



P.O. Box 1749  
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**Item No. 1**  
**Halifax Regional Council**  
**December 10, 2019**

**TO:** Mayor Savage and Members of Halifax Regional Council

**SUBMITTED BY:** Original Signed

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Kelly Denty, Director, Planning & Development

Original Signed by 

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Jacques Dubé, Chief Administrative Officer

**DATE:** November 12, 2019

**SUBJECT:** **Climate Action Plan Update**

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**INFORMATION REPORT**

**ORIGIN**

On October 30, 2018, the following motion of Regional Council was put and passed:

*“That Halifax Regional Council request a staff report to investigate a Municipal Climate Change Directorate (MCCD) working under the direction of the Chief Administrative Officer (CAO), to outline what HRM must do to meet the outcomes of the Intergovernmental Panel on Climate Change (IPCC) Special Report 1.5C of 2018. The goals of the MCCD to be as follows:*

- 1. To provide HRM with an Climate Change Action Plan (CCAP) in the summer of 2019;*
- 2. To provide HRM with, based on the best scientific evidence, a path to meet the first IPCC 1.5C target by cutting total CO2 emissions by 40% by 2030; and*
- 3. To provide a Climate Change Action Plan to meet the IPCC targets of zero CO2 emissions by 2040.”*

On January 29, 2019, the following motion of Regional Council was put and passed:

*“THAT Halifax Regional Council request that staff prepare a report and recommendations and return to Council within one year with respect to:*

- 1. The recognition by HRM Council that the breakdown of the stable climate and sea levels under which human civilization developed constitutes an emergency for HRM.*
- 2. That staff provide Regional Council with an update on current staff reports pertaining to climate change, including, but not limited to, the report for the creation of a Climate Directorate, reporting directly to the CAO, and the Green Network Plan.*
- 3. The incorporation into the Municipality’s climate targets and actions the need to achieve net-zero carbon emissions before 2050 and net negative carbon emissions in the second half of the century.*

4. *The establishment of a remaining carbon budget for corporate and community emissions commensurate with limiting warming to 1.5°C and an annual reporting process with respect to the expenditure HRM's remaining carbon budget.*"

## **LEGISLATIVE AUTHORITY**

*Halifax Regional Municipality Charter*, Section 34(3): "The Council shall provide direction on the administration, plans, policies, and programs of the Municipality to the Chief Administrative Officer."

## **BACKGROUND**

This report addresses the climate emergency motion passed by Regional Council on January 29, 2019, to provide an update on the development of HalifACT 2050 and other climate change initiatives.

### HalifACT 2050 and the October 2018 IPCC Special Report

HalifACT 2050: Acting on Climate Together is the Municipality's long-term climate action plan to reduce emissions and help communities adapt to a changing climate. This plan is an update and consolidation of two existing priority plans; the 2014 Regional Plan Community, Energy Plan (2007; 2016) and the Corporate Plan to Reduce GHG Emissions 2012-2020 (2011). Climate change adaptation is also being considered in this plan. The plan aligns HRM's efforts to support international, national and provincial energy and climate change initiatives that seek to responsibly transition Canada to a low-carbon economy by 2050. These initiatives include the 2015 Paris Agreement, the 2016 Pan-Canadian Framework on Clean Growth and Climate Change, and the objectives of Nova Scotia's *Environment Act* and the *Environmental Goals and Sustainable Prosperity Act*, among others. HalifACT 2050 will support HRM's ongoing climate change mitigation and adaptation commitments under the Global Covenant of Mayors for Climate & Energy, the Canadian Partners for Climate Protection partnership.

In October 2018, the Intergovernmental Panel on Climate Change (IPCC) released a special report that stressed the need to limit global warming to 1.5°C above pre-industrial levels within the next 12 years to prevent irreversible economic, environmental and social impacts.<sup>1</sup> To meet this target, the report stated that governments around the world need to influence aggressive policies to:

- Reduce emissions within the current building stock by 80-90%;
- Reduce emissions within the transport sector by 30%; and
- Generate 75-85% of our electricity through renewables.

On January 29, 2019, Regional Council declared a climate emergency, emphasizing that climate change is a serious and urgent threat to our community. While the development of HalifACT 2050 began earlier in spring of 2018, it is able to incorporate the new findings by the IPCC and to respond to Council's subsequent climate emergency declaration.

To assist in the development of HalifACT 2050, the Municipality contracted Sustainable Solutions Group (SSG), an environmental consulting company specializing in climate change mitigation and adaptation modelling. SSG has worked with more than 60 Canadian municipalities to develop climate action plans.

### Mitigation and Adaptation

Climate change mitigation refers to reducing the amount of greenhouse gas emissions emitted to the atmosphere. Such emissions are changing the global climate. The Municipality's current mitigation target,

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<sup>1</sup> IPCC SR1.5, SPM, 2018 <https://www.ipcc.ch/site/assets/uploads/sites/2/2018/12/SPM-for-cities.pdf>

as set out in the Corporate Plan to Reduce Greenhouse Gas Emissions 2012-2020 (2011) is to be 30% below 2008 emissions levels by 2020. This target includes emissions associated with municipally-owned buildings, streetlights and sportsfield lights, and municipal fleet vehicles. No community-wide emissions reduction target currently exists. Community-wide emissions refer to all greenhouse gas emissions created within the municipal boundary by all residents, businesses, industry and utilities.

Climate change adaptation refers to actions to prepare for the impacts of climate change to prevent or minimize damage and loss. Well planned, early adaptation action saves money and protects people, property and infrastructure. HalifACT 2050 will propose adaptation priorities that reflect community and stakeholder interests and needs with a focus on safety and resiliency.

## **DISCUSSION**

HalifACT 2050 is being developed using a three-pronged approach: 1) stakeholder engagement (both internal and external); 2) technical modeling and analysis to inform targets and pathways; and, 3) public engagement to define actions to be undertaken in order for the Municipality to address climate change. Importantly, HalifACT 2050 is being developed through a lens of social equity and inclusion.

### **Stakeholder Engagement**

As the success of HalifACT 2050 relies heavily on community action, stakeholder engagement and public consultation is critical for evaluating the complex issue of climate change and in finding solutions to existing barriers to mitigation and adaptation. To inform both the pathway to a low carbon economy and priority actions to achieve a 2050 target, the core HalifACT 2050 team held meetings with over 250 internal and external stakeholders including all levels of government, utilities, non-profits and advocacy groups, academics and educators, industry, indigenous peoples, African Nova Scotian communities, Acadian groups, youth and more.

The engagement sessions invited representatives from more than 100 external stakeholder associations to represent the emissions reduction and adaptation interests, goals and ambitions of all sectors of Halifax's community and economy. A complete list of stakeholder organizations is included in Attachment A. The aim of the external leadership team is to scope and determine long-term emissions reduction targets and adaptation priorities out to 2050 and frame the role their sector or organization can play as a partner with the Municipality in acting on climate change.

To assist in the determination of the municipal response to climate change, more than 100 staff members from across the Municipality were invited to participate in an internal consultation process on mitigation and adaptation priorities. Business units and divisions are key stakeholders, each with a role and stake in determining new mitigation targets and actions, along with adaptation priorities.

Internal and external leadership teams have met three times this year for full day meetings, with the last meeting in October combining the two teams together for a full morning of mitigation work and an afternoon of adaptation work. All external leadership meetings were facilitated by New Leaf, a professional facilitation business. Meetings included presentations from the HalifACT 2050 project team and SSG, along with activities that allowed for individual reflection and round table discussions, often by sector or area of interest.

Stakeholders have provided input into the modelling process, data sources, assumptions, the Business As Usual Scenario, and three Low Carbon Scenarios that were explored. They also informed the Actions Catalogue and Multi-Criteria Assessment (MCA) to assist in prioritizing the types of actions that can be used to reduce emissions. Adaptation barriers, strengths and possible actions were also explored through these stakeholder teams. The need for strategies rooted in the principles of equity and accessibility was a large focus of the group.

## Public Consultation

Public engagement has focused on raising awareness on climate change and the development of a new climate strategy. A communications strategy was created at the beginning of plan development and includes an extensive social media campaign, online engagement tools ([www.halifax.ca/climate](http://www.halifax.ca/climate) and Shape Your City<sup>2</sup>) hosting several surveys, resources and upcoming engagement events, along with a unique name and brand with postcards (in both English and French), posters and banners for use in public settings.

The HalifACT 2050 project team has conducted more than 35 informal “pop-up” events throughout the Municipality through the summer and fall of 2019. These informal engagement sessions have been beneficial in providing the team with an opportunity to raise awareness for HalifACT 2050 and to gain key insights with respect to public opinion on climate change and community-level climate hazards and impacts.

The online Shape Your City site has had more than 2,400 visits and 750 survey responses. The site features an interactive map where respondents can add place-based information on local climate change hazards (e.g., flooding, drought), as well as a mitigation survey exploring their willingness to undertake mitigation actions and the barriers they may encounter to doing so. A survey called “All our Ideas” was used to develop criteria (priorities) against which the mitigation & adaptation actions can be evaluated in MCA. This site has received more than 21,500 votes to date, with clean water, clean air, GHG emissions, food security and public health ranked as top adaptation areas of interest.

Past and upcoming formal presentations on HalifACT 2050 to key stakeholders and the public include:

- Smart Energy Conference 2019
- Environmental Services Association Maritimes (ESAMS)
- Transition Bay St. Margaret’s Bay Climate Emergency Preparedness Event 2019
- Parternariat Acadien et francophone de Halifax (PAFH)
- JEM teams (HRM Joint Emergency Management teams)
- Youth Advisory Committee
- East Preston Rate Payers Association
- Akoma Family Centre
- Canada’s Ambassador for Climate Change
- MacEachen Institute for Public Policy and Governance
- African United Baptist Association (AUBA)
- Canadian Oil Heat Association - NS Chapter AGM
- Salon d’exploration d’emplois bilingue, Canadian Parents for French NS Chapter
- DCI Education Day (Design and Construction Institute of Nova Scotia)
- Dalhousie University class presentations
- International Oceans Institute Policy and Governance Program in Halifax
- Halifax Blue Line Initiative 2019 Speakers Panel
- Teens Talk Now Youth Expo 2019
- Liveable Cities Forum

Community engagement continues in partnership with the municipal Emergency Management Office and the Joint Emergency Management (JEM) teams. The HalifACT 2050 project team will be hosted by each JEM team to engage their communities on emergency preparedness and community resiliency with respect to climate hazards. The workshops will include a brief presentation on the climate strategy, followed by mapping exercises where participants will document any experienced climate hazards (e.g. flooded road or basement) as well as climate vulnerabilities and resources in their communities. This engagement was done as a pilot project in Eastern Passage/Cow Bay and will now be refreshed and repeated in all regions where JEM teams are active.

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<sup>2</sup> <http://shapeyourcityhalifax.ca/halifACT2050>



Given the importance of continued action on the global climate crisis, which affects every sector of society, public and stakeholder engagement will continue as the plan is completed as well as through its implementation. Maintaining strong partnerships with stakeholders is critical for success.

## Technical Results

### CLIMATE CHANGE MITIGATION

In January 2019, the Municipality retained Sustainability Solutions Group (SSG) to undertake technical modelling to establish a baseline community emissions inventory, a Business As Usual (BAU) emissions scenario, to define the municipality's remaining carbon budget and to model several emissions reduction pathways. A community-wide emissions baseline for year 2016 has been developed, along with a BAU scenario from 2016-2050. Three low carbon scenarios have been developed to explore emissions reductions associated with various actions and level of deployment to 2050.

Wherever possible, the scenarios were guided by future actions defined in existing municipal plans, such as the Integrated Mobility Plan, Centre Plan and Halifax Green Network Plan. The energy and emissions model includes all energy consumption and GHG emissions associated with HRM's population and building stock, and considers where people live and work, and how they move around the municipality.

#### Business-as-Usual emissions scenario

A baseline community GHG emissions inventory for 2016, and a BAU projection to 2050 was modelled to determine existing GHG emissions, and projected emissions out to 2050 (Figure 1). The BAU was designed using the Centre Plan's growth scenario.

The BAU scenario illustrates the anticipated emissions associated with population and employment growth projections for HRM. This BAU scenario assumes that no additional policies, actions or strategies to address energy and emissions are implemented between 2017-2050, other than those currently underway or planned (e.g. BAU includes Nova Scotia Power's projected/currently planned projects to reduce emissions of the electricity grid out to 2050).

- Under a BAU scenario, emissions are expected to decrease from 5.8 MtCO<sub>2</sub>e (megatonnes of carbon dioxide equivalent) in 2016 to 3.9 MtCO<sub>2</sub>e in 2050 (-33%)
- Per capita emissions are projected to decrease from 13.1 tCO<sub>2</sub>e/person (tonnes of carbon dioxide equivalent per person) in 2016 to 6.8 tCO<sub>2</sub>e/person in 2050 (-48%);
- Most of the emissions reductions in the BAU are a result of the projected decarbonization of the provincial electricity grid and expected electrification of the transportation sector.

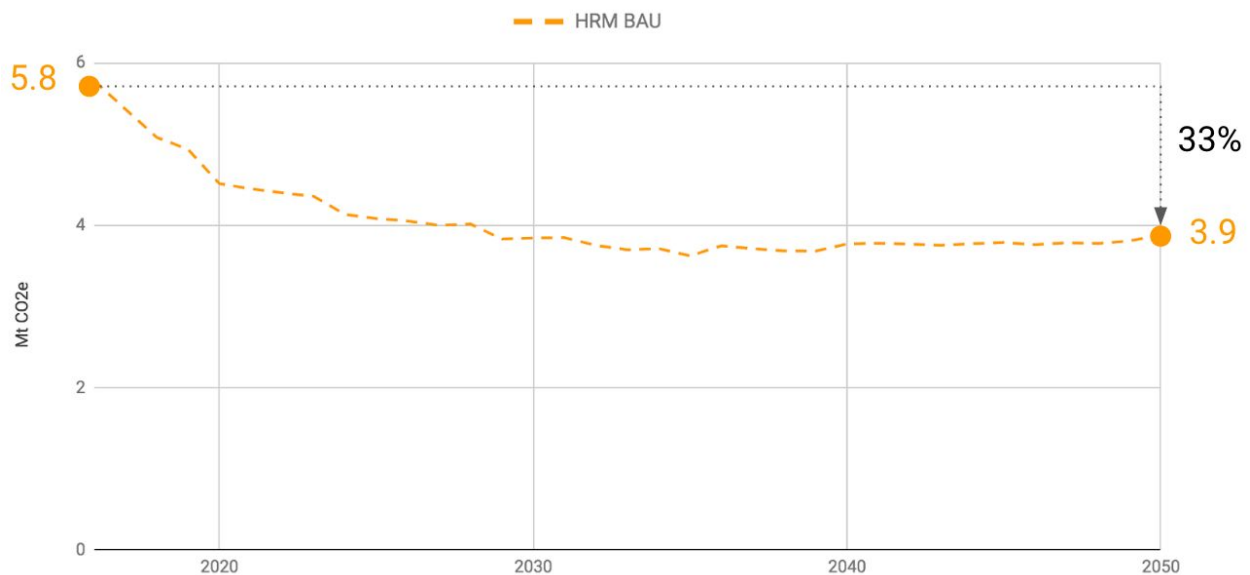


Figure 1. Projected BAU emissions (MtCO<sub>2</sub>e), 2016-2050.

Reductions aligning with the Paris Agreement (2015) and subsequent IPCC Special Report on Global Warming of 1.5°C (2018)

The Paris Agreement's long-term temperature goal is to reduce greenhouse gas emissions to keep the increase in global average temperature well below 2 °C above pre-industrial levels, and to pursue efforts to limit the increase to 1.5 °C, recognizing that this would substantially reduce the risks and impacts of climate change. Subsequently, the Special Report on Global Warming of 1.5°C (SR15), published by the Intergovernmental Panel on Climate Change (IPCC) in October 2018, indicates that climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C. As such, limiting warming to 1.5°C has become the new benchmark for determining needed emissions reduction pathways and carbon budgets. SR15 indicates that limiting global warming to 1.5°C with no or limited overshoot requires rapid and far-reaching transitions in energy, land, urban and infrastructure systems (including transportation and buildings), and industrial systems.

Two emissions reduction pathways (1.5°C and 2°C) were developed by SSG to establish a benchmark for emissions reduction targets in 2050, and carbon budgets (cumulative emissions 2020-2050) for the municipality that align with limiting global temperatures to 1.5C and 2C. To align with the Paris Agreement, the Municipality should be pursuing, at a minimum, emissions reductions consistent with 2°C. To align with SR15, the Municipality should be pursuing emissions reductions consistent with 1.5°C.

Municipal Targets

To be consistent with a 2°C pathway, the municipality needs to reduce its emissions 74% by 2030 and 91% by 2050 from the 2016 baseline. To be consistent with a 1.5°C pathway, the municipality needs to reduce its emissions 75% by 2030 and 100% by 2050 from the 2016 baseline (Figure 2).

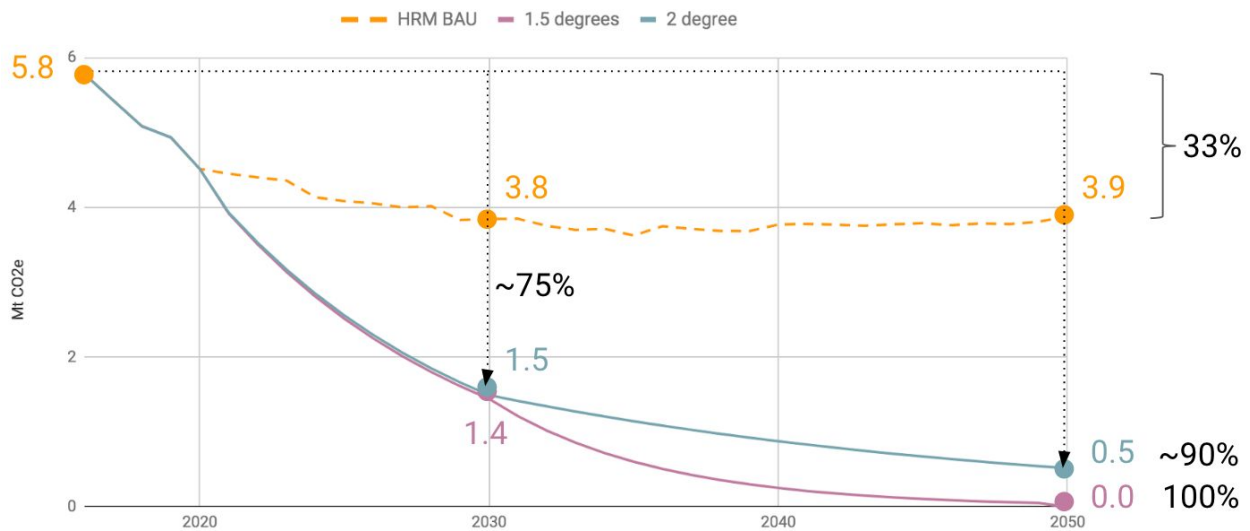


Figure 2. Percentage reductions to align with 1.5C and 2C emissions targets.

Initially, HalifACT 2050 stakeholders explored possible emissions reduction targets, including an 80% reduction by 2050, carbon neutral by 2050 and carbon neutral by 2040. However, with the release of SR15 it became clear that anything less than carbon neutral by 2050 would put the municipality out of step with respect to meaningful climate action. There is large support from stakeholders for this target, which aligns with Regional Council’s climate emergency declaration, the IPCC report and the recently announced provincial target for Nova Scotia. The modelling is intended to explore actions and opportunities for how we can collectively achieve this level of reduction. The targets were used as guiding parameters to establish scenarios and get a sense of the level of action and deployment needed over the next 30 years.

### Carbon budget

A carbon budget is the estimated total amount of carbon dioxide equivalent that can be emitted to the atmosphere while remaining within the advised global temperature threshold. Carbon budgets can be calculated at various scales, from global to local.

Under a BAU scenario (i.e. in the absence of significant efforts to reduce emissions), the municipality will exceed the 1.5°C budget by 2028, and the 2°C budget by 2030 (Figure 3).

- Under a BAU scenario, the municipality will emit 121 Mt CO<sub>2</sub>e between 2020 and 2050.
- To be consistent with a 2°C pathway, the municipality’s carbon budget is 48 MtCO<sub>2</sub>e between 2020-2050.
- To be consistent with a 1.5°C pathway, the municipality’s carbon budget is 37 MtCO<sub>2</sub>e;

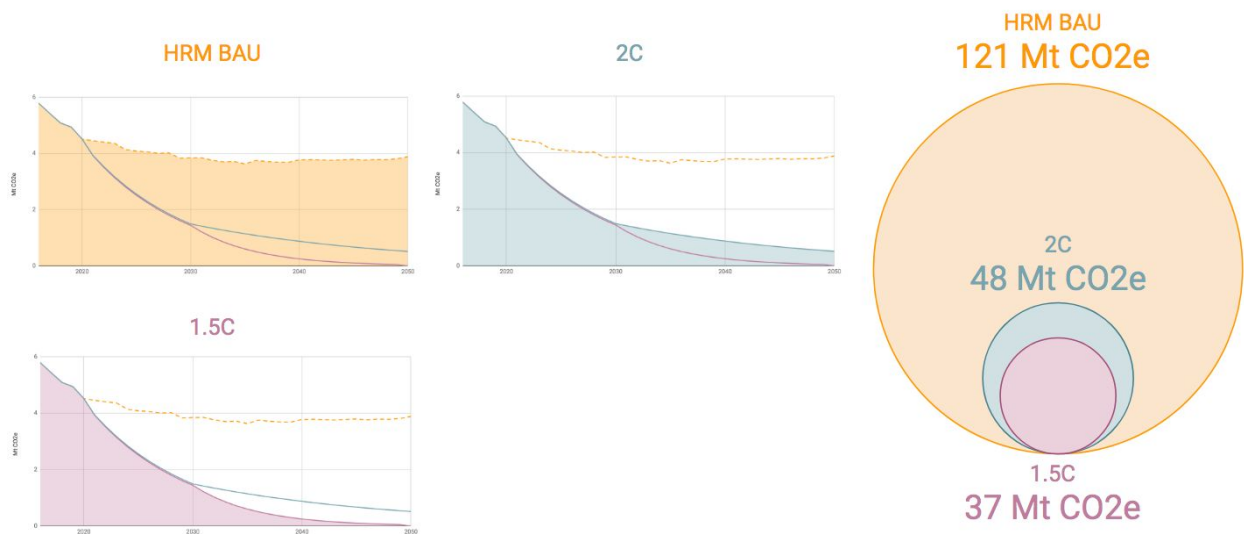


Figure 3. Cumulative carbon 2020-2050 (Mt CO2e) for HRM BAU, 1.5C and 2C.

These initial results indicate that significant and transformative action is needed in the near-term to reduce emissions to align with IPCC/Paris targets and carbon budget.

### Next Steps

SOG developed a catalogue of potential actions to guide the implementation plan for HalifACT 2050 (Attachment B). A multicriteria analysis (MCA) of these actions will be conducted based on public and stakeholder input. An MCA is a decision-making tool that evaluates actions based on a variety of attributes including capital cost, emission reductions, public health, economic impact and more. Through Shape Your City Halifax<sup>3</sup> all stakeholders can continue to provide feedback to assist the Municipality in prioritizing different social, economic and environmental concerns. As the success of HalifACT 2050 relies heavily on community action, an MCA informed through public feedback is crucial for evaluating multi-dimensional problems such as climate change.

SOG will produce a wedge diagram of the recommended actions that will show their respective contributions to reducing emissions over time. An example of a wedge diagram is shown as Figure 4.

<sup>3</sup> <https://www.shapeyourcityhalifax.ca/halifact2050>

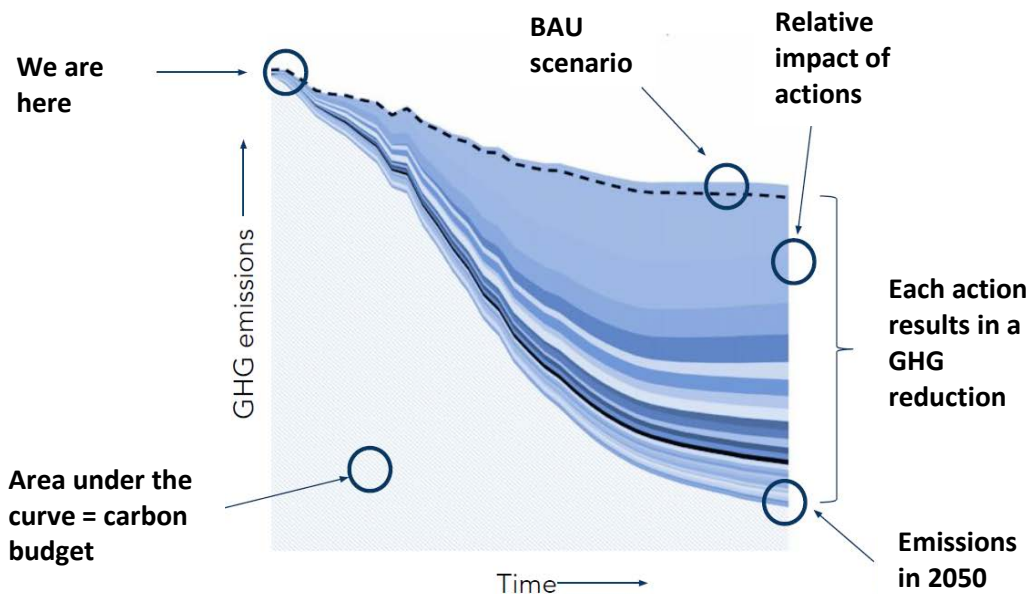


Figure 4: Low carbon modelling using a wedge diagram

The proposed low-carbon actions will be detailed along with their respective emissions impacts and associated high level costs. **The cost estimates will not be limited to Municipally-incurred costs but will represent community costs - overarching costs to all participating stakeholders.** Wherever possible, the financial benefits of the actions will be included as well. Proposed actions for the Municipality will be set forth in the plan, which will include estimated costs and resource needs.

SOG is still in the process of vetting the low carbon scenario results. However, preliminary results indicate that that **significant and transformative action** is needed in the **near-term** to reduce emissions per IPCC/Paris targets and carbon budget. Key areas of action to quickly and significantly reduce emissions include:

- achieving net-zero energy for new residential and non-residential buildings;
- retrofitting existing buildings to net-zero;
- adding renewable energy on existing buildings;
- electrification of transportation, and
- large-scale renewable energy development.

Other significant actions that need to be done simultaneously include transit improvements, district energy systems, and waste and wastewater reductions and energy capture.

## CLIMATE CHANGE ADAPTATION

### Climate projections

Downscaled climate projections for Halifax indicate significant increases in annual and seasonal average temperatures, peak temperatures, and heat extremes. In general, Halifax is expected to see warmer winters, much warmer summers, and extended periods of heat and heat waves. The growing season is projected to become longer as spring and fall temperatures increase along with a decline in frost days. This,

however, does not imply that growing conditions will necessarily improve, as changing temperature and precipitation patterns and extreme events pose risks for crops. Overall, annual and seasonal precipitation is projected to increase. However, alongside increasing temperatures, specifically in the winter and spring, more precipitation is expected to fall as rain and not snow, resulting in wetter springs and winters, decreased snowpack, and earlier or more variable spring runoff. Attributable to changing temperatures and precipitation patterns locally, regionally and globally, extreme events are expected to increase in both intensity and frequency.

### Climate hazards

Climate hazards arise from the climate system and result from natural climate variability as well as change caused by human action (anthropogenic emissions that has caused the climate to change). Climate hazards can be either climate-related physical events (shocks), such as extreme events, or climate change trends (stresses), such as sea level rise, that result in an impact for natural, built and/or human systems.

Anticipated climate hazards include:

- Heat waves
- Hurricanes
- Storms (rain/snow/ice)
- Storm surge
- Extreme high water-levels
- Heavy rainfall
- Flooding
- Wildfires
- Higher temperatures
- Increased precipitation
- Wetter springs & winters
- Decreased snowpack
- Sea-level rise
- Vector & water borne diseases
- Invasive species

### Risks & Impacts

The climate projections used in this work are specific to Halifax, downscaled from global climate models. The risks and impacts generally applicable to Halifax and other coastal communities are described below and are categorized based on who or what is at risk. Further detailed risk assessment will be required to better understand infrastructure vulnerabilities.

*Physical infrastructure* [includes buildings, transportation (roads, bridges, railways), energy supply, ICT, water & wastewater infrastructure etc.]:

- Damage from extreme weather events such as heavy precipitation, hurricanes/high winds, storms, and flooding
- Damage to coastal infrastructure & property from inundation, saltwater intrusion, and coastal erosion due to sea-level rise and storm surges
- Increased probability of power outages and grid failures
- Increasing risk of cascading infrastructure failures.

*Water supply:*

- Reduced water quality and quantity (declining or less regular water supply) due to changing precipitation patterns, diminishing snowpack, earlier or more variable spring runoff, increasing temperatures, inundation and saltwater intrusion from sea level rise and storm surge.

*Food systems:*

- Adverse impacts on agricultural crops (decreased crop yield and decreased nutritional quality of crops grown)
- Increased food prices

- Contaminated water and food supplies
- Increases in new and existing pests and diseases
- Damage and disruption to food supply and distribution infrastructure from extreme events.

*Ecosystems:*

- Threats to biodiversity, ecosystem resilience, and the ability of ecosystems to provide a range of benefits to people (such as environmental regulation, provision of natural resources, habitat, and access to culturally important activities and resources).

*Natural resources industries:*

- Risks to fisheries and fish stocks, including declining fish stocks and less productive/resilient fisheries due to changing marine and freshwater conditions, ocean acidification, invasive species, and pests
- Risks to forestry, including declining forest health and lower production of timber and forest products due to changing weather patterns, increasing frequency of extreme weather events, increasing range of invasive species and/or pests, and growing prevalence of wildfires.

*Human health and wellbeing:*

- Adverse impacts on physical and mental health due to hazards such as extreme weather events, heatwaves, lower ambient air quality, and increasing ranges of vector-borne pathogens.

*Emergency services:*

- Increased demands on emergency services (full-time and volunteer emergency service personnel and non-government organisations) from extreme weather events, along with decreased recovery times as events happen more frequently and or concurrently.

*Economy and business:*

- Risk of financial impacts to businesses and organizations from direct damage or interruptions to assets, operations, supply chain, transport needs, and employee safety
- Financial performance may also be affected by changes in water availability, sourcing and quality, and grid reliability.

*Governance and capacity:*

- Risks related to the capacity of government to effectively provide public services, manage and respond to climate risks, and maintain the public's trust, including new or increased obligations on government policies, programs, and budgets.

Next Steps

Consultation on adaptation is ongoing, and the next effort will be hosted by the JEM teams to discuss climate hazard mapping and emergency preparedness in communities across the municipality. Stakeholders have recently completed a workshop to inform adaptation priorities and barriers, and to propose actions. These results, along with ongoing public input, will be synthesized to inform adaptation priorities and actions in the final HalifACT 2050 plan.

A high-level estimate of total costs to implement and resource climate action will also be included in the final plan, which is targeted to be presented to Regional Council for consideration in March 2020. The plan will also inform consideration of human resource requirements to manage and deliver on its implementation.



### **FINANCIAL IMPLICATIONS**

There are no financial implications directly related to this information report. HalifACT 2050 is funded by a transfer from fiscal services for strategic studies. An estimate of the total community costs of implementation (by the Municipality and other stakeholders) will be included in the final plan. Immediate proposed costs for Municipal actions will be included where possible. For some of the actions, further development of a project or program will be required to better understand the financial implications.

If Council chooses to implement the elements of the climate action plan, there could be a significant investment involved in achieving the plan outcomes. Pending the level of investment Council chooses to make, there could be a need to fundamentally change Municipal priorities and funding models. HalifACT 2050 will provide enough detail to enable Council to make informed decisions on how they want to proceed and what level of investment they deem appropriate. Some outcomes may be achieved through changing priorities of existing budgets while others may require additional budgets. If additional resources are required, this will be brought forward for Council's consideration during future operating and capital budget processes.

### **COMMUNITY ENGAGEMENT**

Extensive public and stakeholder engagement has been completed, and engagement will continue for HalifACT 2050, as described in the discussion section above.

### **ATTACHMENTS**

Attachment A: HalifACT 2050 List of External Stakeholders  
Attachment B: HalifACT 2050 Actions Catalogue

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A copy of this report can be obtained online at [halifax.ca](http://halifax.ca) or by contacting the Office of the Municipal Clerk at 902.490.4210.

Report Prepared by: Shannon Miedema, Manager, Energy & Environment, 902.490.3665

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Attachment A: HalifACT 2050 List of External Stakeholders

1	ACOA Atlantic Canada Opportunities Agency
2	Affordable Housing Association of Nova Scotia
3	Africville Heritage Museum
4	Akoma Family Centre / Akoma Holdings
5	Ambassatours Gray Line
6	Assembly of Nova Scotia Mi'kmaq Chiefs
7	Atlantic Policy Congress of First Nation Chiefs Secretariat
8	Atlantic Provinces Association of Landscape Architects
9	Atlantic Provinces Trucking Association
10	Black Cultural Centre of Nova Scotia
11	Building Owners & Managers Association of NS
12	Canada Green Building Council
13	Canadian Automobile Association, Atlantic Office
14	Canadian Centre for Policy Alternatives
15	Canadian Home Builders' Association - NS
16	Canadian Oil Heat Association, NS Chapter
17	Canadian Solar Industry Association
18	Canadian Wind Energy Association
19	CarShare Atlantic
20	Citizens Climate Lobby Halifax Chapter
21	Clean Foundation
22	CN Rail Atlantic Canada
23	Coastal & Ocean Information Network Atlantic
24	Confederacy of Mainland Mi'kmaq
25	Conseil communautaire du Grand Havre
26	Conseil de développement économique de la Nouvelle-Écosse
27	Conseil de la jeunesse de la Nouvelle-Écosse
28	Conseil scolaire acadien provincial
29	Dalhousie Department of Electrical and Computer Engineering
30	Dalhousie Office of Sustainability
31	Dalhousie Transportation Collaboratory (DalTRAC)
32	Dalhousie University
33	Dalhousie University School of Nursing
34	Downtown Halifax Business Commission
35	Ducks Unlimited Canada
36	East Preston Ratepayers' Association
37	Eastern Shore JEM Team
38	Ecology Action Centre
39	Efficiency Nova Scotia
40	Electric Vehicle Association of Nova Scotia
41	Environment & Climate Change Canada
42	ExxonMobil Canada Ltd - Maritime Fuels Ltd
43	Fisheries & Oceans Canada
44	Fusion Halifax
45	Halifax Chamber of Commerce
46	Halifax Food Policy Alliance

Attachment A: HalifACT 2050 List of External Stakeholders

47	Halifax International Airport Authority
48	Halifax Partnership
49	Halifax Port Authority
50	Halifax Regional Water Commission
51	Heritage Gas
52	Hope Blooms
53	Housing Nova Scotia
54	IKEA Halifax
55	Immigrant Services Association of Nova Scotia (ISANS)
56	iMatter Youth Movement Halifax
57	Insurance Bureau of Canada
58	Investment Property Owners' Association NS
59	Irving Oil Limited
60	It's More Than Buses
61	Lucasville Greenway Society
62	Maritime Aboriginal Peoples' Council
63	MARLANT Safety & Environment Office (DND)
64	Mi'kmaw Native Friendship Centre
65	Mount Saint Vincent University
66	Musquodoboit Trailways Association
67	Nova Scotia Business Inc
68	Nova Scotia Health Authority
69	Nova Scotia Museum
70	Nova Scotia Nature Trust
71	Nova Scotia Power
72	Nova Scotia Woodlot Owners & Operators Association (NSWOOA)
73	NRCan CanmetENERGY Office
75	NRCan Canadian Hydrographic Service
76	Nova Scotia Association of Black Social Workers
77	Nova Scotia Coalition for the Decade for People of African Descent (DPAD)
78	Nova Scotia Energy & Mines
79	Nova Scotia Environment - Climate Change Unit
80	Nova Scotia Federation of Municipalities
81	Nova Scotia Lands & Forestry - Forest Management Planning
82	Nova Scotia Municipal Affairs
83	Nova Scotia Transportation & Infrastructure Renewal
84	Nova Scotia Community College Ivany Campus
85	Public Safety Canada
86	Quality Concrete Ltd
87	QUEST Canada
88	Railway Association of Canada
89	Réseau Santé
90	Sackville Rivers Association
91	Saint Mary's University
92	Sipekne'katik First Nation
93	Solar Nova Scotia

Attachment A: HalifACT 2050 List of External Stakeholders

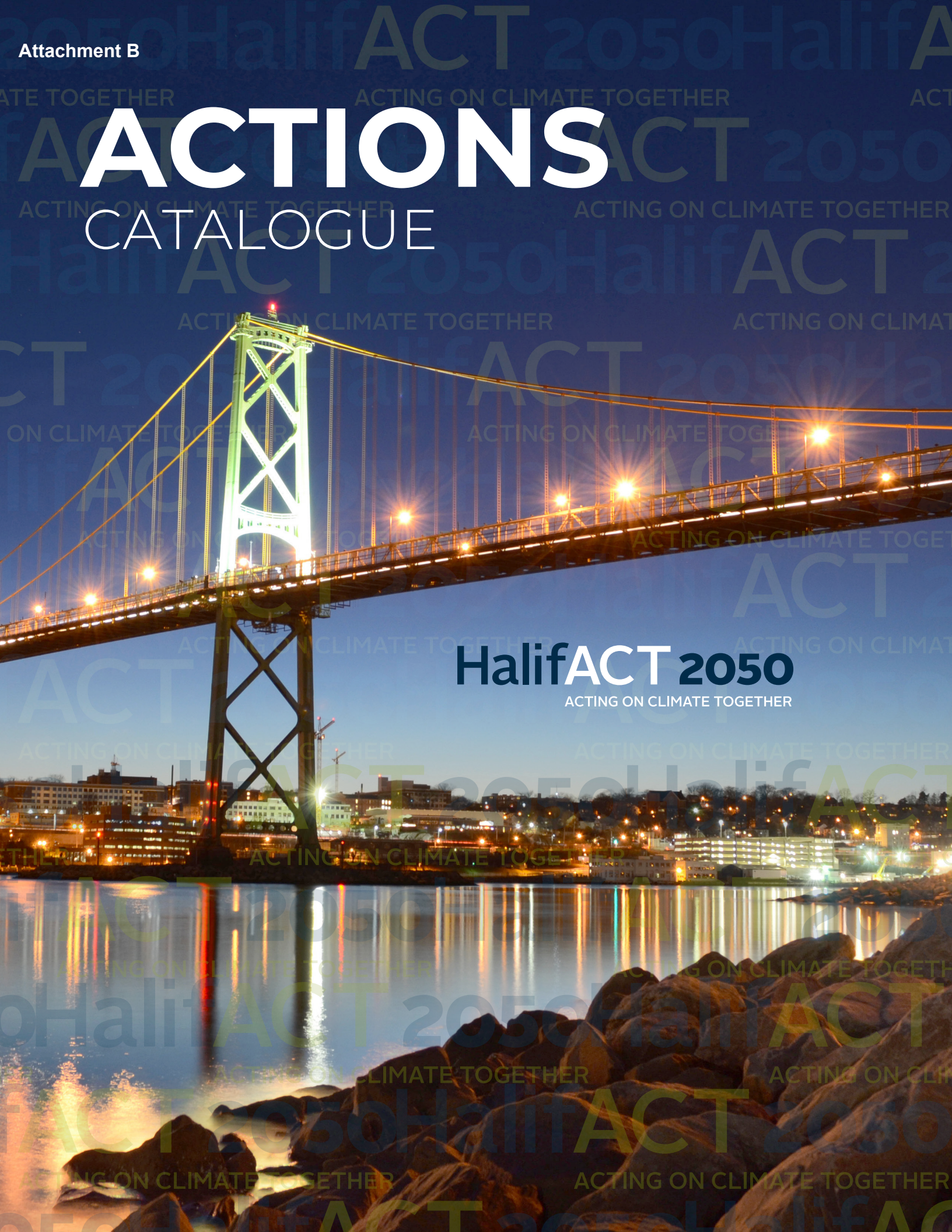
94	Superior Gas Liquids
95	Thinkwell Shift
96	Transport Action Atlantic
97	United Way Halifax
98	Urban Development Institute
99	VIA Rail
100	Waterfront Development Nova Scotia
101	Wilson Fuel Company Ltd



# ACTIONS

## CATALOGUE

**HalifACT 2050**  
ACTING ON CLIMATE TOGETHER







# About this catalogue

This actions catalogue has been developed through research on best practices to reduce greenhouse gas emissions in cities, and is intended to showcase a suite of potential actions that HRM and stakeholders may consider for implementation in the HalifACT2050 plan (currently under development). In this context, the actions contained herein are not necessarily prescriptive, nor comprehensive; they are intended to catalyze discussion and debate, and support the development of a Halifax-specific set of actions to be implemented through HalifACT2050.

## Themes

	<b>BUILDINGS</b>	<b>1</b>
	<b>TRANSPORTATION</b>	<b>7</b>
	<b>ENERGY SUPPLY</b>	<b>12</b>
	<b>WASTE</b>	<b>16</b>
	<b>WATER &amp; WASTEWATER</b>	<b>18</b>
	<b>GREEN &amp; BLUE INFRASTRUCTURE</b>	<b>21</b>
	<b>FOOD &amp; AGRICULTURE</b>	<b>23</b>
	<b>LAND USE</b>	<b>24</b>
	<b>FINANCE &amp; ECONOMIC DEVELOPMENT</b>	<b>27</b>



# POTENTIAL CO-BENEFITS

The set of icons at the foot of each page indicates potential co-benefits of the low-carbon strategies. Highlighted icons indicate that the co-benefit could be realized as a result of employing the strategies.



**REDUCED AIR POLLUTION**



**ECONOMIC PROSPERITY**



**IMPROVED INDOOR AIR QUALITY**



**RESILIENCE**



**SOCIAL EQUITY**



**INCREASED PHYSICAL ACTIVITY**



**REDUCED NOISE POLLUTION**



**HEALTHY DIET**



**REDUCED RISK OF INJURY**

# SAMPLE PAGE



## BUILDINGS

### Building performance rating and reporting

←..... *This is the STRATEGY under which several mechanisms to reduce emissions are grouped.*

#### DESCRIPTION

Building performance monitoring, reporting and benchmarking measures are critical enablers in achieving emissions reduction goals. They allow the city to compile building data from a range of uses and track energy performance (and therefore GHG emission reductions) year by year, enabling cities to understand where to target their continued efforts.

←..... *A brief description of the strategy.*

#### SAMPLE MECHANISMS

- Advanced metering (smart, net and sub-metering)
- Benchmarking
- Energy performance certification
- Mandatory audits and advice

←..... *These are MECHANISMS that are associated with the sub-caterogy. They can be made up of plans, policies or programs. The actual implementation of these (considered ACTIONS) contributes to reducing emissions.*

#### BRIDGING INITIATIVES

- In 2018, HRM began an effort to register all of its municipally owned, administered and leased spaces on the USEPA's EnergyStar Portfolio Manager platform. This allows regular, systematic monitoring of energy consumption and emissions, and provides important information on each building's performance relative to other similar structures in the region.

←..... *This highlights steps already being taken in this area.*

#### WHAT OTHER CITIES ARE DOING

- NYC: Requires sub-metering in non-residential tenant spaces larger than 5,000 square feet in area in all large and mid-sized buildings. The 2009 Greener, Greater Buildings Plan requires benchmarking and disclosure for public buildings greater than 10,000 sf, and commercial or multifamily buildings greater than 50,000 sf.

←..... *These are examples of mechanisms that other cities have used in this area.*

#### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement

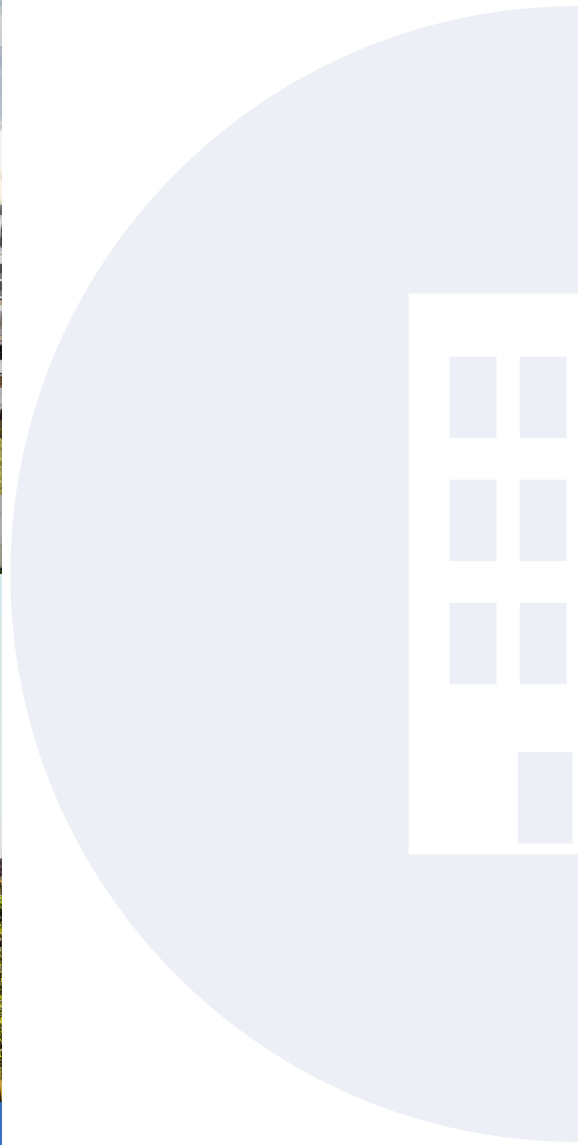
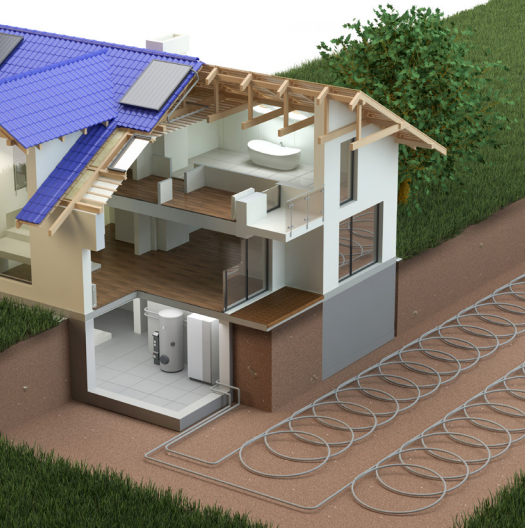
*This is a classification of what type(s) of levers can be used to implement the mechanism.*

*This highlights potential co-benefits associated with the strategy.*



POTENTIAL CO-BENEFITS







# BUILDINGS

## Building codes and standards for new construction

### DESCRIPTION

Energy codes and/or standards seek to encourage or mandate energy efficiency in buildings through either prescriptive or performance methodologies. Prescriptive methodologies require developers to meet minimum thresholds for key energy drivers such as insulation, HVAC efficiency and lighting for example, and are generally in the form of a checklist requiring specific items. Performance methodologies are more focused on how the building performs overall, rather than on the individual physical items it takes to get there (though these can still be identified), require developers to meet minimum thresholds for energy use intensity (EUI), on a per square metre basis (eg. GHG/m<sup>2</sup>, or thermal energy demand intensity (kWh/m<sup>2</sup>)), or a percentage reduction from a baseline. These can also be adopted through minimum energy performance rating systems such as Passive House, Net Zero or Energy Star for the various categories of building types.

### SAMPLE MECHANISMS

- Appliance efficiency standards
- Energy consumption/GHG emissions cap for new construction
- District heating/cooling connection
- HVAC efficiency standard
- Lighting efficiency standards
- Mandatory energy performance rating or green community rating system (LEED, Energy Star, Passivhaus, Net-Zero, etc)
- Renewable energy installation requirements or incentives

### BRIDGING INITIATIVES

- Efficiency Nova Scotia offers services for New Construction for businesses that support the design of energy efficient buildings that lower energy costs and reduce operating and maintenance costs. Support is available from planning stages through to building occupancy.



POTENTIAL CO-BENEFITS





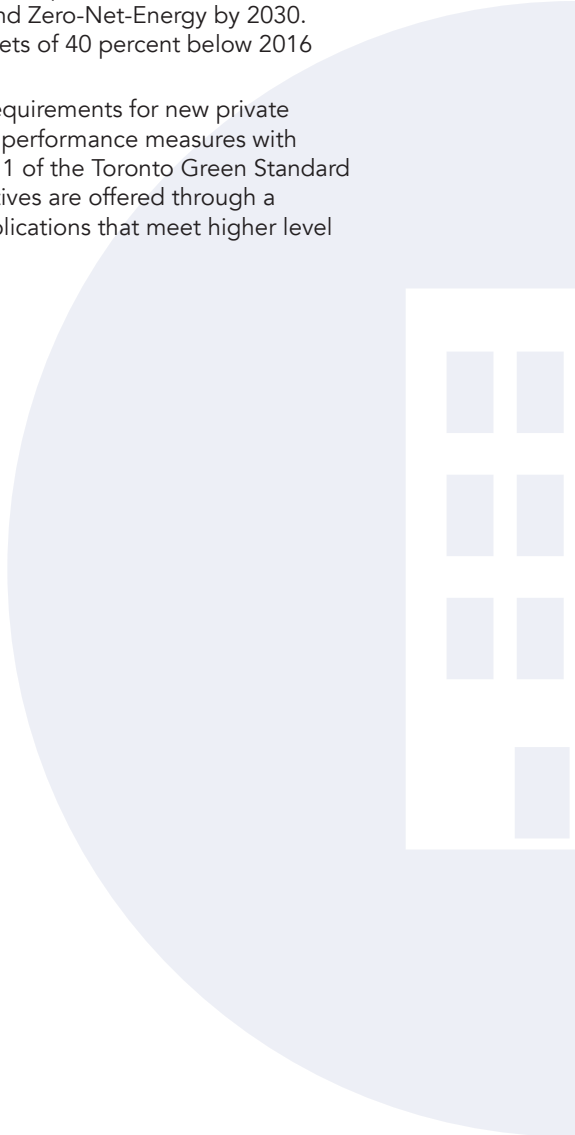
# BUILDINGS

## WHAT OTHER CITIES ARE DOING

- NYC: In order to reach the PlaNYC GHG emissions reduction goal, a more stringent building code (Energy Conservation Code (NYECC)) has been adopted for new residential and commercial buildings and major renovations. The code will be phased-in with consumption reduction targets of 20 percent below 2016 consumption in 2019, 40 percent below 2016 consumption targets in 2022, and Zero-Net-Energy by 2030. Monetary incentives encourage voluntary adoption of stretch codes, with targets of 40 percent below 2016 consumption by 2019 and Zero-Net-Energy by 2022.
- Toronto - The Toronto Green Standard (TGS) is Toronto's sustainable design requirements for new private and city-owned developments. The Standard consists of tiers ( Tiers 1 to 4) of performance measures with supporting guidelines that promote sustainable site and building design. Tier 1 of the Toronto Green Standard is a mandatory requirement of the planning approval process. Financial incentives are offered through a Development Charge Refund Program Version 3 or Version 2 for planning applications that meet higher level voluntary standards in Tiers 2 to 4.

## IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# BUILDINGS

## Building performance rating and reporting

### DESCRIPTION

Building performance monitoring, reporting and benchmarking measures are critical enablers in achieving emissions reduction goals. They allow the city to compile building data from a range of uses and track energy performance (and therefore GHG emission reductions) year by year, enabling cities to understand where to target their continued efforts.

### SAMPLE MECHANISMS

- Advanced metering (smart, net and sub-metering)
- Benchmarking
- Energy performance certification
- Mandatory audits and advice

### BRIDGING INITIATIVES

- In 2018, HRM began an effort to register all of its municipally owned, administered and leased spaces on the USEPA's EnergyStar Portfolio Manager platform. This allows regular, systematic monitoring of energy consumption and emissions, and provides important information on each building's performance relative to other similar structures in the region.
- Halifax Regional Council declared a Climate Emergency in January 2019, which included provisions to establish a carbon budget for the Municipality's corporate and community emissions. Such a budget is a voluntary measure and could be articulated as a new policy during the implementation of HalifACT 2050.

### WHAT OTHER CITIES ARE DOING

- NYC: Requires sub-metering in non-residential tenant spaces larger than 5,000 square feet in area in all large and mid-sized buildings. The 2009 Greener, Greater Buildings Plan requires benchmarking and disclosure for public buildings greater than 10,000 sf, and commercial or multifamily buildings greater than 50,000 sf. A key future suggestion is that utility companies bear the onus of collecting the data, as opposed to the City (e.g. NYSERDA). This would achieve great cost reductions, as the utilities already have access to the data.
- EU: Energy Performance Certificates (EPC) introduced in 2002 as part of Energy Performance Buildings Directive (EPBD), updated in 2010. All properties (homes, commercial, and public buildings) must obtain an EPC when built, sold, or rented. The EPC details building information, energy performance data, calculation methods, inspector qualifications, and recommendations for improvement.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# BUILDINGS

## Energy efficiency and retrofit measures for existing buildings

### DESCRIPTION

If cities are to achieve carbon emissions reduction targets, it is not enough to build new energy-efficient buildings - existing buildings will need to be retrofitted. While contributing a large portion of city emissions, most of the current buildings will still be around in 2050. Retrofitting, energy auditing and re-commissioning of existing buildings provides opportunities for achieving significant energy savings.

### SAMPLE MECHANISMS

- Building Energy Management Systems
- Cooling efficiency
- Daylighting & controls
- Demand response programs
- Efficient lighting systems
- Energy efficient appliance purchases
- Energy performance contracting
- Heating efficiency
- Building operations staff training
- HVAC operations & maintenance
- Insulation (windows, wall, roof)
- Mandatory deep energy retrofit studies with audits
- Minimum performance standards for existing buildings
- Other plug loads or process loads
- Re-commissioning
- Renovation threshold requirement to meet codes and standard
- Create retrofit incentives

### BRIDGING INITIATIVES

- Efficiency Nova Scotia's On-site Energy Manager (OEM) program for businesses and institutions supports a co-funded on-site energy manager that works with staff to improve energy-related activities in businesses, identify and obtain funding and financing opportunities, and plan, implement and evaluate energy saving projects.

### WHAT OTHER CITIES ARE DOING

- NYC: Requires owners of mid-sized buildings to upgrade lighting in non-residential areas to meet current Energy Code standards by 2025; requires buildings over 50,000 gross sf to undergo periodic energy audit and re-commissioning measures; and have tailored energy standards for appropriate application to historic buildings, which are currently exempt from Energy Code compliance.
- Toronto: Launched in January 2014, the Home Energy Loan Program (HELP) offers low interest loans of up to \$75,000 to homeowners to cover the cost of home energy improvements. The program offers low fixed interest rates, terms of up to 15 years, and access to rebates offered by the Province of Ontario and utility companies.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# BUILDINGS

## Industrial carbon emissions reduction

### DESCRIPTION

The industrial sector consumes a significant amount of energy to produce the goods and raw materials that we use everyday. Specific measures on energy efficiency are challenging due to the sheer range of production mechanisms and technologies. As an alternative, carbon emission trading systems provide incentives to encourage firms to identify financially optimal solutions to reduce emissions.

### SAMPLE MECHANISMS

- Carbon emissions reporting
- Carbon reduction targets for industry
- Energy efficiency or waste energy recovery in industrial processes
- Industrial emissions trading system (ETS)
- Voluntary carbon budgets
- Engagement and peer support programs

### BRIDGING INITIATIVES

- Nova Scotia has a closed market Cap-and-Trade program already in place. About 21 entities are implicated in the regulations, and entry into the program is based on emissions thresholds and provincial discretion, as per the regulations.

### WHAT OTHER CITIES ARE DOING

- Buenos Aires: A contest called “Environmental Care Recognition in Small and Medium Enterprises (SMEs) of the City of Buenos Aires” aims to reward and disseminate best environmental management practices implemented by those SMEs that voluntarily meet environmental regulations. The winners can receive the Gold, Green or Green Plus distinction.
- Tokyo: Tokyo implemented a local Emissions Trading System (ETS) in 2010 with a facility-level cap defined during three compliance periods. Industrial entities (factories or facilities that obtain at least 20% of energy from district heating and cooling plants) were required to implement a 6% reduction in 2010-2014, a 15% reduction in 2015-2019, and an undecided reduction in 2020-2022 below base levels (2002-2007). This ETS covers 40% of the industrial and commercial sectors’ emissions.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# TRANSPORTATION

## Fuel economy - public transport

### DESCRIPTION

The emissions of transit operations can be reduced by fuel-switching the transit fleet, including ferries, as well as reducing fuel consumption through reducing stop-start driving that includes less forceful acceleration and braking.

### SAMPLE MECHANISMS

- Improve transit vehicle fuel economy through:
  - fuel-efficient bus driving
  - switching to low or zero carbon fuels
  - switching to electric vehicles
  - automated vehicle locating and monitoring systems
- Electrify ferries/river boats

### BRIDGING INITIATIVES

- HRM is currently undertaking an alternate fuel study for Halifax Transit. One alternate fuel option considered in the study is electricity. The results are expected to be presented to Regional Council before 2020.

### WHAT OTHER CITIES ARE DOING

- Copenhagen: The City is targeting to have carbon neutral public transport by 2025 through a combination of electrification and using biogas as a fuel source. This includes all harbour buses/ferries.
- Oslo: All public transport in Oslo is required to only use renewable energy by 2020; it is anticipated that transit will be supplied by a mixture of bio diesel, bio gas, hydrogen and electricity.
- British Columbia: BC Transit has committed to making its entire bus fleet fully electric by 2040, which includes replacing more than 1,200 existing buses and adding another 350 over the next ten years. The first heavy duty battery electric buses will be launched in 2021, and BC Transit will begin buying electric-only buses starting in 2023.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# TRANSPORTATION

## Fuel economy - private transport

### DESCRIPTION

Fuel consumption of private vehicle operations can be reduced through a number of technological, infrastructural, behavioural and management mechanisms. Improvements in vehicle fuel efficiency and switching to cleaner fuels reduce emissions. The supply of electric vehicle (EV) recharging stations supports greater uptake of electric vehicles, especially for urban travel. Financial incentives and disincentives can influence travel behaviour including trips taken and total vehicle kilometres travelled.

### SAMPLE MECHANISMS

- Eco-driving courses
- Electric vehicle charging infrastructure
- Improve commercial fleet (taxis/hire cars/delivery service) fuel economy
- Incentives/rebates/mandates to switch personal and commercial vehicles to electric/hybrid/low-carbon vehicles
- Registration fees and or road-user charges (e.g. tolls or congestion charges) tied to vehicle efficiency
- Fuel tax surcharges for higher carbon density fuels
- Renewable fuel minimum standard (e.g. minimum blend requirements)
- Switch City authority fleet of vehicles to electric/hybrid/low-carbon (including waste vehicles, if appropriate)

### BRIDGING INITIATIVES

- HRM recently evaluated its 2008 Vehicle and Equipment Anti-idling Policy for Municipal fleet vehicles and equipment. The evaluation, which relied in part on data from AVL devices equipped on most Municipal vehicles, recommended more driver education and regular communication on progress toward GHG reduction targets for the entire fleet.

### WHAT OTHER CITIES ARE DOING

- Buenos Aires: Eco-driving promotion focuses on strengthening ecological driving through workshops for private and professional drivers who wish to get or renew their driving licenses.
- Montreal: The provincial government has introduced Canada's first public charging network, The Electric Circuit, for plug-in electric vehicles. The network is a collaborative effort between Hydro Quebec, regional and municipal governments, and partners from the private sector.
- Singapore: Through the Carbon Emissions-based Vehicle Scheme (CEVS), all new and imported used cars, as well as taxis, are assigned to categories based on their CO<sub>2</sub>/ km performance data. Low-emission cars are given incentives, while higher emission cars incur a penalty in the form of a registration surcharge. The aim is to encourage consumers and taxi companies to choose lower-emission car and taxi models.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# TRANSPORTATION

## Active transportation

### DESCRIPTION

Improvements to walking and cycling environments increase active mode shares. In more dense, urban environments, this can encourage more local trips (multi-purpose trips by foot or cycle), rather than vehicle trips to more distant destinations. It can also encourage more transit trips (especially for commutes) as people are more willing to walk or cycle between transit stops and their origins and destinations. In less dense and more suburban environments, it can increase the incidence of short task-oriented walking and cycling trips that might otherwise be taken by private vehicle (e.g. to local shops and schools).

### SAMPLE MECHANISMS

- Cycling schemes;
  - Expanded hire/share programmes
  - Separated bike lanes and traffic lights, cycle only parking, signage
  - Implement road diets to reduce road space for motorised modes (chiefly, single-occupancy vehicles) and reallocate to active transport (walking and cycling)
- Walking Schemes:
  - improve pedestrian crossings, install better-connected, generous and comfortable walking routes, and provide walking maps and signage

### BRIDGING INITIATIVES

- In 2014, HRM adopted an Active Transportation Priority Plan to guide its efforts to improve infrastructure for and access to active transportation. Halifax's new All Ages & Abilities (AAA) Bikeway Connections are a result of this plan.

### WHAT OTHER CITIES ARE DOING

- Copenhagen: Intelligent transport systems optimise the city's traffic signals to the benefit of bicyclists and buses. The Danish have also invested significantly in cycling priority infrastructure including separated cycle lanes along many streets. In 2017, 41 % of all trips to work and study to/from Copenhagen was by bike and 62 % of Copenhageners chose to bike to work and study in Copenhagen. In total, 1.4 million km is cycled in the city on an average weekday.
- Montreal: BIXI Montreal is North America's first large-scale bike sharing systems. The BIXI network has 7,250 bikes and 600 stations spread out across the areas of Montreal, Longueuil and Westmount. In 2018, approximately 5.8 million bicycle trips were made on the BIXI system.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# TRANSPORTATION

## Public transport - infrastructure, services and operation

### DESCRIPTION

Improving bus infrastructure, service and operations encourages residents to use public transport more frequently, resulting in significantly lower transport carbon emissions per capita.

### SAMPLE MECHANISMS

- Construct bus rapid transitways or partial priority facilities for bus services
- Increase bus service density, coverage, and frequency
- Introduce bus rapid transit
- Introduce light rail
- Modernise bus fleet to improve passenger comfort and experience
- Allow bikes to be carried on transit
- Introduce e-scooters
- Construct more secure bike stackers/lockers at transit stations
- Improve design and legibility of transit stations
- Modify or eliminate transit fares to encourage travel in shoulder periods
- Introduce a free Central Area Transit Zone (CATZ)
- Increase priority within mixed traffic environments to improve journey speed and reliability
- Make all transit free

### BRIDGING INITIATIVES

- Most of Halifax Transit’s buses now feature bike racks to allow riders to quickly load and unload bicycles as they move around the municipality.
- HRM recently began installing priority signals for Transit buses to improve the efficiency and reliability of the service.

### WHAT OTHER CITIES ARE DOING

- Connecticut: The Fastrak BRT – Bus Rapid Transit Program started in 2015 and includes dedicated bus-only roads, travel times comparable or less than car, modern low-floor buses, modern bus stations with rising platforms, fare payment pre-boarding and WiFi. Ridership has doubled within the first year.
- NYC: 7 Downtown Connection buses offer free transportation routes in New York’s financial district to reduce taxi use in the area.
- Copenhagen: To add convenience, bikes were integrated into the wider transport network, so passengers could easily transfer between cycling and public transport. Carriages on trains were upgraded to accommodate cycles, including travel at peak times.
- Calgary: The Calgary CTrain light rail system has a Free Fare Zone downtown, where rides taken solely within the downtown are free.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# TRANSPORTATION

## Freight systems

### DESCRIPTION

Fuel consumption and emissions from the freight transport sector can be reduced through freight traffic planning (mode, route/ distribution and timing), pricing models, route/area restrictions and application of low-carbon fuels and fuel efficiency measures in vehicles.

### SAMPLE MECHANISMS

- Preparation of a Freight Master Plan (or equivalent function plans) that designates freight routes, intermodal transfer locations, load break-down locations and freight traffic management (e.g. restricted travel hours via selected routes).
- Incentives/rebates/mandates to switch freight trucks to electric/hybrid/low-carbon
- Low emissions zones/congestion charges
- Real-time information for logistics conveyed digitally
- Registration fees and/or road-user charges (e.g. tolls or areal congestion charges) tied to vehicle efficiency and VKT/VMT
- Trucks - restricted access to particular areas (time-based or permanent)
- Shipping port operations - fuel switching; port electrification; more efficient vehicles

### BRIDGING INITIATIVES

- Halifax's Macdonald Bridge is closed to large trucks and commercial vehicles, which are instead diverted to Highway 118 and the MacKay Bridge instead of moving through residential sections and downtown Halifax.

### WHAT OTHER CITIES ARE DOING

- Chicago: Chicago is undertaking a \$3 billion CREATE freight rail program aimed at reducing freight rail emissions and improving efficiency.
- San Diego: Green Port Program specifies a number of sustainable initiatives for the seaport, one of which is to reduce the Port's operational energy use by at least 170,000 kilowatt hours per year.
- Florida: The "AV/CV/ITS Freight Applications" pilot project is exploring the feasibility of using AV trucks in the perishable freight industry. It is a three-phase project in which Connected Vehicle (CV) technology will be used to study truck traffic patterns (phase 1), then connected to street signals (phase 2), then given street signal priority for travel time optimization (phase 3).

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# ENERGY SUPPLY

## Local low or zero carbon energy generation (community scale)

### DESCRIPTION

Electricity generation can be one of the biggest drivers of citywide carbon emissions, especially in provinces with more carbon-intensive electricity grids. Cities and residents may either influence utility providers to decarbonize, or seek development of local city-scale or community-scale low-carbon energy generation facilities themselves. Local decentralized generation, especially when combined with storage, also enables self-sufficiency and resilience.

### SAMPLE MECHANISMS

- Anaerobic digestion of organic wastes
- Biogas / landfill gas recapture
- Community renewable energy projects
- District energy (electricity, heating or cooling) with renewable energy source (e.g. biomass)
- Large scale heat pumps (water, ground)
- Wind
- Solar electricity (photovoltaic, concentrating solar)
- Solar heat (solar thermal, solar hot water, solar hot air)
- Wastewater heat recovery systems
- Large scale purchases of renewable energy on behalf of the community
- Explore and support provincial regulatory requirements for renewable energy generation

### BRIDGING INITIATIVES

- Halifax Water plans to construct a district energy network using waste heat from its wastewater treatment plant as part of the Cogswell Redevelopment.

### WHAT OTHER CITIES ARE DOING

- Seattle: The Solar Market Transformation project uses American Reinvestment and Recovery Act funds to 1) develop a financial and ownership model that addresses all legal, technical and logistical requirements for community solar; 2) install the first Community Solar Project in Seattle (estimated 30-60 kW); 3) market the program and enrolling participants; and 4) establish a Solar Revolving Fund that will re-invest revenue generated by the first project into future projects.
- Okotoks, Alberta: Drake's Landing, a 52-home housing community, receives 90% of its space heating from solar thermal technology, and makes use of seasonal underground energy storage.
- Toronto: Toronto has a policy that requires developers in Community Energy Plan (CEP) areas to submit an Energy Strategy as part of a complete development application. The Energy Strategy addresses opportunities for embedded energy solutions that pertain to a particular development. The City provides the scope, reviews the strategy, and works with the developer on implementation.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# ENERGY SUPPLY

## On-site (building scale) energy generation

### DESCRIPTION

On-site renewable energy, such as solar, is a way to supply some of the required energy for a building or facility while reducing its reliance on fossil fuels. There has been increased deployment of on-site renewable systems in recent years, by both residential and non-residential energy consumers. The increased availability of tax incentives, credits, and grants for renewable energy, as well as financing mechanisms, such as the residential power purchase agreement and leasing options for solar, have contributed to this growth.

### SAMPLE MECHANISMS

- Biomass heating
- Combined heat and power
- Fuel cells
- Heat pumps (water, ground, air)
- Micro wind
- Solar electricity
- Solar heating / hot water

### BRIDGING INITIATIVES

- HRM's award-winning Solar City program for residential home owners and non-profits finances the up-front costs of installation for solar PV, solar hot air and/or solar hot water systems, based on a 10-year, fixed rate loan that is provided by HRM to eligible participants.

### WHAT OTHER CITIES ARE DOING

- London: The Mayor's £34m Energy for Londoners programme aims to make London's homes warm, healthy and affordable, its workplaces more energy efficient, and to supply London with more local clean energy. It includes a Solar Action Plan to maximize solar power in London and achieve one gigawatt of installed solar capacity by 2030 (ten times more than 2018 levels), and two gigawatts by 2050.
- Berlin: Berlin's Solar Atlas shows precisely whether a roof is suitable for using solar energy and whether the investment will pay off.
- Basel-Stadt: When new buildings are erected or existing heating systems are renovated, 50% of the energy requirements for hot water must come from renewable sources. This point can be met by installing a thermal solar energy system, a ground source heat pump or a wood pellet heating system. The building can also be connected to the district heating network.
- Toronto: The Toronto Green Standard requires all new City-owned buildings to generate at least 5% of total energy load from one or a combination of renewable sources.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# ENERGY SUPPLY

## Smart grid

### DESCRIPTION

Smart grid refers to a modernization of the electricity delivery system so that it monitors, protects, and automatically optimizes the operation of its interconnected elements: from the distributed generator through the distribution system to industrial users and building automation systems, to energy storage installations, to end-use consumers and their thermostats, electric vehicles, appliances, and other household devices. Benefits include reductions in electricity demand, integration of disparate renewable energy sources and plug-in vehicles and greater grid reliability.

### SAMPLE MECHANISMS

- Demand-responsive pricing (time-of-day pricing)
- Development of smart grids
- Energy storage
- Smart meters/ controls
- Micro-grids

### BRIDGING INITIATIVES

- Nova Scotia Power's Electric Thermal Storage (ETS) program supports the installation of an ETS system that works with Nova Scotia Power's time-of-day power (TOD) rates. ETS is a specialized electric heater that stores heat during off-peak hours when electricity costs are the lowest, and then releases the stored heat when it is required throughout the day.

### WHAT OTHER CITIES ARE DOING

- Houston: CenterPoint Energy Houston Electric's (CPE) Smart Grid project involves deployment of a fully integrated advanced metering system and web portal access to over 2.2 million customers, along with installation of advanced monitoring and distribution automation equipment.
- Chicago: As of 2019, ComEd has installed more than four million smart meters in Illinois to help accelerate customer savings. In February 2016, over 950,000 smart meters had been installed in the Chicago area – By 2019, all Chicago residents and businesses have smart meters.
- NYC: Con Edison and NYSERDA offer financial incentives for both thermal and battery storage, with bonus incentives for projects larger than 500 kW. To demonstrate viability, NYCEDC, in partnership with Con Edison, developed a smart grid demonstration project at the Brooklyn Army Terminal (BAT) in Sunset Park. The smart grid system at BAT integrates three main components: a 100 kW solar photovoltaic (PV) array; building management system (BMS); and A 720 kWh battery for on-site energy storage capable of delivering 100 kW for 4 hours.

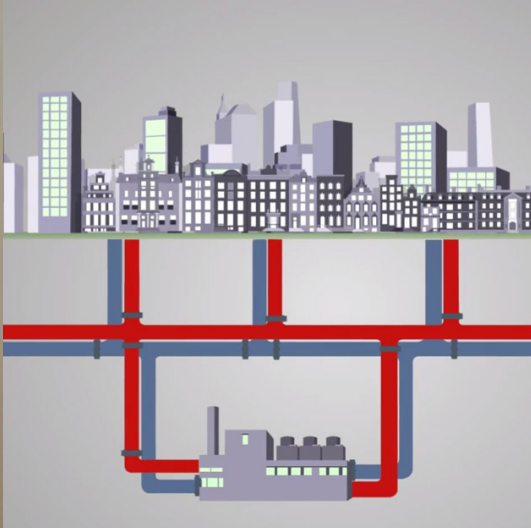
### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS







# WASTE

## Waste prevention policies and programmes

### DESCRIPTION

A holistic waste management strategy focuses on a waste hierarchy that prioritizes waste reduction, then its reuse and recycling/composting and energy recovery, followed by final disposal as a last option. Numerous cities are striving for zero waste goals (i.e. 100% diversion rates). Opportunities include outreach programmes, strict separation policies, incentives/disincentives to promote recycling/organic composting and bans on certain waste streams.

### SAMPLE MECHANISMS

- High Level Zero Waste Goal
- Expand City's by-laws and diversion requirements to private waste contractors
- Outreach programmes (awareness and minimisation)
- Incentives for organics treatment
- Incentives for recycling
- Industrial waste bans (eg. styrofoam, chemicals)
- Non-organic waste separation policies
- Organic waste separation policies
- Construction waste: permitting, recycling, waste management plans, deconstruction requirements (to reduce demolition)
- Extended Producer Responsibility (EPR)

### BRIDGING INITIATIVES

- At 60%, HRM has achieved one of the highest solid waste diversion rates in Canada. This success is the result of regulation coupled with significant, long-term public education efforts.

### WHAT OTHER CITIES ARE DOING

- Los Angeles: Zero Waste LA was established in 2017 to reduce landfill disposal by 1 million tons per year by 2025 and reduce waste by 65% in all 11 of the City's new service zones
- Chicago: As part of Sustainable Chicago 2015's Goal 20, the City partnered with Recyclebank to trial a unique incentive program for recycling. Selected blue carts were retrofitted with an ID chip that reads the weight of the recycled materials collected by that household. Points are earned for every pound of recyclables diverted from the waste stream and can be redeemed for discounts at local and national businesses.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# WASTE

## Energy recovery & landfill management

### DESCRIPTION

Energy recovery from waste involves the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolysis, anaerobic digestion and landfill gas recovery. This practice is common in Central and Eastern Europe and Scandinavian countries and has shifted the paradigm towards waste and methane gases being seen as valuable commodities to create energy. For landfills, emitted methane can be reduced through the installation of landfill gas capture and combustion technology to convert the methane to carbon dioxide. Combustion with energy recovery can further reduce GHG emissions by displacing fossil fuel sourced energy to generate heat and electricity.

### SAMPLE MECHANISMS

- Landfill gas to energy (carbon capture, methane capture)
- Landfill planning/engineering/construction
- Price mechanisms to discourage landfill (e.g. landfill levy)

### BRIDGING INITIATIVES

- At HRM's former (decommissioned) Sackville-Highway 101 Landfill site, genset systems are used to convert landfill gas that's harvested from below ground into electricity that is sent to the electric grid.

### WHAT OTHER CITIES ARE DOING

- NYC: Fresh Kills Landfill generates enough methane gas each day to heat over 30,000 homes per year.
- Edmonton: The Edmonton Waste Management Centre includes the largest composting facility in Canada and a Materials Recovery Facility that recycles 40,000 tonnes of waste a year. A waste to biofuels facility, opened in 2014, turns household garbage into biofuels and biochemicals, which will enable an increase in diversion rate from 60 to 90% by 2016.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# WATER & WASTEWATER

## Energy recovery

### DESCRIPTION

Wastewater can be harvested to provide energy through harnessing the waste thermal energy through a large heat pump to provide space heating and domestic hot water to buildings in the nearby area; or to create electricity, and also sometimes heat, by harnessing the biogas created by the breakdown of organic matter or by incinerating the sludge at the waste facility.

### SAMPLE MECHANISMS

- Methane/biogas recovery for reuse
- Wastewater to energy initiatives

### BRIDGING INITIATIVES

- Halifax Water’s plans to construct a district energy network using waste heat from its wastewater treatment plant as part of the Cogswell Redevelopment.

### WHAT OTHER CITIES ARE DOING

- Vancouver: The South East False Creek Facility is meeting 78% of heating and domestic hot water energy use for 3.5 million sf of the surrounding neighbourhood by recovering heat from wastewater.
- Oslo: In February 2010, a biogas plant was opened at the Bekkelaget wastewater treatment plant. Here, biogas is produced from sewage sludge and upgraded for use as transport fuel, and is already being used to fuel more than 100 heavy vehicles, mainly refuse trucks and 36 buses.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# WATER & WASTEWATER

## Water recycling and reclamation

### DESCRIPTION

A reduction in overall water consumption by cities and residents has the potential to significantly impact the energy and emissions footprint of water, as well as ensuring sufficient water supply during warmer and/or dry periods. Using less water results in reductions in the amount of energy that is required to clean and pump water and wastewater around a city. Improving the efficiencies of water treatment and pumping also provides additional reduction potentials.

### SAMPLE MECHANISMS

- Wastewater and water pumping efficiencies
- Automatic leak detection
- Building-level greywater and blackwater recycling requirements
- Education or campaigns to promote water efficiency
- Mandatory / standards for connection for reclaimed water (purple pipe infrastructure)
- Real-time water supply risk monitoring
- Water recycling or reclamation

### BRIDGING INITIATIVES

- Halifax Water's Halifax Water was the first utility in North America to adopt the International Water Association [IWA] methodology for managing leakage in the distribution system. Efforts save \$650,000 per year in treatment chemical and electricity costs and have reduced water main breaks by 20%, saving \$500,000 in repair costs annually. The program has won several national awards and Halifax Water staff are in demand to share expertise with industry and other utilities.

### WHAT OTHER CITIES ARE DOING

- Copenhagen: To increase water efficiency, the City has made significant efforts in the minimisation of water loss in the city's infrastructure through leak detection technology, regulation of water pressure and other mitigation measures. Water losses in Copenhagen are around 6-7%, whereas the figure in other cities is as high as 40 to 50%.
- New South Wales, Australia: The BASIX program implemented requires all new residential buildings and renovations to complete an assessment using the BASIX online tool. Residential development must be designed and built to use 40% less drinking-quality water and produce 25% less greenhouse gas emissions than average NSW homes of the same type.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS









# GREEN & BLUE INFRASTRUCTURE

## Managing stormwater and reducing heat island

### DESCRIPTION

Due to urbanization (which drastically increases impervious surfaces and decreases vegetation), cities are prone to the heat island effect. Urbanization also contributes to flooding risk in cities, as less rainwater is able to infiltrate into the ground, increasing runoff. Green and blue infrastructure, which includes all natural or human-made elements that provide or perform some form of ecological or hydrological function, plays a significant role in reducing both heat and flooding impacts, primarily through increasing infiltration and reducing runoff, reducing the heat island effect, and providing shading and areas for reprieve. It also contributes social and environmental benefits, including improving air quality, providing space for recreation, physical activity and social interaction, improving water quality, reducing noise pollution, reducing energy demand for cooling, providing habitat and enhancing biodiversity, growing food, and generally beautifying a city. Many aspects of green and blue infrastructure are no-regret measures that can significantly enhance communities.

### SAMPLE MECHANISMS

- Constructing green roofs on existing buildings
- Requiring green roofs for new buildings
- Low impact development design
- Expanding urban tree canopy
- Protecting and maintaining existing natural assets
- Integrating bioswales, ponds and watercourses in built up areas (including parks, trees, shrubs, urban forests, green roofs and walls, gardens, bioswales, natural channels, watercourses, ponds, and constructed wetlands)
- Green streets and corridors
- Requirement to retain a proportion of each development site as green space (including minimum green space requirements in new developments)
- Create urban gardens (e.g. rooftop gardens, alleys, etc.)
- Reclaim space for urban parks

### BRIDGING INITIATIVES

- In the summer of 2018, Halifax Regional Council adopted the Halifax Green Network Plan, a ground-breaking priority plan that contemplates the many ecosystem services provided by the Municipality's natural and green infrastructure.
- HRM's 2014 Urban Forest Master Plan details the social, economic and ecological values of HRM's urban trees.
- HRM's coastal protection bylaws in all coastal areas, which limit new residential buildings in coastal zones to a minimum height of 3.8 m above CGVD 28.



POTENTIAL CO-BENEFITS



# GREEN & BLUE INFRASTRUCTURE

## WHAT OTHER CITIES ARE DOING

- Berlin: To adapt to a changing climate, Berlin is striving to become a “sponge city” through increasing permeable pavement/surfaces and green space throughout the city to absorb rainwater rather than cause flooding, and increase evaporation to cool the urban environment.
- NYC: In 2007, NYC launched the ambitious MillionTreesNYC initiative, with a goal to plant and care for one million trees in New York City by 2017. In 2015, thanks to help from the New York Restoration Project (NYRP), additional partners, our many volunteers, and nearly 50,000 New Yorkers who helped plant trees in parks, on neighborhood streets, and in their own backyards, NYC planted its millionth tree.

## IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement







# FOOD & AGRICULTURE

## Encourage sustainable food production and consumption

### DESCRIPTION

Food consumption and production trends and patterns are among the main causes of pressure on the environment. Additionally, a changing climate has impacts for the reliability of future food supply. Fundamental changes in the way food is produced, processed, transported and consumed are indispensable for achieving sustainable development. Cities can help reduce the environmental impact of food, while increasing self-sufficiency and resilience, by encouraging local/community agriculture, educating the public on low-carbon food benefits and setting similarly focused food procurement guidelines.

### SAMPLE MECHANISMS

- Assessment of city food shed
- Community gardens or allotments / food sources locally
- Community supported agriculture
- Education or community events focused on climate smart food
- Food policy councils
- Municipal food purchasing/ procurement guidelines
- Rooftop or vertical farming

### BRIDGING INITIATIVES

- In 2014, HRM's issued an Administrative Order on community gardens that permits the operation of community gardens within the Municipality and provides direction for the establishment and operation of such gardens.
- The Halifax Mobile Food Market initiative, operated in collaboration with the Halifax Food Policy Alliance has been serving Halifax communities since May 2016, focuses on making healthy, affordable, high quality food available in communities with limited access to healthy food.

### WHAT OTHER CITIES ARE DOING

- Seoul: The City is providing technological support and education programs for rooftop gardens and greenings including the establishment of a city support center for agriculture, city farming school, city agriculture white paper, and a vegetable garden model development, among other initiatives.
- Victoria, BC: The Love Food Hate Waste initiative aims to raise awareness of avoidable food waste from Victorian households. The LFHW challenge is a voluntary call to action to Victorians to reduce food waste; it provides a lengthy list of vegetarian meal prep ideas and tips on how to preserve food.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# LAND USE

## Low carbon zones & eco-districts

### DESCRIPTION

Low carbon zones are specialized zones that aim to lower the carbon footprint of the industrial and related operations within the zone and provide a testing ground for pilot projects and policies for reducing the environmental footprint of industrial operations. Eco-districts, whether existing or new developments, take a masterplan approach to sustainability where key resources (such as energy, waste and water ) are best optimized, instead of at a building scale.

### SAMPLE MECHANISMS

- Zoning land to encourage low carbon industries
- Supporting sustainable infrastructure parks
- Eco-district development strategies/framework

### WHAT OTHER CITIES ARE DOING

- London: RE:CONNECT - This programme consists of ten low carbon zones in London, each of which has signed-up to deliver a 20% reduction in CO2 emissions by 2012.
- Stockholm: Sustainable Järva is an investment in ecologically, socially and economically sustainable development in the districts surrounding Järvafältet. With new technology, information and education, Järva intends to become a model for the sustainable rehabilitation of areas that formed part of Sweden's Million Homes Programme.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# LAND USE

## Compact Cities

### DESCRIPTION

The continued growth of urban populations calls for a response that optimizes land resources and reduces the carbon footprint on a per resident basis. The compact city or city of short distances is an urban planning and design concept that promotes relatively high residential density with mixed land uses and connected with transit.

### SAMPLE MECHANISMS

- Mixed use development/live-work targets
- Promote or have minimum density requirements
- Strategic refurbishment/reuse of unused buildings for new purposes

### BRIDGING INITIATIVES

- HRM's Integrated Mobility Plan encourages significant densification within the regional centre out to 2031, as a means to reduce overall vehicle kilometres travelled and improve active transportation infrastructure.

### WHAT OTHER CITIES ARE DOING

- San Diego: The City of Villages growth strategy which directs growth into compact, mixed-use, walkable centers linked by transit, which reduces the need to travel and makes alternative modes of transportation easier to use.
- Washington, D.C.: The 115-acre "SW Ecodistrict" planned for 2030, includes office, residential, and cultural space. The area will be heated, cooled, and powered with a district energy system using cogeneration. A number of other sustainable design measures will be implemented.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# LAND USE

## Transport Oriented Development

### DESCRIPTION

Transit or Transport-Oriented Developments (TODs) are high activity intensity development nodes characterised by excellent walkability and cycle access, and anchored by higher order transit (typically a train or major bus station or interchange). They are an integrated land use and transport outcome facilitated by appropriate policy and financial/development incentivisation. They are also environments where private vehicle and freight vehicle traffic are limited by design, regulation and restrictions on parking.

### SAMPLE MECHANISMS

- Prioritising development in areas well connected by transit
- Creating pedestrian plazas
- Minimum affordable housing targets near transit hubs
- Prioritise access and circulation for pedestrians, cyclists and transit users
- Minimise roadway capacity and severance (i.e. barrier) effect for pedestrians and cyclists
- Define and apply station typology framework to prioritise modal interchange and/ or land development

### BRIDGING INITIATIVES

- HRM is working with Halifax Transit to focus growth in areas that fall within the current and future (planned) transit boundaries.

### WHAT OTHER CITIES ARE DOING

- San Francisco: By concentrating new development along existing transit corridors, San Francisco has decreased GHG emissions and vehicle miles traveled.
- Perth: In 2004, the State Government of Western Australia enacted Network City, which was an urban growth policy targeting 60% of new growth on land currently zoned as urban, with a focus on established centres served by higher quality transit services. In 2009, this was replaced with State Planning Policy 4.1: Activity Centres for Perth and Peel with revised requirements including a reduction in infill to 53% of the total.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# FINANCE & ECONOMIC DEVELOPMENT

## Instruments to fund low carbon & climate resilient projects

### DESCRIPTION

To create new economic opportunities and spur investment in the green economy, new funding strategies, from the public and private sector, are needed. These strategies can include public initiatives such as revolving funds with low interest for entire projects, funds for early stage projects (thereby attracting further private sector investment for design and construction), loan guarantees, community bonds and tax rebates. Private sector strategies have included the creation of specially tailored Energy Service Agreements where initial costs are paid back through energy savings on the building utility bills.

### SAMPLE MECHANISMS

- Establish a revolving fund for low carbon or green projects (public entity)
- Provide loan guarantees or insurance packages for energy efficiency projects
- Property tax exemption for energy efficiency projects

### BRIDGING INITIATIVES

- Low Carbon Cities Canada (LC3) is a partnership between seven local centres and the Federation of Canadian Municipalities. A contribution of \$18-million for has been announced for EfficiencyOne to establish the urban climate centre in Halifax. LC3 is an initiative that will enable and accelerate urban carbon-reduction solutions.

### WHAT OTHER CITIES ARE DOING

- Philadelphia: The Philadelphia Industrial Development Corporation aims to create a low-interest revolving loan fund using federal Energy Efficient Block Grant monies. Landlords will then be able to finance energy efficient improvements to a tenant's space with repayment coming from a portion of the savings.
- United Kingdom: The Green Investment Bank was created by the UK Government and capitalised with public funds. They then use this finance to back green projects on commercial terms and mobilise other private sector capital into the UK's green economy.
- NYC: In 2019, NYC launched a Commercial Property Assessed Clean Energy (C-PACE) program to finance clean energy and energy efficiency retrofits and upgrades at more favorable terms, allowing New York City building owners to access finance for such projects through an assessment placed on their property tax bills. Paired with a building energy performance mandate, the PACE program has the potential to finance \$100 million annually in energy efficiency and clean energy projects.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS





# FINANCE & ECONOMIC DEVELOPMENT

## Developing the green economy

### DESCRIPTION

The green economy is defined as an economy that aims for sustainable development without degrading the environment. It has been framed as an important tool for achieving sustainable development by the UN. Support for this economy, and its related new businesses, is a foundational pillar to meeting carbon reduction goals. Support measures can include green enterprise zones, start-up labs, and specific tax incentives and grants.

### SAMPLE MECHANISMS

- Define the growth and startup of green businesses as a key objective of the City's economic development service
- Establishment of green enterprise zones/labs
- Tax incentives/grants/subsidies for green businesses
- Green procurement
- Competitions and challenges

### BRIDGING INITIATIVES

- HRM's green catering policy and the HRM fleet vehicle 'right-sizing' filter.

### WHAT OTHER CITIES ARE DOING

- London: The Green Enterprise District, covering six boroughs in east London, will promote clusters of low-carbon businesses and will draw in large-scale investment for innovative low-carbon technologies ranging from energy generation to low-carbon transport.
- Boston: The City is supporting small businesses going green through introducing a matchmaking service for small businesses that allows them to be paired with sustainability services.
- Buenos Aires: In 2013, the Green Economy Centre worked on a green job registry, aiming to promote the green job market in the City. During 2014 a course on provision of electricity through solar photovoltaic took place, with the aim of generating new green experts; opened to the community, it's curricula included the sizing of the installation, security criteria, and basic knowledge of solar energy, among others.

### IMPLEMENTATION LEVER

Policy / Incentive / Program / Procurement



POTENTIAL CO-BENEFITS



# ACTIONS

CATALOGUE

**HalifACT 2050**  
ACTING ON CLIMATE TOGETHER

Prepared by:

**SSG**