker space and capacity in the main electrical distribution for the future addition of EV charging stations.

If the intended use of the building is maintenance of vehicles it shall be designed such that compressed natural gas vehicles can safely be worked on inside the building.

5. RESPONSIBILITIES

4.1 General Manager, Asset and Financial Management - is responsible for administering this policy and recommending updates to this policy.

4.2 City Council - is responsible for reviewing this policy and any recommended changes on an annual basis, as well as final approval.

4.2 All City Project Managers - are responsible for understanding and implementing this policy when they deliver Projects.

4.4 Reporting

4.3.1 Facilities and Fleet Management – is responsible for annual reporting on outcomes of the policy. Reports are to be made available internally for City Council and Administration as well as externally to the general public.

4.3.2 Environmental and Corporate Initiatives – is responsible for energy, water, and utilities Performance Evaluation.

4.3.2 Project Managers – are responsible reporting Project decisions and impacts to the Director of Facilities and Fleet Management.

11 APPENDIX D – CITY OF SASKATOON ENVIRONMENTAL POLICY

CITY OF SASKATOON COUNCIL POLICY

NUMBER
C02-036

POLICY TITLE *Environmental Policy*	**ADOPTED BY:** *City Council*	**EFFECTIVE DATE** *December 18, 2006* **UPDATED TO** *October 26, 2015*
ORIGIN/AUTHORITY *Clause 8, Report No. 17-2006 of the Administration and Finance Committee and Item 8.4.2. of the Standing Policy Committee on Environment, Utilities and Corporate Services – October 26, 2015.*	**CITY FILE NO.** *CK 375-1 and 7550-1*	**PAGE NUMBER** *1 of 4*

1. PURPOSE

This document serves as a statement of intentions and objectives in relation to the desired overall performance of the City of Saskatoon towards community sustainability.

2. DEFINITIONS

2.1 Biodiversity

The variety of life in the Saskatoon region, particularly species, habitats and ecosystems typical to the Canadian prairie.

2.2 Environment

The surroundings in which a community is located and an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelations. The environment in this context extends from within the community of Saskatoon to the prairie region and the broader global system.

2.3 Environmental Management

Those elements of the overall planning and management function of the City of Saskatoon that develop, implement, and maintain its environmental policy and objectives.

2.4 Environmental Requirements

2.4.1 Regulatory Requirements - The collection of laws such as: Acts, Regulations, Guidelines, Standards, Permits to Operate, and Bylaws, as enacted by any federal, provincial, municipal, territorial or Aboriginal governments that specifically apply to the plans, constructed works, operations, maintenance, and services of the City of Saskatoon that pertain to the environment;

2.4.2 Non-regulatory Requirements - The collection of non-regulatory items such as: industry codes of practice, agreements with public authorities, internal Council or Administrative policies or requirements or any other non-regulatory guideline pertaining to the environment to which the organization subscribes to.

2.5 Environmental Sustainability

Maintaining qualities that are valued in the natural environment by living within the Earth's limits through:

- Energy efficiency and reliance on renewable energy sources;
- Preventing waste;
- Transportation and land-use patterns that protect the environment;
- Maintaining the capacity of the environment to sustain living conditions for people and other species.

2.6 Sustainability

Employee recognition of the connections between actions and the resulting impacts, considering a four pillars framework. This framework focuses on ecologic (the natural environment), social (society and justice), cultural (values and perspectives), and economic factors, today and into the long-term future.

2.7 Sustainable Community

Thriving in harmony with nature to ensure that citizen quality of life today does not negatively affect the ability of future generations to live by the same or improved standards.

3. POLICY

3.1 General

The City of Saskatoon is committed to becoming an environmentally sustainable community. As a result, the organization encourages and expects environmentally responsible behaviour from all employees and contractors working at civic facilities and grounds. Achieving the ultimate goal involves shared responsibility between the community at large and our organization. As such, the City of Saskatoon has a responsibility to facilitate and provide programs and services that move toward sustainability.

3.2. Objectives

The following environmental performance objectives guide the development and implementation of programs, initiatives, and services.

3.2.1 To promote and engage in the protection, enhancement, and responsible use of natural areas and resources; through attention to: biodiversity, protection of soils as a valued resource, climate change, water and air quality, land use, transportation patterns, and civic development.

3.2.2 To ensure asset and financial sustainability through life cycle accountability, risk management, and responsible environmental management.

3.2.3 To continually improve overall environmental performance through ongoing research and appropriate revision to objectives and targets, as well as transparent plain language reporting.

3.2.4 To seek the commitment of all internal staff, management, council members, businesses, and citizens to environmental stewardship and safety by building relationships and understanding through communication, education, training, and support.

3.2.5 To design, construct, retrofit, and operate new and existing City facilities so that reduced environmental impacts are considered through all phases of life by incorporating: energy efficiency, water conservation, waste minimization, energy generation that reduces greenhouse gas emissions, pollution prevention, and investments in indoor environmental quality.

3.2.6 To comply with environmental requirements and meet or exceed other performance targets the City has committed to meet.

3.2.7 To create meaningful stakeholder partnerships and civic collaboration through consultation and integration with programs and initiatives.

4. RESPONSIBILITIES

4.1 General Manager, Corporate Performance - is responsible for administering this policy and recommending updates to this policy.

4.2 City Council - is responsible for reviewing this policy and any recommended changes on an annual basis, as well as final approval.

4.3 Reporting

4.3.1 Environmental and Corporate Initiatives – is responsible for annual reporting on environmental performance objectives. Reports are to be made available internally for City Council and Administration as well as externally to the general public.

4.3.2 All City of Saskatoon Employees – are responsible for including Environmental Implications in all reports being put forward to Committees and City Council.

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Comparison of ASHRAE Advanced Energy Design Guidelines to National Energy Code of Canada for Buildings

The following table presents the ASHRAE Advanced Energy Design Guidelines for Office Buildings which are requirements for achieving a 50% energy savings compared to buildings that meet the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004, and the National Energy Code of Canada for Buildings 2015. It attempts to compare each element and the percent difference between the two codes.

		AEDG			2015 NECB			AEDG vs 2015 NECB		
	Item	Component	Recommendation	Equivalent Value in SI	Recommendation	Notes	Source	AEDG vs NECB	Comparison	% Difference
Envelope	Roofs	Insulation entirely above deck	R-35.0 c.i. (minimum)	U_{max} = 0.162 W/m^{2}K	Above-ground: Continuous insulation,U_{max} = 0.162 W/m^{2}K In contact with the ground: U_{max} = 0.284 W/m^{2}K	Applies only for Zone 7A	Table 3.2.2.2	Insulation entirely above deck vs. Above-ground	NECB equal to AEDG	0%
		Attic and other	R-60.0 (minimum)	U_{max} = 0.095 W/m^{2}K			Table 3.2.3.1	Attic vs. Above-ground	NECB greater than AEDG	71%
		Metal building	R-30.0 + R-11.0 Ls	U_{max} = 0.189 W/m^{2}K + U_{max} = 0.516 W/m^{2}K ($U_{overall}$ = 0.138 W/m^{2}K)				Metal building vs. Above-ground	NECB greater than AEDG	17%
		SRI	No recommendation							
	Walls	Mass (HC > 7 Btu/ft2)	R-19.0 c.i. (minimum)	U_{max} = 0.298 W/m^{2}K	Above-ground: Continuous insulation, U_{max} = 0.210 W/m^{2}K	Applies only for Zone 7A	Table 3.2.2.2	Mass wall vs. In-contact w/ ground	NECB lower than AEDG	3%

		Steel framed	R-13.0 + R-18.8 c.i. (minimum)	U_{max} = 0.437 W/m^{2}K + U_{max} = 0.302 W/m^{2}K (Uoverall = 0.179 W/m^{2}K)	In contact with the ground: U_{max} = 0.284 W/m^{2}K		Table 3.2.3.1	Steel-framed vs. Above-ground	NECB greater than AEDG	17%
		Wood framed and other	R-13.0 + R-15.0 c.i. (minimum)	U_{max} = 0.437 W/m^{2}K + U_{max}= 0.379 W/m^{2}K ($U_{overall}$ = 0.203 W/m^{2}K)				Wood-framed vs. Above-ground	NECB greater than AEDG	3%
		Metal building	R-0.0 + R-22.1 c.i. (minimum)	U_{max} = ? + U_{max} = 0.257 W/m^{2}K				Metal building vs. Above-ground	NECB lower than AEDG	18%
		Below-grade walls	R-15.0 c.i. (minimum)	U_{max} = 0.379 W/m^{2}K				Below-grade vs. Inc-contact w/ground	NECB lower than AEDG	25%
	Floors	Mass	R-20.9 c.i. (minimum)	U_{max} = 0.272 W/m^{2}K	Above-ground: Continuous insulation, U_{max} = 0.162 W/m^{2}K	Applies only for Zone 7A	Table 3.2.2.2	Mass vs. In-contact w/ground	NECB greater than AEDG	178%
		Steel joint	R-49.0 (minimum)	U_{max} = 0.116 W/m^{2}K	In contact with ground: U_{max} = 0.757 W/m^{2}K for 1.2 m		Table 3.2.3.1	Steel joint vs. Above ground	NECB greater than AEDG	40%
		Wood frames and other	R-49.0 (minimum)	U_{max} = 0.116 W/m^{2}K				Wood frames vs. Above-ground	NECB greater than AEDG	40%
	Slabs	Unheated	R-20.0 for 24 in. (minimum)	U_{max} = 0.284 W/m^{2}K	Floors in contact with the ground and floors-on-ground with		3.2.3.3	Unheated slab vs. In-contact w/ ground	NECB greater than AEDG	167%

		Heated	R-25.0 for 48 in. (minimum)	U_{max} = 0.227 W/m^{2}K	heating ducts/cables and cooling pipes, U_{max} = 0.757 W/m^{2}K for floors less than 0.6 m below grade			Heated slab vs. In-contact w/ ground		233%
	Doors	Swinging	U-0.50	U_{max} = 2.84 W/m^{2}K	All doors, U_{max} = 2.2 W/m^{2}K	Applies only for Zone 7A	Table 3.2.2.4	Swinging/not swinging vs. All doors	NECB lower than AEDG	23%
		Not Swinging	U-0.50	U_{max} = 2.84 W/m^{2}K						
	Vestibules	At building entrance	Yes		Yes		3.2.2.1			
	Continuous Air Barriers	Continuous Air Barriers	Entire building envelope		Entire building envelope		3.2.4.1			
	Vertical Fenestration	WWR	20% to 40%		FDWR = (2000 - 0.2 x HDD)/3000 for HDD between 4000 and 7000	FDWR = Fenestration and door area to gross wall area ratio	3.2.1.4		NECB FDWR within range provided by AEDG for WWR, FDWR = 29% for Saskatoon	
		Window orientation	Area of W and E windows each less than area of S windows (N in southern hemisphere)		N/A					
		Exterior sun control (S, E, and W only)	No recommendation		N/A					

		Thermal transmittance	Nonmetal framing windows = U-0.33 Metal framing windows = U-0.34 (maximum)	U_{max} = 1.87 W/m^{2}K , U_{max} = 1.93 W/m^{2}K	All fenestration, U_{max} = 2.2 W/m^{2}K	Applies only for Zone 7A	Table 3.2.2.3	Thermal transmittance vs. All fenestration	NECB greater than AEDG	14%
		SHGC	Nonmetal framing windows = 0.40 Metal framing windows = 0.40 (maximum)		N/A					
Daylight/Lighting	**Daylighting**	Light-to-solar-gain ratio	Minimum VT/SHGC = 1.10		N/A					
		Vertical fenestration EA	0.12		For calculations, see 4.2.2.3 *Determination of Primary and Secondary Sidelighted Areas*		4.2.2.3			
	Interior Finishes	Interior surface average reflectance	Ceilings = 80% Wall surfaces = 70% Open office partitions = 50%		N/A					
		Open office partitions parallel to window walls	Total partition height = 36 in. maximum - or - Partition above desk height = min 50% translucent		N/A					
	Interior Lighting	LPD	0.75 W/ft^2		See Table 4.2.1.5 *LPD based on building type*, for example:	For buildings not stated in Table 4.2.1.5, LPD can be calculated	Table 4.2.1.5			

				8.1 W/m^2	Exercise centre, LPD = 9.0 W/m^2 Fire station, LPD = 7.2 W/m^2 Library, LPD =12.8 W/m^2 Office, LPD = 8.8 W/m^2 Police Station, LPD = 9.4 W/m^2 Sports Arena, LPD = 9.8W/m^2 Transportation Facility, LPD = 7.5 W/m^2 Warehouse, LPD = 7.1 W/m^2	using the Space-by-Space Method as described in Table 4.2.1.6	Table 4.2.1.6	AEDG's LPD vs. NECB'S LPD for Exercise Centre AEDG's LPD vs. NECB'S LPD for Fire Station AEDG's LPD vs. NECB'S LPD for Library AEDG's LPD vs. NECB'S LPD for Office AEDG's LPD vs. NECB'S LPD for Police Station AEDG's LPD vs. NECB's LPD for Sports Arena AEDG's LPD vs. NECB's LPD for Trans. Facility AEDG's LPD vs. NECB's LPD for Warehouse	NECB higher than AEDG NECB lower than AEDG NECB greater than AEDG NECB greater than AEDG NECB greater than AEDG NECB greater than AEDG NECB lower than AEDG NECB lower than AEDG	11% 11% 58% 9% 16% 21% 7% 12%

		24-hour lighting LPD	0.075 W/ft^2		N/A			N/A		
		Light source lamp efficacy (mean LPW)	T8 and T5 lamps > 2 ft = 92		N/A, no direct mention of T8 and T5 lamps			N/A		
			T8 and T5 lamps ≤ 2 ft = 85							
			All other > 50							
		Ballasts	4 ft T8 lamp nondimming applications = NEMA Premium instant start		Fluorescent and electronic lamp ballasts hall conform to CSA 654, or ANSI_ANSLG		4.2.1.2			
			4 ft T8 lamp dimming applications = NEMA Premium program start							
			Fluorescent and HID sources = electronic							
		Controls for daylight harvesting in open offices—locate on N and S sides of bldg	Dim all general fluorescent lights within primary and secondary daylight zones of open offices		See section 4.2.2.1 and Table 4.2.1.6 *Automatic Daylight Responsive Controls for Sidelighting*					
		Automatic controls	Auto ON to 50% = private offices, conference and meeting rooms, lounge and break rooms, copy rooms, storage rooms		Varies for each space type in the building, see 4.2.2.1 and Table 4.2.1.6 *Automatic Daylight Responsive*		Table 4.2.1.6			

			Auto ON occupancy sensors = restrooms, electrical/mechanical rooms, open and private office task lighting		*Controls for Sidelighting*					
			Time switch control = all other spaces							
	Exterior Lighting	Façade and landscape lighting			Lighting Power Allowance depends on lighting zone LZ0 = 60W or less LZ1 = no allowance		4.2.3.1	N/A for LZ0 and LZ1		
			LZ2 = 0.05 W/ft^2	0.54 W/m^2	LZ2 = 1.1 W/m^2, or 8.2 W/m for each illuminated wall/surface			AEDG's LZ2 vs. NECB's LZ2	NECB greater than AEDG	104%
			LZ3 = 0.075 W/ft^2	0.81 W/m^2	LZ3 = 1.6 W/m^2, or 12.3 W/m for each illuminated wall/surface			AEDG's LZ3 vs. NECB's LZ3	NECB greater than AEDG	98%
			LZ4 = 0.075 W/ft^2		LZ4 = 2.2 W/m^2, or 16.4 W/m for each illuminated wall/surface			AEDG's LZ4 vs. NECB's LZ4	NECB greater than AEDG	172%
			Controls = auto OFF between 12 am and 6 am		Should shut off automatically		4.2.4.1.5			

		Parking lots and drives			LZ0 = no allowances LZ1 = 0.4W/m^2					
			LZ2 = 0.06 W/ft^2	0.65 W/m^2	LZ2 = 0.7 W/m^2			AEDG's LZ2 vs. NECB's LZ2	NECB greater than AEDG	98%
			LZ3 = 0.1 W/ft^2	1.1 W/m^2	LZ3 = 1.1 W/m^2			AEDG's LZ3 vs. NECB's LZ3	NECB = AEDG	0%
			LZ4 = 0.1 W/ft^2		LZ4 = 1.4 W/m^2			AEDG's LZ4 vs. NECB's LZ4	NECB greater than AEDG	27%
			Controls = auto reduce to 25% (12 am to 6 am)		Should automatically reduce lighting power to at least 30%		4.2.4.1.4			
		Walkways, plazas, and special feature areas	N/A		Walkways less than 3m wide: LZ0 = no allowances LZ1, LZ2 = 2.3 W/m	Lighting zones: LZ0 = Underdeveloped areas LZ1 = developed areas within national, provincial or territorial paks, and rural areas	Table 4.2.3.1	N/A		

					LZ3 = 2.6 W/m LZ4 = 3.3 W/m	LZ2 = Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial areas with limited nighttime use, and residential mixed-use areas LZ3 = All other areas LZ4 = High-activity commercial districts				
			LZ2 = 0.14 W/ft^2 LZ3, LZ4 = 0.16 W/ft^2	1.5 W/m^2 1.72 W/m^2	Walkways 3m wide or greater, plazas, and special features: LZ0 = no allowances LZ1, LZ2 = 1.5 W/m^2 LZ3 = 1.7 W/m^2 LZ4 = 2.2 W/m^2			AEDG's LZ2 vs. NECB's LZ2 AEDG's LZ3 vs. NECB's LZ3 AEDG's LZ4 vs. NECB's LZ4	NECB = AEDG NECB almost equal to AEDG NECB greater than AEDG	0% 1% 28%

			Controls = auto reduce to 25% (12 am to 6 am)		Shall be equipped with backup provisions to retain programming and time setting for at least 10h during a power outage					
		All other exterior lighting	LPD = follow Standard 90.1-2010		See Table 4.2.3.1 C&D					
			Controls = auto reduce to 25% (12 am to 6 am)		Shall be equipped with backup provisions to retain programming and time setting for at least 10h during a power outage		4.2.4.1.6			
Plug Loads	**Equipment Choices**	Laptop computers	Minimum 2/3 of total computers		N/A			N/A		
		ENERGY STAR equipment	For all computers, equipment, and appliances							
		Equipment power density	For all computers, equipment, and appliances							

	Controls	Computer power control	Network control with power saving modes and control OFF during unoccupied hours							
		Occupancy sensors	Desk plug strip occupancy sensors							
		Timer switches	Water coolers and coffee makers control OFF during unoccupied hours							
		Vending machine control	Yes							
SWH	**SWH**	Gas water heater efficiency	Condensing water heaters = 90% efficiency		Gas-fired storage type	ANSI Z21.10.3/CSA 4.3	Table 6.2.2.1		NECB requires lower efficiency.	10% lower for system with input greater than 22 kW
					< 22 kW, EF ≥ 0.67 - 0.0005 V_r					
					22 - 117 kW, E_t ≥ 80%					
					> 117 kW, E_t ≥ 80%					
		Electric storage EF (≤12 kW, ≥20 gal)	EF > 0.99 – 0.0012 × volume		SL ≤ 35 + 0.20V_r (top inlet), SL ≤ 40 + 0.20 V_r	SL = standby losses, V_r = rated volume	Table 6.2.2.1		For NECB, efficiency depends on standby losses (SL) and rated volume (V_r)	
		Point-of-use heater selection	0.81 EF or 81% Et		See Table 6.2.2.1					

		Electric heat pump water heater efficiency	COP 3.0 (interior heat source)		Heat pump water heater: For input, ≤ 24A and ≤ 250 V, EF ≥ 2.1		Table 6.2.2.1			
		Pipe insulation (d < 1½ in. / d ≥ 1½ in.)	1 in. / 1 ½ in.		Depends on piping location (conditioned space or outside). See Table 6.2.3.1		Table 6.2.3.1			
HVAC	**Packaged Single-Zone Air-Source Heat Pumps**	Cooling and heating efficiency	See Table 5-8 for efficiency		See Table 5.2.12.1		Table 5.2.12.1		For AEDG, efficiency requirements are based on size, while for NECB, efficiency depends on size AND rating conditions	
		ESP	0.7 in. w.c.		N/A					
		DOAS air-source heat pump	Yes		N/A					
		DOAS heating and cooling efficiency	See Table 5-10 for efficiency		See Table 5.2.12.1		Table 5.2.12.1			
		DOAS energy recovery	Yes, see Table 5-11 for effectiveness		N/A					
		DOAS fan—ESP	1.5 in. w.c. maximum		N/A					
	WSHPs with DOAS	Unit size	5 tons or less		Mentioned water-source heat pumps in Table 5.2.12.1,		Table 5.2.12.1	N/A		
		Single-stage cooling and	Cooling = 16.4 EER							
			Heating = 5.2 COP							

		heating efficiency			but did not provide other details regarding efficiencies					
		Two-stage cooling and heating efficiency	Cooling part load = 17.6 EER							
			Cooling full load = 15.0 EER							
			Cooling full load = 15.0 EER							
			Heating part load = 5.7 COP							
			Heating full load = 5.0 COP							
		WSHP fan—ESP	0.5 in. w.c.							
		Condensing boiler efficiency	90%							
		DOAS water-to-water heat pump	See Table 5-10 for efficiency							
		DOAS variable airflow with DCV	Yes							
		DOAS energy recovery	Yes, see Table 5-11 for effectiveness							
		DOAS fan and motor	65% mechanical efficiency							
			Motor efficiency per Standard 90.1-2010, Table 10.8B							
			VSD efficiency = 95%							
	VAV DX	DX efficiency	See Table 5-9 for efficiency		N/A, only talked about VAV		5.2.3.3	N/A		

	with Gas-Fired Hydronic Heating	Low-temperature air supply and SAT reset	50°F to 61°F		systems for fan and pumps					
		Perimeter convector heat source	Hot water							
		Condensing boiler efficiency	90%							
		Economizer	≥54,000 Btu/h, differential dry-bulb control							
		Energy recovery	Yes, see Table 5-11 for effectiveness							
		Indirect evaporative cooling	No recommendation							
		Demand control and ventilation reset	Yes							
		ESP	2.0 in. w.c.							
	VAV CHW (same as VAV DX except)	Air-cooled chiller efficiency	10 EER		N/A, same as above			N/A		
		Air-cooled chiller IPLV	12.5 IPLV < 150 tons, 12.75 IPLV ≥ 150 tons							
		Variable-speed pumping	Yes							
		Maximum fan power	0.72 W/cfm							
	Fan-Coils	Air-cooled chiller efficiency	10 EER		N/A, only talked about DOAS for		Table 5.2.12.1	N/A		

	with DOAS	Air-cooled chiller IPLV	12.5 IPLV < 150 tons		cooling, but not ventilating					
			12.75 IPLV ≥ 150 tons							
		Condensing boiler efficiency	90%							
		Variable-speed pumping	Yes							
		VAV fan-coil units	Yes							
		Fan-coil unit fan power	0.30 W/cfm							
		DOAS chilled-water and hot-water coils served by same plant as fan-coils	Yes							
		DOAS variable airflow with DCV	Yes							
		DOAS energy recovery	Yes, see Table 5-11 for effectiveness							
		DOAS fan and motor	65% mechanical efficiency, motor efficiency Standard 90.1-2010, Table 10.8B							
	Radiant Systems with DOAS	Air-cooled chiller full-load efficiency	10 EER		N/A, same as above			N/A		
		Air-cooled chiller IPLV	12.5 IPLV < 150 tons, 12.75 IPLV ≥ 150 tons							

		Condensing boiler efficiency	90%							
		DOAS heating and cooling efficiency	See Table 5-10 for efficiency							
		DOAS variable airflow with DCV	Yes							
		DOAS energy recovery	Yes, see Table 5-11 for effectiveness							
		DOAS fan—ESP	1.5 in. w.c.							
	Ducts and Dampers	OA damper	Motorized damper		Motorized damper		5.2.4.1.1			
		Friction rate	0.08 in./100 ft		N/A					
		Sealing	Seal Class B		Depends on Static Pressure	ANSI/MACNA 006	5.2.2.3			
					Static Pressure ≤ 500, Seal Class C					
					Static Pressure > 500 & <1000, Seal Class B					
					Static Pressure ≥ 1000, Seal Class A					

		Location	Interior only		Located as near as possible to the plane of the building envelope		5.2.4.2.1			
		Insulation level	R-6.0	R = 1.06 $m^2°C/W$	Depends on ΔT	ΔT refers to the difference at design conditions between space within which the duct is located and the design temperature of the air	5.2.2.5			
					ΔT <5°C, R_{min} = 0 $m^2°C/W$			AEDG's R-value vs. NECB's R-value for ΔT <5°C	NECB lower than AEDG	100%
					ΔT = 5 to 22°C, R_{min} = 0.58 $m^2°C/W$			AEDG's R-value vs. NECB's R-value for ΔT = 5 to 22°C	NECB lower than AEDG	45% 17%
					ΔT > 22°C, R_{min} = 0.88 $m^2°C/W$			AEDG's R-value vs. NECB's R-value for ΔT> 22°C	NECB lower than AEDG	

Comparison of LEED v4 to ASHRAE 189.1-2014 to Green Globes

The following table compares LEED v4 (for new construction), ASHRAE 189.1-2014, Standard for the Design of High-Performance Green Buildings and Green Globes (for new construction) and notes their alignment with the City of Saskatoon's Environmental Policy (Policy C02-036).

LEGEND	
	Good
	Better
	Best
	Same shade = equally good
N/A	**Not applicable / not mentioned**
🍁	**Canadian ACP**

COMPARISON OF SUSTAINABLE RATING SYSTEMS

Section	Criteria	LEED v4	ASHRAE 189.1-2014	Green Globes	City Environmental Policy
Location and Transportation	**Development Location**	(Credit) Locate project within the boundary of a development certified under LEED for Neighborhood Development.	Allows development on certain areas depending on its purpose (example: development in forest land for forestry purposes, development in agricultural land for agricultural purposes)	Allows development in areas close to wetland or wildlife corridor, agricultural land, parkland, or an area notable for its scenic beauty, but must demonstrate on the site plan, how any portion of this site will be fully preserved.	✓ **responsible land use**

		(Credit) Prohibits development on prime farmland, floodplains, habitat, water bodies, and wetlands.	Similar to LEED, prohibits development on floodplains, land within 50 m of any fish and wildlife habitat conservation area and land within 35 m of a wetland.	Same as above. In addition, all required environmental assessments need to be carried out.	
	Sensitive Land Protection	Low impact development on wetlands and water body buffers are allowed.	Same as LEED	Does not mention whether development of low-impact trails is allowed or not, but mentions in B.1 to minimize the disturbance of undeveloped areas.	
	High Priority Site	(Credit) Requires project construction in areas with development constraints (historic districts, priority designation, brownfield remediation)	Allows development on a remediated brownfield site	Same as ASHRAE	
	Surrounding Density and Diverse Uses	(Credit) Requires development in areas with existing infrastructure. Minimum average development density = 22,000 ft^2/acre. See pages 16-18 in LEED v4 manual.	N/A	Similar to LEED, but LEED is more stringent. GG requires the selection of a site in an existing serviced site, or with existing minimum development density of 14,000 m^2/ha (60,000 ft^2/acre)	

	Transit	(Credit) Requires development in areas where different modes of reliable transportation already exist. Locate buildings within 400 meters of bus, street car, or rideshare stops, or within 800 meters of bus rapid transit stops, light rail stations, etc.	Requires main building entrances to have a pedestrian walkway that extends to a public way or a transit stop. Walkways across parking lots shall be clearly delineated.	Provide access to public transport within 500 m of the building with service at least every 15 minutes during rush hour	
		N/A	N/A	Provide designated areas for shelter from weather at pick-up and drop-off locations	
	Bicycle	(Credit) Requires bike storage and shower rooms	Similar to LEED, but has more specific requirements for bike parking (minimum number of spaces, location, horizontal parking racks, ability to lock, security and visibility, and documentation). No mention of shower rooms though.	Also requires safe, covered storage areas with fixed mountings for bicycles. Does not give specific details. Also requires changing rooms or large washrooms for occupants to change from cycling wear to office-working apparel.	✓ **transportation patterns and GHG reduction**
	Parking Facilities - General	(Credit) Meet the local code requirements for parking capacity, provide preferred parking to carpools (5% of the total parking space). Has additional	Similar to LEED, at least 5% of the parking spaces need to be provided to vehicles that minimize GHG and air pollution. The preferred parking space need to be located close to building entrance.	Similar to LEED and ASHRAE, requires designated areas for preferred parking for car/van pooling but does not give a specific percentage	

		requirements in the manual.			
		Restrict additional parking	N/A	N/A	
	Green Vehicles and Charging Infrastructure	(Credit) Reserve 5% of all the parking spaces for green vehicles with a discounted parking rate of at least 20%, AND construct EV charging stations OR liquid, alternative fuel fueling facilities, or battery switching stations.	Similar to LEED, 5% of the parking spaces must be designated to green vehicles, EV charging stations must be within 400 meters from the building project, does not mention parking discount for green vehicles	No mention of green vehicles, but briefly mentioned the inclusion of an alternative-fuel re-fueling facility on-site or in the general vicinity	
Site Sustainability	**Construction Activity**	(Prerequisite) Requires erosion and sedimentation control plan to reduce soil, water, and air pollution	(Mandatory) Has provisions for developing and implementing an ESC Plan; must comply with USEPA standards	Similar to LEED and ASHRAE, erosion control plan is required. Specify measures such as limiting grading, leaving steeper slopes undisturbed, avoiding soil compaction and providing vegetative ground cover.	**✓ pollution prevention**

	Site Assessment	(Credit) Evaluate site's topography, hydrology, climate, vegetation, soils, human use, and human health effects, and assess how these site features would affect project design.	Similar to LEED, but ASHRAE is more focused on the inventory of invasive and native plants. Also requires the assessment of site features that need to be preserved, and identifying any prohibited development areas located on or adjacent to the building site	Map all the existing site vegetation and carry out all required environmental assessments. Does not really give any details which assessments are "required".	
	Greenfield/Site Development, Protect or Restore Habitat	(Credit) Provide habitat and promote biodiversity by protecting 40% of greenfield area (if such areas exist) AND restoring 30% of disturbed portions of the site OR achieve credits by offering financial assistance to land trust or conservation organizations.	Retain at least 20% of vegetation/native plants in greenfield sites. Does not talk about restoration, but has provisions for maintenance procedures to maintain healthy vegetation growth.	Similar to LEED but does not specify the % of vegetation that need to be preserved. Requirements: Minimize the disturbance of undeveloped areas of the site. Preserve significant trees and natural slopes to maintain the existing direction of groundwater flow. Map all existing site vegetation.	**✓ biodiversity and soil**
			Mentioned under the WE section that a minimum of 60% of the area of the improved landscape shall be in biodiverse planting of native plants and adapted plants other than turfgrass.	Specify a naturalized landscape using native trees, shrubs and ground cover, with a minimal lawn. Create a biophysical inventory of on-site plants to be retained or salvaged and re-planted.	

	Open Space	(Credit) Maximize open space by providing outdoor space ≥ 30% of the site area, 25% of it must have vegetation or have overhead vegetated canopy	N/A	N/A	
	Rainwater Management	(Credit) Implement a stormwater management plan that results in treatment system designed to remove 85%, 95%, or 98% of the regional or local rainfall events. Does not provide specific guidelines on how to meet these requirements.	Provides specific methods for managing stormwater, also specifies a certain % of stormwater that must be removed/collected for greenfield sites, greyfield sites, adjoining lots, and brownfield sites. Discharge rates and coal tar sealants are also specified.	Similar to LEED and ASHRAE. Provide a stormwater management plan to prevent damage to project elements, including vegetation, on both the project site and those adjacent to it. Include an engineering design of the drainage pattern, including volume calculations and site management strategies. Aim for no-increase in run-off. Or, if the site already consists of more han 50% impervious surface in its pre-development state, aim for a reduction of 25% in storm water run-off.	✓ **water quality**

	Heat Island Reduction	(Credit) Select one of two options: non-roof and roof measures, or parking under cover. For non-roof measures, install plants that can provide shading for 10 years. Solar thermal collectors, photovoltaics and wind turbines count as shades. Solar reflectance (SRs) are specified. Vegetated roof can also be installed. For Parking under Cover option, 75% of parking spaces must be under cover.	Similar requirements as LEED, but provides more detailed language for roof and non-roof measures, see section 5.3.5. Does not mention Parking under Cover.	Similar to LEED and ASHRAE, has requirements for roof and non-roof measures: Provide natural cover including trees that within 5 years will shade at least 30% of impermeable surfaces. At minimum, there should be one tree for every 100 m^2 of impermeable surface including parking, walkways and plazas. Where natural shading is not possible, install artificial shading such as covered walks, or light-coloured, high-albedo materials (reflectance of at least 0.3) over the site's impervious surfaces. specify measures to reduce heat build-up on the roof roofing materials, OR a green roof, or a combination of both.	✓ **pollution prevention** (thermal pollution)

	Light Pollution Reduction	(Credit) Provisions for exterior lightings: requirements for uplight and light trespass as well as internally illuminated exterior signages. For uplight and light trespass, the backlight-uplight-glare (BUG) method, or another formula provided in the manual can be used. Internally illuminated exterior signages must have a maximum luminance of 200 nits during nighttime and 2000 nits during daytime.	Similar to LEED but gives more details, requirements are based off ASHRAE 90.1	Minimize the obtrusive aspects of exterior lighting as per the optical design recommendations of the Royal Astronomical Society of Canada. Provisions for glare, uplight, and light trespass are discussed.	**✓ pollution prevention**
	Tenant Design and Construction Guidelines	(Credit) Information regarding sustainable design and construction features need to be provided to building tenants before signing the lease. Only applies to Core&Shell.	Similar to LEED, the building owner shall provide a copy of appropriate building documents to tenants	N/A	
	Pollution Minimization - Integration of Storage Tanks	N/A	N/A	Ensure compliance with federal *Technical Guidelines for Underground Storage Tank system Containing Petroleum* and *Allied Petroleum Products and Technical*	**✓ pollution prevention**

				Guidelines for Aboveground Storage Tank Systems Containing Petroleum.	
	Pollution Minimization - Control of other pollutants (PCBs, asbestos, or radon)	N/A	N/A	In the case of retrofit, comply with regulations for all PCBs present in the building. Contain, remove, or eliminate asbestos and asbestos-containing materials in compliance with all applicable provincial and local regulations. Prevent the accumulation of harmful chemicals and gases such as radon and methane in soaces below the substructure, and their penetration into the building.	
	Pollution Minimization - Pest Management	N/A	N/A	Protect components, materials and the protection of structural openings to avoid infestation by pests (rodents, insects, termites and other pests)	

Water Use Effiency	**Irrigation**	(Prerequisite) Gives the option of not using potable water, OR the option of reducing the potable water consumption by at least 30% from the calculated baseline for the site's peak watering month.	(Mandatory) Does not give a % reduction goal for irrigation, but outlines the requirements for using automatic irrigation systems and smart controllers that can reduce potable water consumption. Requires 80% minimum ET_c for irrigation adequacy, and irrigation excess should not exceed 10 %	Does not give a % reduction target, but requires the following: (1) provide landscaping that can withstand extreme local weather conditions and requires minimal irrigation, (2) specify a water-efficient irrigation system, (3) specify irrigation using non-potable water (i.e. captured rainwater or recycled site water)	**✓ water conservation**
		(Credit) Gives the option of not using potable water, OR potable water consumption can be **further reduced by at least 50%** from the calculated baseline for the site's peak watering month.	(Prescriptive Option) Golf courses and driving ranges shall only be irrigated by municipally reclaimed water or alternative on-site sources of water.		
			(Performance option) Recommends to limit the potable water use to 35% of the demand for that landscape		
	Indoor Water Use (Fixtures and Fittings)	(Prerequisite) Reduce indoor water consumption by 20% from baseline, see Table 1. Also has standards for appliances and HVAC processes.	(Mandatory) Does not specify certain amount of potable water reduction but outlines specific criteria for valves, faucets, showerheads, etc.	Also requires reduction on water use, but LEED provides more detailed specifications. GG requirements: Offices: less than 1.5m^3/m^2/year, less than 1.0 m^3/m^2/year,or less than 0.5m^3/m^2/year. MURBs: less than 300 m^3/apartment/year, less than 150m^3/m^2/year,	**✓ water conservation**
		(Credit) Requires further reduction of fixture and fitting water use from the calculated baseline in WE Prerequisite. 50% reduction in potable water use can receive full	(Performance option) The building project shall be designed to have total annual interior water use less than or equal to that achieved by compliance with the provisions in the Mandatory section. Does not give specific % reduction		

		points. Alternative water sources can be used.		50m^3/m^2/year. Also requires the use of water-efficient fixtures.	
	Building-Level Metering	(Prerequisite) Requires water metering that can collect and summarize monthly and annual data. Data need to be shared with USGBC starting on the date the project accepts LEED certification. (Credit) Requires the installation of two or more submetering systems for the following: irrigation (at least 80% of irrigated area), indoor plumbing fixtures and fittings (at least 80%), domestic hot water (at least 80%), boiler with aggregate annual water use of 100,000 gallons or more, or boiler of more than 150 kW, reclaimed water, and other process water (at least 80%).	(Mandatory) Similar to LEED, requires that both potable and reclaimed water entering the building be monitored. Rented spaces greater 5000 m^2 must have individual submeters. The monitoring system must be able to communicate and store hourly, daily, monthly, and annual water consumption data.	Similar to LEED and ASHRAE but not as specific, requires sub-metering for high water-usage operations or occupancies such as boilers, cooling tower make-up lines, water cooled air-conditioning units or special laboratory operations. Does not provide specific % of the water-consuming system that need to be monitored	

	Cooling Water Use	(Credit) Requires water analysis to measure control parameters including Ca, total alkalinity, SiO2, Cl-, and Conductivity. Cooling tower cycles must then be calculated, and use that info to determine the points that can be achieved, see Table 2 page 60-61.	Similar to LEED, requires specific number of cycles of concentration based on hardness of the make-up water. Make-up waters that have <200ppm Ca must have at least 5 cycles of concentration, whereas make-up waters that have >200pm, must have at least 3.5 cycles of concentration.	Requires the installation of features for minimal use of water for wet cooling towers (where applicable)	✓ **water conservation**
	Special Water Features (Fountains, pools, spas)	N/A	(Prescriptive) Fountains must use alternate water sources or municipally reclaimed water, and must be equipped with make up water meters, leak detection devices, and recirculating/treatment system. For pools and spas, requirements for backwash water, filtration, and pool splash are outlined.	N/A	✓ **water conservation**

	On-Site Treatment of Water	Mentions the assessment of potential water supply source volumes (i.e. site rainwater, **graywater,** non-potable water, and HVAC condensate) in the preliminary water budget analysis. Demonstrate how at least one on-site nonpotable water supply source can be used.	Mentioned the use of efficient water treatment systems only for medical and laboratory facilities.	Where feasible, integrate a graywater collection, storage and distribution system to collect, store, treat and redistribute laundry and bathing effluent for toilet flushing, irrigation, janitorial cleaning, cooling and car washing. Where feasible, integrate a biological waste treatment system for the site and building such as peat moss drain fields, constructed wetlands, aerobic treatment systems, solar aquatic waste systems (or living machines), and composting or ecologically-based toilets	✓ **water conservation**
Energy Efficiency	**Energy Performance**	(Prerequisite) Sets the minimum energy performance requirements. Options are based off ASHRAE 90.1-2010.	(Mandatory) Based off ASHRAE 90.1.	Requires buildings to perform better than the base MNECB,. Similar to LEED, points depend on % energy performance achieved. Also has	✓ **energy efficiency, GHG reduction**

		(Credit) Select one of two options: Option 1: Show 50% improvement in energy performance to achieve full points. Option 2: Comply with ASHRAE 50% AEDG (US) or ASHRAE 90.1 (outside US).	(Performance) The proposed building performance shall be equal to or less than the building baseline performance (or to that achieved by compliance with related sections in ASHRAE 189.1). Does not set a % improvement goal.	provisions for space optimization, integration of daylighting, and building envelope.	
		N/A	(Performance) Incorporates CO2e reduction measures -- the proposed design shall have an annual CO2e equal or less than the CO2e of the baseline building design (or to that achieved by compliance with the related sections in ASHRAE 189.1). Does not set a % reduction goal.	N/A	
		N/A	N/A	Take advantage of site microclimate and topography using site orientation and features, decisions based on wind and snow control studies, design building that benefits from natural or hybrid ventilation	
	Building-Level Energy Metering	(Prerequisite) Requires installation/use of building energy meters, or submeters that can provide data to show total building energy consumption	(Mandatory) Same as LEED	Also requires energy sub-metering. For a building greater than 500 m^2, specify the sub-metering of processes which are major energy consumers such as:	**✓ energy efficiency**

		(electricity, natural gas, chilled water, steam, fuel, propane, biomass, etc.)		lighting, motors, how water heaters, boilers, fans, cooling and humidification plant, computers, and catering facilities.	
		(Credit) Install advanced energy metering for entire building energy use, and anything that represents 10% of the building's annual energy consumption must be monitored as well. Additional specifications for the energy metering are required, see page 77.			
	Demand Response	(Credit) Reduce peak demand by at least 10% through load shedding or shifting. Provides slightly more detailed guidelines than ASHRAE 189.1.	Same as LEED, requires demand limiting or load shifting that can reduce peak demand by 10% or greater	Requires Energy Demand Reduction through Space Optimization, Response to Microclimate and Topography, Integration of Daylighting, Building Envelope, and Integration of Energy Sub-metering. Does not give specific % reduction goal.	✓ **GHG reduction**

	Renewable Energy	(Credit) Generate 1-10% renewable energy on-site.	(Mandatory) Provide space for future installations of renewables. (Prescriptive) Single-story buildings must have an annual energy production of at least 20kWh/m^2, while all other buildings must be able to generate 32 kWh/m^2. (**Exceptions** apply to building projects that receive incident solar radiation of less than 4.0 kWh/m^2day and building projects that purchase Green-e energy of at least 75 kWh/m^2 per year until the purchase totals 750 kWh/m^2. Another exception applies to buildings that reduce the renewables but install/use higher-efficiency equipment.)	..Requires the integration of renewable energy sources such as solar, wind, biomass, or photovoltaics. Generation must (1) between 5 to 10% of the total load, (2) or more than 10% of the total load	✓ **energy generation that reduces GHG emissions**
	Green Power and Carbon Offsets	(Credit) Purchase at least 50% or 100% of the project's energy from green power, carbon offsets, or renewable energy certificates (RECs).	(Prescriptive) Mentioned the purchase of Green-e energy of at least 75 kWh/m^2 of conditioned space each year until the purchase totals amount to 750 kWh/m^2.	N/A	✓ **GHG reduction**
	Refrigerant Management	(Prerequisite) Prohibits the use of CFC-based refrigerants. Existing small HVAC&R units that contain less than 0.5 pound of refrigerant are exempted.	(Mandatory) Same as LEED, CFC-based refrigerants shall not be used. Also prohibits the use of CFCs, halons, & HCFCs for fire suppression systems.	Select refrigeration systems that avoid the use of ozone-depleting substances (ODS) and potent industrial greenhouse gases (PIGGS).	✓ **GHG reduction/Climate Change**

		(Credit) Select one of two: (1) refrigerants that have ODP = 0 and global warming potential (GWP) < 50. (2) Calculation of Refrigerant Impact - install HVAC&R equipment that does not contribute to ozone depletion and climate change.	N/A	Choose refrigerants that have ODP = 0 or less than 0.05.	✓ **GHG reduction/Climate Change**
				Ensure air-conditioning systems complies with the requirements of the Federal Halocarbon Regulations under CEPA and the Safety Code for Mechanical Refrigeration ASHRAE 15-1994.	
	Building Envelope	Select between the two: (1) perform whole-building simulation showing improvement in % energy performance or (2) comply with ASHRAE 50% AEDG	Provides highly detailed guidelines better than ASHRAE 90.1.	For walls and roof, design the building's thermal resistance to comply with MNECB. Use vapour barrier practices to assure integrity of building envelope. Prevent unwanted stack effect by appropriate sealing of the top, bottom and vertical shafts of the building.	✓ **energy efficiency, GHG reduction**
		N/A	N/A	Design the building to prevent water and/or rain penetration.	
	HVAC	Mentioned compliance with ASHRAE 50% AEDG	Provides specific guidelines that are better than ASHRAE 90.1.	Specify energy-efficient HVAC equipment (boilers, chillers, hot water service systems, BMS, variable speed drives, motors, and other energy saving systems)	

	Lighting	Provided detailed guidelines for exterior lighting and signages. There's also an option for interior lightings to comply with ASHRAE 50% AEDG.	Provides detailed guidelines for interior and exterior lightings, better than ASHRAE 90.1.	Integrate daylighting to reduce the need for electrical lighting. Comply with IESNA Lighting Handbook. Lighting controls.	
	Energy Star Equipment	Not required for all equipment, only specified it for washers and kitchen equipment to reduce water consumption	Requires it for wider range of items including appliances, heating and cooling equipment, electronics, office equipment, etc.	N/A	
Materials and Resources	**Storage and Collection of Recyclables**	(Prerequisite) Requires dedicated area on-site for collection and storage of recyclables as well as the appropriate measures for the safe collection, storage, and disposal of two of the following: batteries, mercury-containing lamps, and e-waste.	(Mandatory) Same as LEED, but slightly more specific. Allows offsite storage and sorting.	Same as LEED, requires handling and storage facilities for recyclables and composting; does not talk specify the collection of batteries, e-waste, lamps	**✓ waste minimization, GHG reduction**
	Composting Facilities	N/A	N/A	Compost organic waste.	
	Construction and Demolition Waste	(Prerequisite) Develop and implement a C&D waste management plan. Provide final report detailing all major waste streams generated, including	(Mandatory) Similar to LEED, C&D waste management plan is required. 50% of non-hazardous C&D must be diverted. Alternative daily cover and incinerated materials shall not be	Also requires a CD&R waste management plan, but does give specific diversion rate or limit on total waste produced.	

		disposal and diversion rates.	included in the calculations. Also sets a maximum volume of Total Waste for buildings with less than 5% buildings or hardscape shall not exceed 6000 kg of waste/1000 m^2.		
		(Credit) Has provisions for waste reduction and diversion, can either divert 50% or 75%, or reduce the total waste material by limiting the total weight of waste to 12 kg/m^2 of the building's floor area.			
	Reused/Salvaged Materials	Provisions to use salvaged, refurbished, or reused products, the sum of which constitutes at least 25% of the cost of the total value of building products installed in the project	The sum of the recycled content and the salvaged material content shall constitute a minimum of 10%, based on the cost, of the total materials in the building project.	Requires the specification of used building materials and components, does not specify a certain amount or percentage of material.	✓ **waste minimization**
	Recycled Content	Provisions to use materials with postconsumer recycled content plus one-half the preconsumer recycled content, based on cost. The sum of which constitutes at least 25% of the cost of		Same as above, requires the specification of materials with recycled content. However, it doesn't specify a certain amount or percentage of material.	

		the total value of building materials installed in the project.			
	Regional materials	Achieved credit(s) when products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site used. These are valued at 200% of their base contributing cost.	A minimum of 15% of building materials or products used, based on cost, shall be sourced within 800 km of the project site.	Specify locally manufactured materials that have been selected based on LCA.	✓ **GHG reduction**
	Certified Wood	Certified wood need to be at least 25% of the total costs of materials. Wood products must be certified by the Forest Stewardship Council or USGBC approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.	Wood building components must contain at least 60% certified wood content. The use of wood products that contain endangered wood species is prohibited unless the trade conforms with the requirements of the Convention of International Trade in Endangered Species of Wild Fauna and flora (CITES).	Use lumber and timber panel products which originate from certified and sustainable sources (certified by the CSA, the FSC, or the SFI) and avoid use of tropical hardwoods). Does not specify a certain % composition required.	

	Bio-based materials	Biobased materials need to be at least 25% of the total material costs and meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must also be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material.	A minimum of 5%of building materials used, based on cost, shall be biobased products.These must comply with the USDA requirements, or must be composed of solid wood, engineered wood, bamboo, wool, cotton, cork, agricultural fibers, or other biobased materials with at least 50% biobased content.	N/A	
	Life Cycle Assessment (LCA)	(Credit) Has provisions for materials life-cycle assessment and impact to the atmosphere. There are two options. Option 1: use at least 20 different permanently installed products from at least 5 manufacturers that follow ISO standards or USGBC approved program. Option 2: use products that have low impact on the atmosphere, or	(Mandatory) Third party must review the life-cycle assessment of a product based on ISO Standards 14040 and 14044 that show compliance with cradle-to-gate requirements. (Performance) Provides more detailed guidelines for the performance option.	Requires selection of materials with the "best run" life cycle assessment for the ff: (1) foundation and floor assembly materials, (2) column and beam or post and beam combinations, and walls, (3) roof assemblies, (4) other envelope assembly materials. Apply environmental purchasing criteria or integrate the green aspects of the National Master	

		one that follows the USGBC program. Products must be sourced within 160 km of the project site valued at 200%.		Specification (NMS). Specify energy-saving, high efficiency equipment based on NMS and/or Energuide.	
	Building Life-Cycle Impact Reduction	(Prerequisite) Requires the reuse of historic buildings, maintaining at least 50% surface area of abandoned or blighted buildings, re-use and salvage of materials, OR project structures for new construction must demonstrate a minimum of 10% reduction in the following categories: global warming potential, depletion of stratospheric ozone layer, acidification of land and water sources, eutrophication, formation of tropospheric ozone, and depletion of nonrenewable energy resources.	N/A	Also requires the reuse of existing buildings: (1) retain 50-100% of existing facades in fully renovated buildings, (2) retain a minimum of 50% of the existing major structures (other than the shell i.e. walls, floors, and ceilings)	

	Building durability, adaptability and disassembly	N/A	N/A	Specify durable and low-maintenance building materials and assemblies that can withstand the following: sunlight, temperature and humidity changes; condensation; and wear-and-tear associated with the amount and type of traffic expected. Implement a building design that promotes building adaptability. Specify fastening systems that allow for easy disassembly.	
	Building Product Disclosure and Optimization - Material Ingredients	(Credit) Has provisions for the full disclosure and optimization of material ingredients. One option requires the use of at least 20 different products from 5 different manufacturers that demonstrate complete inventory of the product. Second and third options require that installed materials be at least 25% of the total material costs, and need to be sourced from	Similar to LEED, requires a multiple-attribute product declaration or certification. A minimum of 10 building products shall comply with either a Type 3 Industry-Wide Certification, Type 3 Product-Specific Declaration, or a third party multi-attribute certification (example: ANSI/BIFMA e3, NSF/ANSI 140, etc.)	N/A	

		manufacturers that optimize their material ingredients or supply chain.			
Indoor Environmental Quality (EQ)	**Outdoor Air/Preventing the Entry of Pollutants**	To achieve credit, compliance with the IAQ strategies listed below is required. Additional IAQ monitoring and prevention measured can be installed as well. Either ASHRAE 62.1-2010 (US), or CEN EN 15251-2007 and EN 13779-2007 (outside US) can be followed or show that naturally/mix-mode ventilated spaces meet CIBSE requirements.	(Mandatory) Similar to LEED, follows ANSI/ASHRAE 62.1 but with some modifications/improvements.	Provide ventilation in accordance with ANSI/ASHRAE 62-2001(?) and verify that ventilation system provides effective air exchange (that the outdoor air delivered to the space actually reaches the occupants).	**✓ investments in indoor environmental quality**

		• Install permanent entryway systems (grates, grilles, rollout mats, etc.)	Similar to LEED, but gives more detailed specifications for the entrance scraper, absorption, and finishing surfaces.	Similar to LEED and ASHRAE, but does not provide specific guidelines. It only requires to specify ventilation lining that will avoid the increase release of pollution and fibres into the ventilation air path	
		• Sufficiently exhaust each space where hazardous gases or chemicals are used (e.g. garages, janitor and copy rooms), provide self-closing doors and deck-to-deck partitions or hard-lid ceiling and maintain negative pressure. During the predesign stage, use results of simulations/models and ensure compliance with National Ambient Air Quality Standards (NAAQS).	Not directly specified, but has provisions for maintaining and monitoring indoor air quality in all areas after building occupancy	Design secure and appropriately-ventilated areas for storage of hazardous and flammable materials. Does not recommend any standards to be followed.	
		• Filters for outdoor air need to have MERV = 13 or higher, in accordance with ASHRAE 52.2-2007; or Class F7 or higher as defined by CEN	Requires compliance with ASHRAE Standard 62.1. For particulate matter filtration, MERV must be 8 or higher.	Specify a minimum of filter efficiency of 65% arrestance, or 40% atmospheric dust-spot efficiency for air distributed to occupied spaces.	

		Standard EN 779-2002.		
	Control of Indoor Pollutants	Protect absorptive materials by developing a moisture control plan. Dispose any materials susceptible to microbial growth. Only specified it for healthcare.	Similar to LEED, but applies to all buildings. Provides a brief guideline for moisture control, but does not directly state that a moisture control *plan* is required	Implement design measures to prevent the growth of fungus, mold, and bacteria on building surfaces and in concealed spaces
		N/A	N/A	Ensure easy access to the air-handling units (AHUs) for regular inspection and maintenance
		Microbial growth not directly addressed, but seems to be covered by requiring a moisture control plan	N/A	Design a humidification system to avoid the growth of microorganisms
		Prevent excessive leakage between units by sealing penetrations in the walls, ceilings, and floors and by sealing vertical chases (including utility chases, garbage chutes, mail drops, and elevator shafts)	Mentioned the sealing of all filter frames, air cleaner racks, access doors, and air cleaner cartridges to eliminate air bypass pathways.	Implement measures to mitigate pollution at source such as physical isolation of the spaces, separate ventilation, or a combination of isolation and ventilation for areas that generate contaminants.

	N/A	N/A	Design and locate wet cooling towers to avoid the risk of *Legionella*.
	N/A	N/A	Design a domestic how water system to minimize the risk of *Legionella*.
	N/A	N/A	Provide CO monitoring in enclosed parking garages.
Tobacco Smoke	(Prerequisite) Prohibits smoking inside the building and within 7.5 meter from all entries and air intakes. Signages must be posted within 3 meters of all building entrances.	Same as LEED	N/A
Emission Requirements for Indoor Materials	(Credits) Has specific threshold, emissions and content requirements for indoor products that contains VOCs, based on certain standards. This include exterior paints and coatings, adhesives, sealants, flooring, composite wood, insulation, and furnitures.	Similar to LEED, materials used indoors need to comply with certain standards.	Use interior materials, including paints, sealants, adhesives, carpets and composite wood products that are low-VOC emitting, non-toxic, and chemically inert (i.e. contain concentrations of VOC as per Environmental Choice Program limits).

During Construction	(Credit) Requires an IAQ management plan that follows the SMACNA IAQ Guidelines for Occupied Buildings under Construction. Air handling units must not be operated unless the filtration media has an MERV of at least 8 as determined by ASHRAE 52.2-2007, or F5 or higher as defined by CEN Standard EN 779-2002.	Similar to LEED, IAQ management plan is required. Also has a provision for no-idling of construction vehicles.	Does not directly mention the use of an IAQ management plan, but is somehow addressed under the *Ventilation System* section
After Construction and During Occupancy	(Credit) Can choose between flush-out before or during occupancy, or air testing before occupancy. Requirements are specified for both options. Air testing must comply with ASTM, EPA, or ISO methods.	Similar to LEED, but also talks about continuous postconstruction, preoccupancy/postoccupany flush-out. Provides detailed guidelines and formulas to be used.	Provide mechanical ventilation systems that allow for the flushing-out of the building with 100% outside air at ambient temperatures above 0°C. Does not specify when the flush-out should be conducted.
Thermal Comfort Design	(Credit) For the Thermal Comfort Design, can either follow the ASHRAE 55-2010 or the ISO and CEN Standards.	Building shall be designed in compliance with ASHRAE ASHRAE 55, Sections 6.1, "Design", and 6.2, "Documentation"	Achieve compliance with ASHRAE 55-1992, Addenda 1995 for thermal comfort.

	Thermal Control	At least 50% of individual occupant spaces must have individual thermal comfort controls whereas shared spaces must be provided with group thermal controls.	N/A	Specify personal controls over the ventilation rates, or, in naturally ventilated buildings, operable windows or trickle vents on windows.	
	Interior Lighting Control and/or Quality	(Credit) Has requirements for controls and/or lighting quality. For controls, at least 90% of all individual must have individual lighting controls with at least three levels (on, off, midlevel). All shared multi-occupant spaces must have lighting controllability as well. For lighting quality option, 4 out of 8 specific strategies can be chosen.	Also requires daylighting controls, occupancy sensors, and automatic shut-off controls, but does not specify the % of spaces that must be equipped with controls	Specify lighting controls that relate to room occupancy, circulation space, daylighting and the number of workstations in office areas.	
		N/A	N/A	Provide light levels no less than those recommended in *IESNA Lighting Handbook 2000*, for the types of tasks that are anticipated in the various building spaces (regardless of daylighting).	

		N/A	N/A	Avoid excessive direct or reflected glare, as per *IESNA RP-5, 1999. Recommended Practice of Daylighting*.	

	Daylight	(Credit) Select one of two: (1) Perform simulation to show at least 55% of spatial daylight autonomy (SDA) and maximum 10% of annual sunlight exposure are achieved, or (2) at least 75% of regularly occupied area is illuminated from 9am to 3pm	(Prescriptive) Perform simulation to show at least 50% of floor area achieve daylight. Provides detailed requirements for sidelighting, skylights, and roof monitors.	Provide ambient daylight to 80% of primary spaces. Achieve a minimum daylight factor of 0.2 for work places or living/dining areas that require moderate lighting and 0.5 for work areas requiring good lighting.	

	Views	(Credit) Use large, clear windows to provide direct line of sight for 75% of all regularly occupied floor area. Views into interior atria may be used to meet up to 30% of the required area.	N/A	Provide views to the building exterior, or to atria from all interior spaces.	
		N/A	N/A	Specify solar shading devices to enable occupants to control brightness from direct daylighting.	
	Acoustic Performance/Comfort	(Credit) HVAC noise levels must comply with 2011 ASHRAE Handbook. Composite sound transmission (STCc) ratings, reverberation time requirements, sound reinforcement and masking systems are specified for different room types.	Similar acoustical ratings as LEED, ratings are specified for outdoor and indoor assemblies	Conveys the same idea as LEED and ASHRAE, but does specify specific acoustical ratings. Requirements are very general and not specific:	
				• Site the building and zone spaces within the building to provide protection from undesired outside noise.	
				• Specify an appropriate sound transmission class rating of perimeter walls in response to external noise levels.	
				• Provide noise attenuation of the structural systems and implement	

				measures to insulate primary spaces from impact noise.	
				• Mitigate acoustic problems associated with mechanical equipment and plumbing systems noise and vibration.	
				• Specify acoustic controls to meet the acoustic privacy requirements.	
				• Specify measures to meet speech intelligibility requirements for various spaces and activities.	
	Boiler and Furnace Emissions	N/A	N/A	Specify low-Nox boilers and furnaces, which comply with ASME codes.	
Innovation	**Innovation**	(Credit) Any combination of innovation, pilot, and exemplary strategies can receive additional points (i.e., strategies not mentioned in the LEED rating system, achieving pilot credit from USGBC's LEED Pilot Credit Library).	N/A	N/A	
	LEED AP	(Credit) At least one participant of the project team must be	N/A	N/A	

		a LEED Accredited Professional (AP)			
Regional Priority	**Regional Priority**	(Credit) Earn credits by meeting regional environmental priorities.	N/A	N/A	
Commissioning and Building Operations	**Owner's Requirements**	Provisions for an owner's project requirements	Also has provisions for an owner's project requirements	N/A	
	Acceptance/Commissioning	Commissioning authority must be experienced (i.e., have worked on/documented at least 2 buildings with a similar scope of work). CxA must conduct the ff: OPR and BOD review, development and implementation of Cx plan, documentation, findings, etc.	Similar requirements to LEED, but does not specify that the CxA authority must be experienced	Requirement of an independent CxA that will perform commissioning activities.	**✓ commissioning**
	Commissioning Systems	At minimum, perform commissioning on the following systems: (1) HVAC&R systems (in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007) (2) electrical systems (3) plumbing systems (4) renewable energy systems. To achieve more points/credits,	Similar to LEED, the following systems need to be commissioned: (1) HVAC systems and controls (2) Building envelope to verify airtightness and thermal and moisture integrity (3) Lighting contols (4) Fenestration control systems (5) Irrigation (6) Plumbing systems (7) Domestic and process water pumping and mixing systems (8) Service water heating systems (8)	Does not specify which systems must be commissioned	**✓ commissioning**

		include the commissioning of energy and water-metering systems, and building envelope	Renewable energy systems (9) Water and Energy metering devices (10) IAQ systems		
	Measurement, Verification & Operation	Cx plan needs to include the analysis of energy and water-consuming systems, at least quarterly in the first year of occupancy	Requires building operations plan to include M&V Plan of water use, energy use, outdoor airflow, and plans to maintain vegetation on the site. Water and energy use need to be assessed every 3 years at minimum.	N/A?	
	Documentation	Provisions for systems manual, commissioning report and specifications, does not mention the owner's retention of these materials	Similar to LEED, the owner retains construction documents, O&M documentation, commissioning reports, and M&V materials	Provisions for "Design Intent" and "Basis Design" documentation, construction documentation, and commissioning report	
Others	**Emergency Response Plan**	N/A	N/A	Include in Division 1 the project's environmental goals and procedures with regard to emergency response.	

	Integrated design process	N/A	N/A	Use an integrated design process for the design development to identify functional and environmental priorities at the initiation of the project, evaluate options, and develop the design.	
				Solicit input from all members of the design team at each stage of the design process.	
				Use green design facilitation to support the integrated design process and involve team members throughout each stage of the project delivery.	

Draft Outcomes for a High Performance Building Policy

Various green building concepts exist that are unique from traditional building design. These concepts range from Mitigation (reducing impacts), Net Zero (typically net zero energy), to Regenerative (net positive in areas beyond energy efficiency). A Mitigation approach reduces a building's current level of greenhouse gases (GHG) emissions while maintaining building functionality and improving occupants' comfort. Achieving a LEED Gold rating combined with an energy efficiency target is an example of a Mitigation approach. In comparison, a Sustainable Building (i.e. Net Zero and Regenerative) further minimizes a building's over-all environmental impact over a course of a lifetime. A Net Zero Energy Building is a self-sufficient structure that generates enough renewable energy to meet its own annual energy consumption, whereas a Regenerative or Net Positive building produces more renewable energy than what it consumes. Additionally, a Regenerative building treats its own water on-site, operates in a pollution-free manner, and promotes healthy relationships between the built and the natural environment.

The following set of values reflect a Mitigation approach which would result in a "High Performance" building policy.

Environmental

- Energy efficiency, measured by energy use intensity and on-site renewable energy generation.
- Water efficiency/use reduction, measured by water use intensity.
- Improved indoor air quality
- Climate change impact, measured by total greenhouse gas emissions.
- Waste diversion, measured by diversion amount
- Pollution minimization (soil, water, air, light, and thermal)
- Transportation impacts

Social

- Employee health and productivity, e.g. reduced absenteeism, employee engagement and workplace satisfaction.
- Environmental sustainability leadership and public image
- Support to the growth of local green building industry
- Transportation impacts

Financial

- Reduced utility costs and demand on municipal infrastructure (water treatment and distribution, wastewater treatment, storm water management, solid waste management)
- Lower operations and maintenance costs (using a lifecycle cost approach that includes benefits of commissioning and durable building construction), including financial benefits from improved employee health and productivity

Saskatoon Environmental Advisory Committee

Social Media Policy

July 2017

This policy governs the publication of and commentary on social media by volunteers of the Saskatoon Environmental Advisory Committee (SEAC). For the purposes of this policy, social media means any facility for online publication and commentary, including without limitation blogs, wiki's, social networking sites such as Facebook, LinkedIn, Twitter, Instagram, and YouTube.

Assigned SEAC members are free to publish or comment via social media in accordance with this policy. This policy applies to all committee-related uses of social media by SEAC members who are Social Media Coordinator(s). Publication and commentary on social media carries similar obligations to any other kind of publication or commentary.

All uses of social media must follow the same ethical standards that SEAC board members must otherwise follow.

Purpose

- The purpose of SEAC's social media is about reaching and connecting with people. Social media is a cost effective way to engage stakeholders, supporters, volunteers and potential supporters and a great way to reach certain audiences. The audience can be residents of the City, City Councillors and officials, media and visitors.

Role of Social Media Coordinator(s)

- The appointment of one or more Social Media Coordinator(s) must be approved by SEAC during a regular meeting of Committee. The length of appointment as Social Media Coordinator(s) should also be determined at a regular Committee meeting. Appointment may be extended during regular meetings, but may not exceed the members' terms of appointment with SEAC. This position is to be filled on an as-needed basis and may be left vacant when no active social media campaign is underway. When the position is unfilled, it is the responsibility of the chair of SEAC to maintain administrative access to all social media accounts associated with SEAC. Alternatively, the Committee may decide, by vote during a regular Committee meeting, to de-activate all social media accounts.

Voice & Tone

- Voice: Collaborative & Informative community member
- Tone: Simple and easy to understand

E.g. (from launch of video): "The Saskatoon StarPhoenix covered the launch of our video 'Climate Change in Saskatoon.' If you haven't seen it yet, check out the video on our Facebook page!" (and included link of Star Phoenix article).

Be responsible for what you write

- SEAC board members take responsibility for what they write on SEAC social media and exercise good judgment and common sense.

Exercise good judgment

- Refrain from comments that can be interpreted as slurs, demeaning, inflammatory, etc. The Internet is full of varied opinions, and it's okay to share yours, but keep it collaborative and understanding of differences.
- As SEAC is a city committee, it is imperative that highly credible information is shared. Information that has been approved by committee is OK to share; a list of approved messaging and information has been created by committee members and approved at the Month, 2017, meeting of SEAC. As well information published by the City of Saskatoon is acceptable to share.

Be authentic and honest

- Do not say anything that is dishonest, untrue, or misleading. If you have a vested interest in something you are discussing, point it out. Include your name and when appropriate your title if needed to be identified during an online conversation.

Protect your own privacy

- Be mindful of posting information that you would not want the public to see.

Understand the concept of community

- The essence of community is the idea that it exists so that you can support others and they, in turn, can support you. You need to learn how to balance personal and professional information, and the important role that transparency plays in building a community. Your community shouldn't be an environment where competition is encouraged or emphasized, but rather a platform where your audience feel comfortable sharing, connecting, and receiving help.

- As conflicts arise, deal with them as transparently as possible. If an argument escalates beyond the point of being beneficial to the community, request the poster sends a private message for resolution. Racism, slander, and hate speech will not be tolerated. Any community members who engage in these activities should be banned and blocked.

Respect copyrights and fair use

- Always give people proper credit for content shared, and make sure you have the right to use something with attribution before you publish.

Controversial Issues

- Refer misrepresentations made about SEAC in the media to the Social Media Coordinator. Always deal with controversial issues with respect and facts. Avoid online arguments.

Disclaimer

- Reposting/sharing stories on social media doesn't mean endorsement of the source.

Remember to protect confidential & proprietary information

- It's perfectly acceptable to talk about your work and have a dialog with the community, but it's not okay to publish confidential information. Confidential information includes things such as unpublished details of current projects, financial information, confidential donors, etc. In case of doubt, discuss confidentiality with SEAC Chair or Committee Clerk.

Quality over Quantity

- Remember that in order for your social media endeavors to be successful, the content needs to engage the audience. Will it stand out from the clutter in the user's feed?
- For SEAC two quality original-content posts per month is ideal frequency.

Social Media Tips

A. Who To Follow/Avoid

• City of Saskatoon News Service is a great resource for news releases from the City Hall.
• Councillors have a wealth of information and most of them are on social media.
• Organizations with similar mandates, e.g. University of Saskatchewan, are good to follow on issues of sustainability.
• Quite often bots (automated accounts) follow you on Twitter. The best approach is to block them.

B. Avoid Commercial Advertisements

It's best to avoid commercial advertisements of all kind:

• Do not share advertising from commercial entities or political parties.
• Do share committee approved public service announcements and articles
• Time permitting, post announcements or articles from charitable and non-profit organizations.
• Avoid endorsement or implied endorsement of any political party or candidate.

References

- Social Media Policies
- Rough Draft of a Nonprofit Social Media Policy
- 10 Must Haves for Your Social Media Policy
- Social Media Networking for Non Profits

SEAC GHG Communication Talking Points

8 June 2017

(Update wording from when meeting minutes are available).

Item 7.1 Environmental & Corporate Initiatives: Re vehicle idling. SEAC supports action on Idle Free

Item 7.3 initiatives to support Energy-Efficient Building Standards in Residential construction: SEAC supports the overall plan, but want the target to be net zero buildings, not just 9.36.

Item 7.5 Waste Diversion Opportunities: SEAC supports city wide organics collection, ICI waste plan, and exploring waste as a utility.

11 May 2017

Item 9.2 That the Saskatoon Environmental Advisory Committee present its proposed targets for community-wide GHG reductions to the Standing Policy Committee on Environment, Utilities & Corporate Services at its meeting to be held June 12, 2017. (attach 2 page proposal – I don't have a clean copy)

- 15% emissions reductions below 2014 levels by 2023
- 80% emissions reductions below 2014 levels by 2050
- Set incremental targets evert 5 years after 2023
- Targets are absolute, not per capita
- Reporting to include absolute and per capita reductions

9 March 2017

Item 7.1 The Committee discussed its position on carbon pricing in conjunction with the video on climate change. It was determined that currently the Committee's main focus with the video is to raise awareness related to climate change, which has led to the Committee's GHG community reduction targets it has set.

9 February 2017

Item 9 2017 Goals and Objectives

The Committee, at its meeting held on January 12, 2017, determined to set its 2017 Goals and Objectives, the following have been put forth in this regard:
1. Support the City in the development of appropriate emissions' targets for community-wide greenhouse gas emissions reductions, including through engagement with expert stakeholders.
2. Advocate for the development of municipal practices and policies that support emissions reductions in the following domains:

(a) building codes
(b) energy efficiency including renewable energy programs, such as Solar City project
(c) waste diversion, including city-wide organics diversion(c) waste diversion, including city-wide organics diversion
(d) transportation
(e) other areas arising from target setting
3. In recognition of the role of public education and communication in achieving these goals, SEAC will continue to work towards the spring 2017 release of a short animated video on climate change in Saskatoon. Additionally, SEAC will continue to support the work of the partnership program Student Action for a Sustainable Future.
4. Given their public value as carbon sinks and how they support climate resiliency, SEAC supports biodiversity and green spaces such as Meewasin.

12 January 2017

No GHG related motions

10 November 2016

Item 7.1 That the Saskatoon Environmental Advisory Committee put forth requests to speak to the Standing Policy Committee on Environment, Utilities & Corporate Services at its November and December 2016, and January 2017 meetings of the Committee. (Notes from these SPC presentations will be filled in by SEAC Chair)

01-5536-103 - SASKATOON ENVIRONMENTAL ADVISORY COMMITTEE - 2017 BUDGET - $6,800								
DATE	**NUMBER**	**DESCRIPTION**	**DEBIT**	**CREDIT**	**BALANCE**	**GL**	**TOTAL SPENT**	**BUDGET REMAINING**
		Beginning Balance						**$6,800**
		Total					**0**	

2017 Budget		
Student Action for a Sustainable Future (SASF) program		1,800
Public Education/Information Gathering		5,000
2017 Total		**6,800**
2017 Forecast		**6,800**
2017 Forecasted Variance		**0**

2017 Actuals		
2017 Budget		**6,800**
2017 Variance (Under)		**-6800**