

# 2018 Climate Leadership Plan

Strategies and Actions for a Low-Carbon, Prosperous Future



Public Comment Draft  
Comments Due by April 18, 2018  
[victoria.ca/climateaction](http://victoria.ca/climateaction)

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## TABLE OF CONTENTS

|                                                    |     |
|----------------------------------------------------|-----|
| TABLE OF CONTENTS.....                             | I   |
| MESSAGE FROM THE MAYOR.....                        | II  |
| KEY TERMS .....                                    | III |
| INTRODUCTION.....                                  | 1   |
| VICTORIA'S CLIMATE LEADERSHIP VISION.....          | 2   |
| VICTORIA'S CLIMATE IMPERATIVE.....                 | 4   |
| CLIMATE LEADERSHIP PLAN (CLP) .....                | 6   |
| CITY GREENHOUSE GAS BASELINE DATA .....            | 9   |
| LOW CARBON, HIGH PERFORMANCE BUILDINGS .....       | 13  |
| LOW CARBON TRANSPORTATION AND MOBILITY .....       | 18  |
| LOW CARBON WASTE MANAGEMENT SYSTEMS.....           | 22  |
| ADAPTATION – PREPARING FOR A CHANGING CLIMATE..... | 26  |
| CITY LEADERSHIP & MUNICIPAL OPERATIONS .....       | 30  |
| PARTNERSHIPS AND COLLABORATION.....                | 35  |
| MEASURING SUCCESS.....                             | 36  |
| NEXT STEPS .....                                   | 37  |
| GLOSSARY.....                                      | 38  |

## MESSAGE FROM THE MAYOR

*It's 2050. Victoria is a prosperous, affordable, sustainable and smart city. Victorian's health and well-being is the best in the nation and Victoria is featured in the annual World Happiness Report ([www.http://worldhappiness.report](http://worldhappiness.report)) as one of the happiest small cities on the planet. We live in a dense, compact city with people clustered along corridors, in village centres and in our beautiful downtown. We've stewarded and enhanced our natural assets – tree canopy, parks and open spaces, ocean – and these continue to contribute to our quality of life and the livability of our city.*

*We live and work in buildings that are powered by 100% renewable energy. We move about mostly by affordable, efficient, 100% electric rapid public transit, and by walking and cycling. Those of us who drive use cars powered by 100% renewable energy.*

*All our kids are safer, happier and healthier than they were in 2017. And they all have more opportunities. No one has been left behind in the transition from a fossil-fuel based economy to a carbon-free economy. New educational opportunities match the new job opportunities that have sprung up as Victoria's amazing entrepreneurs leapt at the challenge to innovate and invent the goods and technologies needed for this clean energy future.*

The Climate Leadership Plan that Victoria is launching today for community input lays the foundation for this future. It is a series of targets, goals, strategies and actions for each of us to work towards. The City's role is to lead and inspire. The Climate Leadership Plan sets goals for the City to transform its own fleet, buildings, energy use, consumption habits waste management, and corporate practices. We aim to make the city's buildings, fleets and public spaces into a microcosm or model of what is possible.

But the City's actions are not enough. The City's corporate emissions account for only 1% of total emissions in the city; the rest come from community and industry. The City's core commitment and our number one job is to support our residents and businesses as they take action.

According to *The Stern Review on the Economics of Climate Change*, there's an economic imperative to act now. Early action on climate adaptation is 40% cheaper than each decade of delay. Early action on climate mitigation is less disruptive and provides opportunity for healthier change. A clean energy community avoids fossil fuel price fluctuations and shocks, and avoids increasing emissions and pollution costs. Energy retrofits, if done wisely and timely with other planned improvements, maximize value, avoid costs, and minimize disruption for both residential and commercial building owners.

To reach the City's goal of 100% renewable energy by 2050 and to reduce our greenhouse gas emissions by 80% over 2007 levels by that same year, means we need to do more than turning off lights when we leave the room, recycling, or using less water. It means that we need to radically transform our daily lives making them more convenient, affordable, efficient and happier at the same time as healing the planet.

First and foremost, the climate challenge is human-centred. It's about us, all of us. Technology, apps, innovation – they will help us get there. But to truly solve the climate challenge we need to weave a strong social fabric, to build on the gifts, assets, talents of our friends, neighbors and colleagues. It means we need to shift our thinking from me to we, from now to the long term. We're all in this together. And together, we're poised to soar.

## KEY TERMS

**Active transportation** – Any form of human-powered transportation (e.g. bike, walk, in-line skating, etc.)

**Baseline** – The reference or starting year to which targets and GHG emissions projections are based.

**BC Energy Step Code** - A voluntary provincial standard enacted in April 2017 that provides an incremental and consistent approach to achieving more energy-efficient buildings that go beyond the requirements of the base BC Building Code

**Building embodied energy** - The energy consumed by all of the processes associated with the production of a building, including resource extraction, material processing, manufacturing transportation, and construction.

**Building retrofit** – Modification to the structure, or operational systems of a building that result in improved energy efficiency, and/or decreased energy demand.

**Carbon dioxide equivalent (CO<sub>2</sub>e)** – A unit that expresses any greenhouse gas in terms of its global warming potential (GWP), using carbon dioxide as the baseline measure. This is usually expressed as tonnes of CO<sub>2</sub> equivalent, or “tCO<sub>2</sub>e”.

**Climate change adaption** - The practice of adapting to the effects of climate change, to reduce risks and impacts, losses, or exploit opportunities.

**Climate change mitigation** – The practice of reducing GHG emissions to reduce global temperature rise, and the subsequent impacts to climate systems.

**CLP** – Climate Leadership Plan

**Community GHG emissions/Community GHG Inventory** – GHG emissions arising from all significant activities occurring within the territorial boundaries of a community. This typically includes stationary energy sources, transportation, and waste.

**Greenhouse gas (GHG) emission** – A gas emitted to the atmosphere from natural and human activities. GHG emissions include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Also, referred to as carbon emissions.

**Low carbon** – Infrastructure, vehicles, buildings and power sources that have a minimal output of greenhouse gas (GHG) emissions

**Multi-Modal transportation system** - An integrated transportation system that balances the effectiveness for all transportation modes/types across a region, to meet demands, and maximize benefits by enhancing convenience, safety, comfort, and efficiency.

**Net zero building** – A building that consumes less than or equal to the total amount of renewable energy than it generates.

**Net zero ready** – A net-zero energy ready building is one that is designed to be ultra-efficient and ‘ready’ to produce all of its energy needs through the future installation of an on-site renewable energy system

**Paris Agreement** – An agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gas emissions mitigation, adaptation and finance starting in the year 2020.

**Resilience** – The capacity of the built, natural, and human systems to cope and recover from climate impacts in an efficient and timely manner.

**Renewable Energy** - energy that is generated from naturally occurring processes that is replenished over a single human timescale.

## INTRODUCTION

Global cities are a major contributor to climate change. More than half of the world's population currently live in cities, and these urban centres consume nearly 80% of global energy and account for more than 70% of global greenhouse gas (GHG) emissions. Our national, provincial, and regional commitments all state that cities must set ambitious GHG reduction targets, and commit to bold and immediate action to improve energy use patterns and GHG intensity. The City recognizes our leadership role in this regard, and we have set our GHG commitments to align with international best practice. The City's commitment is to reduce community-wide GHGs by 80% by 2050 (based on 2007 levels), and shift completely away from fossil fuels, to 100% renewable energy.

To achieve these targets, we will remain tireless in our efforts to reduce GHG emissions, and recognize that this demands leadership and community commitment, fuelled by a long-term vision of an energy efficient and sustainable city.

The majority of community based GHG emissions are not within direct municipal control or influence (see Figure 1). This shared responsibility between all city residents, businesses and groups requires common will, collaborative action, and cooperation, in close and constant engagement. Both small daily choices, as well as significant step-changes will be necessary to reach these goals. When Victorians are armed with energy information, we will all be able to make timely and meaningful choices that lead to big improvements; whether that is insulating our homes, upgrading our inefficient furnace, or redesigning our fleets to run on renewable, electric propulsion. Transformative innovation, together with incremental individual action - will all amount to significant GHG reductions, and a transition to a clean, renewable energy future.

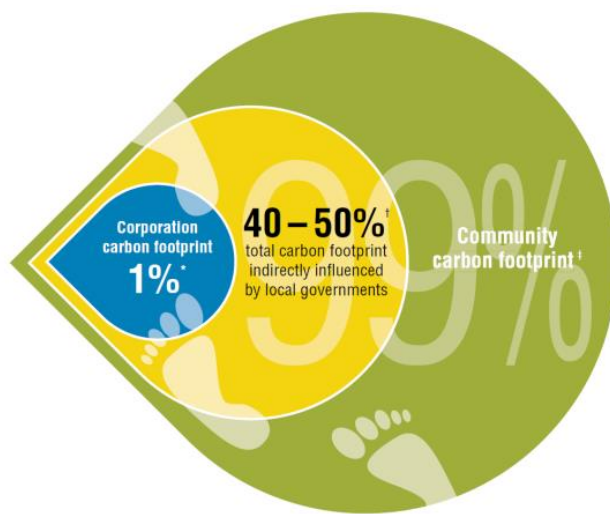


Figure 1. Municipal Influence on GHG Emissions

The City's Climate Leadership Plan will deploy several short and long term strategies and actions, including education programs, so that commercial and resident stakeholders can improve their own smart energy choices, for buildings, activities, transportation, and lifestyle. We must act boldly, and we shall work cooperatively to innovate across all domains to ensure we do not miss the best opportunity for affordable change. This plan intends to drive the City's planning towards a low-carbon emissions future, with prosperity, health, and well-being that represent both the clear requirements, and the destined outcomes. This draft will be shared across the community to gain feedback and insights into how to best achieve the overall goals, and implement a successful plan.

This draft plan is intended for community comment. Your feedback, ideas and critique will help sharpen our climate strategies and actions. In some cases, additional analysis and new considerations will reshape priorities. Don't be shy! Please give us your input. The City will also reach out to groups across

the community for focused input and discussion, starting in January 2018, with the goal of developing a plan of which all Victorians can be proud.

Following this program of detailed engagement in early 2018, a final draft will be provided to Council for consideration, and formal adoption.

Please send us your comments at [engage@victoria.ca](mailto:engage@victoria.ca) and visit <http://victoria.ca/climateaction>.

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## VICTORIA'S CLIMATE LEADERSHIP VISION

### "LOW-CARBON PROSPERITY"

The City's vision for 2050 is of a vibrant, healthy, and prosperous community, fueled by renewable low-carbon energy systems, designed and integrated in such a way to promote the highest quality of life for all Victorians.

Our mission is to lead our transition to a low-carbon, prosperous future. We have a responsibility to inspire our community's shift to sustainable, renewable transportation, waste and buildings systems. Together, we must take bold action now to unlock the barriers and take the opportunities that can deliver 80% GHG reductions, and 100% renewable energy.

#### ***HOW WILL A LOW CARBON, PROSPEROUS VICTORIA LOOK?***

*In 2050, all residents and visitors are inspired by the quality and function of the City's built environment, as one that truly emulates the natural beauty of its surroundings.*

*City residents enjoy the nation's highest happiness index scores, the highest air quality standards, and the lowest per-capita CO<sub>2</sub> emissions - all thanks to a low-carbon economy built on a thriving village lifestyle surrounding an elegant and beautifully functional urban core.*

*The City is home to hyper-efficient and award winning buildings (both new and old), and North America's most active and integrated multi-modal transportation network. Victorians are the continent's most active population, moving around the region using world-leading integrated, cycling and pedestrian networks. Commuters enjoy a fast and super-convenient renewably powered rapid transit system that affordably connects regional visitors to City jobs and returns them home quickly to spend more time with family, without the burdens of congestion, noise, or air pollution.*

*Victoria is home to a thriving circular economy, which repurposes and reintroduces residual materials (previously termed 'waste') as nutrients to support the production of other goods and services, with almost nothing lost as waste. Landfill natural gas and advanced biofuels supply the only remaining combustion fuel in the region. All community properties enjoy strengthened infrastructure and support healthy, abundant natural ecosystems that contribute to resilience. Restorations were made early and steadily to ensure affordability and the least disruption to our City's quality of life.*

## CLIMATE LEADERSHIP - PLANNING PRINCIPLES

Several planning principles (below) are central and fundamental to all actions that will follow, which set a foundation to influence the actions and tactics intended to deliver meaningful GHG reductions, integrated with other important priorities in the City.

1. **Lead and inspire** – The City will be a regional and national leader on climate mitigation and adaptation. We will take urgent action; creatively and collaboratively with other leaders and key stakeholders to drive innovative GHG reductions, while carefully and wisely balancing social, economic, and environmental sustainability and prosperity.
2. **Harmonize climate and other co-benefits** - Consider GHG reduction actions alongside other important health, safety, affordability, quality of life, and other City planning priorities.
3. **Energy is visible** – Our community's energy use, performance, trends, and impacts are clearly known, owned, and actioned.
4. **All Victorians are accountable:** All Victorians (residents, businesses, employees, and visitors) are accountable for through-life GHG performance, and take meaningful action for their GHG responsibilities and reductions.
5. **Renewable energy for all** – We will work to remove barriers to ensure that our community has access to affordable, renewable, and efficient energy options. All City planning efforts act to deliver a low carbon, renewable energy future.
6. **Smarter energy choices are easier** – We will act to ensure our community understands the value of clean energy and reduced GHGs, and we will systematically remove the barriers preventing a seamless transition to a renewable energy future. Our actions are intelligent, scientific, and socially minded and they deliver real results that achieve the highest benefits, per dollar investment.
7. **Climate resilience is developed early** – We must act with a sense of urgency and take early and meaningful action to avoid the most disruptive through-life economic, social, and environmental impacts imposed by both slow and abrupt climate change.
8. **Think globally, change locally, partner regionally** – All Victorians understand the implications of their habits and decisions on climate, the environment, and on other Victorians. The CLP focuses on change-management activities and acts using an understanding of barriers and opportunities to transition to a low carbon community successfully and smoothly.

## A LOW CARBON, SUSTAINABLE FUTURE

A shift to a low-carbon, renewable energy economy represents both opportunity and risk. A combination of energy innovation and energy conservation will enable our city to reach a clean energy and resilient future. If wisely implemented, climate action can result in numerous co-benefits to the community and should enhance the quality of life for all Victorians:

- **Prosperous and Affordable:** Households and businesses save money on energy and resources, and by using durable, and repairable goods. Early action on climate adaptation is 40% cheaper now, than any decade of delay<sup>1</sup>. Early action on climate mitigation is less disruptive and provides opportunity for healthier change. A clean energy community is not subjected to fossil fuel price fluctuations and shocks, and avoids increasing emissions/pollution costs. If done wisely and timed with other planned improvements, energy retrofits maximize value, avoid costs, and minimise disruption.

A shift to a low carbon economy also creates new clean-technology jobs and business opportunities in all sectors, and requires innovative and creative application of new tools to improve overall management of transportation, waste and building sectors.

- **Healthy and Resilient:** Homes are more comfortable, and resilient. Natural areas are protected and beautiful. Community gardens, urban forest and local food systems are thriving. The elimination of fossil fuel combustion removes CO<sub>2</sub> and other harmful exhaust emissions from our local air. Improved air quality supports healthy child development, and reduces cardiovascular and respiratory issues and illness.
- **Equitable:** Every resident and visitor enjoys a connected, and accessible active transportation network, to connect to jobs and amenities. Affordable and clean mobility choices are available to all, freeing money for other important needs. All Victorians are involved in the development of climate action programs.

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## VICTORIA'S CLIMATE IMPERATIVE

### THE CHALLENGE

Human activity and the rate of fossil fuel combustion has produced CO<sub>2</sub> at an intensity beyond what the earth's natural systems (ocean, land, and atmosphere) can absorb. In 2017, the atmospheric concentration of carbon dioxide (CO<sub>2</sub>) exceeded 400 parts per million (ppm) for the first time in the earth's history. The United Nation's Intergovernmental Panel on Climate Change, (IPCC), estimates that the cumulative concentration of atmospheric greenhouse gas (measured as tonnes of CO<sub>2</sub> equivalent) must not exceed 445 to 490 parts per million to limit the mean global temperature rise between 2.0 to 2.4 °C. Even if we succeed in limiting GHGs below these thresholds, temperature rise could still result in catastrophic climate and weather changes, sea level rise, increased storm severity

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<sup>1</sup> *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press, 2007

and frequency, and severe global ecosystem decline (including the “possible...collapse of part or all of the Amazonian rain forest.”<sup>2</sup>). The IPCC estimates that it will be necessary to reduce global carbon emissions by 50 to 85 percent of the 2000 levels by 2050 to limit temperature rise, and avoid the most severe impacts from climate change.<sup>3</sup>

There is risk that the impacts from global warming at these concentrations of GHGs could be even more severe than anticipated. These uncertainties suggest that bold precautionary and meaningful action is required to reduce GHGs to below the required levels, at the earliest possible opportunity.

Climate change is an unprecedented social, economic, and environmental challenge that threatens our health, well being and way of life. This plan is required to align and set into motion the City’s plans and actions necessary to reduce community GHGs to help maintain global temperature rise well below 2°C.

## LOCAL CLIMATE RELATED IMPACTS

Unless we all act globally, Victorians should expect the following local climate-related impacts before 2050<sup>4</sup>:

- **Increased seasonal precipitation** (31% more precipitation on very wet days and 68% more on extremely wet days) which may result in local flooding causing property damage.
- **Rising sea levels** (at least 0.5 m) may cause local flooding, coastal erosion, and risk of property damage, and the need for increased investment in protections and infrastructure.
- **More frequent, longer and hotter heat-waves** will place socially and economically vulnerable populations at risk of negative health impacts (discomfort, heat stress, stroke, loss of human life.)
- **Resultant effects** such as increased incidence of wildfires, drought, water contamination, loss of biodiversity, increased incidence of plant and animal diseases, building and infrastructure damage, increasingly unaffordable risk management costs, and pressures on the economy.

All of these impacts have a negative social, environmental, and economic cost. Without action, leading economists estimate that the overall costs and risks of climate change will be equivalent to losing between 5% and 20% of global Gross Domestic Product (GDP) annually (Stern, 2007).

This plan aims to put into action the required measures to aggressively reduce GHGs in line with the recently ratified Paris Agreement. This plan will establish community GHG and renewable energy strategies that align with global, federal, provincial and regional government commitments.

## BUSINESS-AS-USUAL IS NOT ENOUGH

Between 2007 and 2015, the city’s community GHG emissions have dropped only 7.2 per cent. This current pace of improvements is not fast enough to stay within safe GHG limits. Unless the pace of the GHG reductions are corrected, the municipality will fall short of its 2050 GHG requirements. The

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<sup>2</sup> IPCC (to be inserted)

<sup>3</sup> GHG inventories became more commonplace in BC communities in 2007, and so 2007 is used as Victoria’s baseline year.

<sup>4</sup> Climate Projections for the Capital Region, CRD (2017). Projections based on RCP 8.5 and 2.6

current pace of improvements (i.e. in planning and in progress), have been projected to 2050, and only result in a 32% reduction in greenhouse gases, which represents a 48% (190,000 tCO<sub>2</sub>e) shortfall. To meet the 2050 requirements, more action is required to reduce an additional ~10,000 tonnes of GHGs (CO<sub>2</sub>e) per year.

## CLIMATE LEADERSHIP COMMITMENT

The City of Victoria will take urgent and meaningful climate mitigation and adaptation action, to transform Victoria into a clean, renewable, and innovative City that uses a frugal mix of renewable energy to power a new era of prosperity, sustainability, and well-being.

Although we may not now know exactly *how* we are going to achieve these goals, bold and ambitious targets are still required to galvanize action and alignment to reach the 80% GHG reduction requirement, and find new and innovative ways to inspire the necessary change, even when faced with uncertainty.

# CLIMATE LEADERSHIP PLAN (CLP)

## STRUCTURE

The CLP is broken down into overall goals that describe the broad climate action objectives, which are then refined into a set of measurable targets for various climate action sectors. To reach these targets, a series of strategies and actions are proposed. In some cases, several strategies must still be developed, which will define the grouping, priority and alignment of initiatives meant to achieve the desired climate benefit. In all cases, metrics and performance measures are required to track progress, trends, and any need for refinement.



Figure 2. Structure of Climate Action Goals, Targets, Strategies, and Actions.

## KEY GOALS – ALL SECTORS

The following table, (Table 1) summarizes the broad climate action goals for each sector, that are strengthened by measurable targets and defined in the sector chapters below.

*Table 1. Climate Action Goals*

| Sector                                            | City Climate Goals                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Carbon, High Performance Buildings            | <ul style="list-style-type: none"> <li>Buildings are highly energy efficient, using only a small fraction of their 2017 operational energy needs.</li> <li>Buildings are powered by renewable energy.</li> </ul>                                                                                                                                                                                                                                                    |
| Low Carbon Mobility                               | <ul style="list-style-type: none"> <li>Vehicles are powered by renewable energy.</li> <li>Victorians enjoy a high-performing, affordable, sustainable, and fully integrated multi-modal transportation system.</li> <li>Transportation emissions are minimized through smart land-use planning that optimises urban mobility and quality of life.</li> </ul>                                                                                                        |
| Low Carbon Waste Systems                          | <ul style="list-style-type: none"> <li>All residual organic materials are reduced, recovered, and reused.</li> <li>Systems are in place to optimise the continual use and reuse of materials, to eliminate landfill waste and related greenhouse gases.</li> </ul>                                                                                                                                                                                                  |
| Adaptation                                        | <ul style="list-style-type: none"> <li>All climate-related risks are minimized through early and wise planning and action.</li> <li>Local, natural habitats flourish in a changing climate.</li> <li>Victorians are prepared for all climate related events and emergencies.</li> </ul>                                                                                                                                                                             |
| Low Carbon Municipal (City) Operations Leadership | <ul style="list-style-type: none"> <li>The City is a recognized leader in climate mitigation and adaptation action.</li> <li>City climate action is informed by a full understanding of through-life social, environmental, and economic costs, risks and benefits.</li> <li>Victorians have access to timely and accurate data to support strong climate mitigation and adaptation actions.</li> <li>Climate action is integrated across City programs.</li> </ul> |

## OVERARCHING GHG REDUCTION TARGETS

Detailed sectoral GHG reduction targets are outlined in the below sections, for buildings, transportation, waste, and also include adaptation targets for improved climate resilience. Interim goals have been developed to ensure we define and stay on track, with the ability to course-correct before mid-century. The following overall mid-term and long-term targets apply:

Mid-Term:

- Reduce community GHG emissions by 50% below 2007 levels by 2030.
- Reduce corporate GHG emissions by 60% below 2007 levels by 2030.

Long-Term:

- Reduce community GHG emissions by 80% below 2007 levels by 2050.
- Reduced our corporate GHG emissions by 90% below 2007 levels by 2050.

## CLIMATE STRATEGIES AND ACTIONS

A series of actions have been developed, which include the creation of strategies and initiatives that align and group discrete actions in a way to promote the highest potential for success. All climate actions are prioritized to reduce fossil fuel energy demand, replace fossil fuel technology or fuels, or to redesign systems, land use, processes, technology, behaviours, and actions to transition to a low carbon, resilient community. The City's climate action plans fit into a combination of four actions types, focused on a list of activities to be completed before the end of 2020:

- **REDUCE:** Reduce fossil fuel energy use through demand-side management, deep energy retrofits, radical efficiency improvements (with a primary focus on 'end-use' efficiency), new energy standards, and improvements in energy operations.
- **REPLACE:** Replace systems that rely on fossil fuel energy sources or replace the fuel with a lower carbon alternative.
- **REDESIGN:** Redesign, re-create, and reconsider GHG emissions production by 'designing-out' the energy burden using designs, plans and tools to achieve low carbon systems, and communities.
- **RESILIENCE:** Improve, strengthen, and mitigate risks to community, ecosystems, and infrastructure due to a changing climate and its resultant forces.

## CLIMATE ACTION SPHERES OF INFLUENCE

The City has a large sphere of influence relating to climate action in our community, using our role in community planning and development, transportation planning and design, waste management, and asset management. The City can also use its regulatory powers to influence energy and emissions reductions. While this Plan mostly identifies actions that fall within the mandate of our regulatory influence, it also identifies actions that can only succeed with the help and cooperation with our partners and community stakeholders. These areas of joint-responsibility pose an important challenge where the City is an influencer, more than a 'duty-holder'. In these areas, the City must collaborate, support and partner with many community stakeholders, share critical information and incentivise change. All meaningful change will require effective communication and engagement. Education and awareness is a critical part of the stakeholder engagement process, and one role the City must lead.

As part of our process, each of the actions have been assessed on our ability to influence through:

- **Control** – this is where we have direct ownership over the initiatives, from capital and resources, and can implement actions to reduce climate change or its impacts (e.g. using local regulatory tools to mandate energy efficient buildings).
- **Influence** – these are actions where we can promote and support the desired GHG reductions (e.g. providing financial top-ups to energy efficiency programs such as the provincial Oil to Heat Pump Incentive Program, collaborating with other levels of government on policy design).

- **Educate, Inform, and Encourage** – these are creative and intelligent programs to support improved energy and GHG reduction behaviours and decision-making. This is typically where behavior change initiatives fall (e.g. Metro Vancouver Love Food; Hate Waste Campaign).

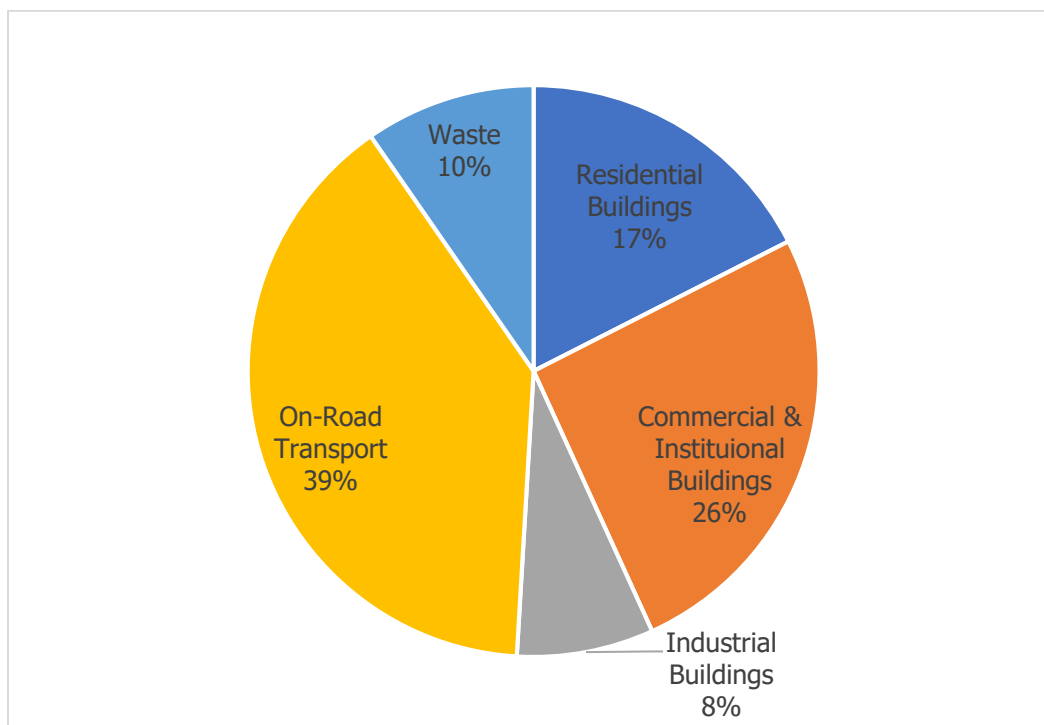
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## CITY GREENHOUSE GAS BASELINE DATA

### 2015 GHG INVENTORY

Residents, businesses, and organizations consume energy to heat and power buildings, and to move goods and services through and around the City. In 2015, approximately 50% of the City's GHG emissions came from buildings, 40% from transportation, and 10% from waste, Figure 3.

Electrical energy in BC is approximately 96% hydro-electricity.<sup>5</sup> Despite this cheap and clean energy source, much of the GHG emissions in buildings still come from heating oil or natural gas, Figure 4. Energy and GHG emissions from the transportation sector are mainly produced from the combustion of gasoline, diesel, and propane in passenger vehicles, which account for near 39% of total GHG emissions. Regionally, the bulk of emissions directly from municipal waste result from organic waste that decomposes and releases methane at the Hartland Landfill.



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<sup>5</sup> Clean Energy Act mandates BC Hydro to minimally supply 93% clean power – 96% in 2016

Figure 3. City of Victoria 2015 GHG Emissions by Sector (387,694 tCO<sub>2</sub>e).

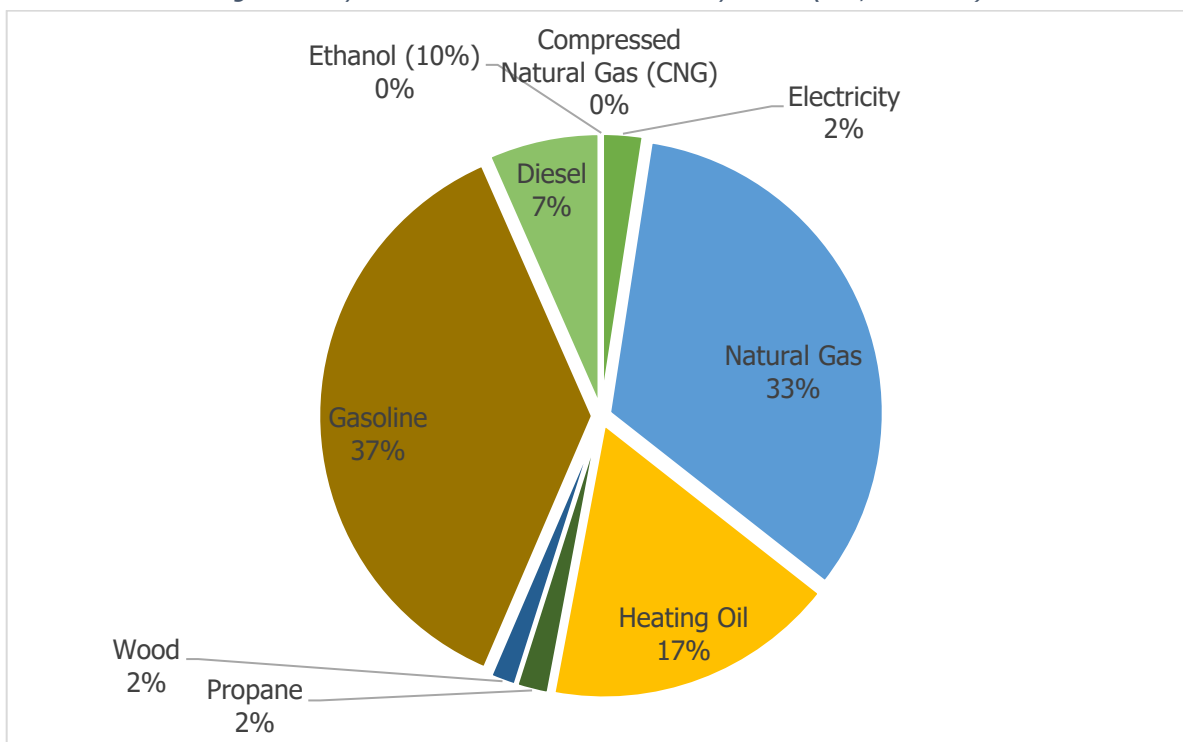


Figure 4. City of Victoria 2015 GHG Emissions by Fuel Type

## GHG REDUCTION PATHWAYS

Our City's population is growing and is projected to increase by more than 20%<sup>6</sup> in the next 25 years. As population grows, so does demand for energy. A GHG emissions forecast estimates how much energy our community will need if we do or do not make changes to today's patterns of energy consumption. It is a useful tool in that it also estimates how much our GHG emissions will grow by 2050 so that we can assess the potential of GHG reduction actions as well as set interim and long-term targets.

We established three planning GHG scenarios – **business as usual** (BAU), **current-pace**, and **meeting our target**, each of which required us to project and grow our 2015 GHG emissions to estimate what our GHG profile would look like in 2050 (see Figure 5). The BAU scenario shows us where are GHG emissions are heading if we do nothing at all – this scenario provides us the context to which we must work from if we are to achieve our GHG reduction targets. The "current pace" scenario reflects the City's current infrastructure, and incorporates our already planned changes. The intent of this scenario is to present the GHG reductions that are likely to occur because of our GHG reduction actions already underway. The third scenario ("**meeting our targets**"), shows us what we need to do to reach our target, and reduce GHGs by 80% below 2007 levels by 2050. The actions in this scenario are aggressive – they are beyond what we have planned today, and require considerable planning, resources, political commitment, and coordination with partners and residents. These strategies are long-term, are complex (some require behavior change, others financial incentives, etc.), and thus

<sup>6</sup> Based on historical population growth rate of 1%

have risk and uncertainty. While the three scenarios are combined in the following chart, the separate profiles and associated assumptions are presented in Appendix A.

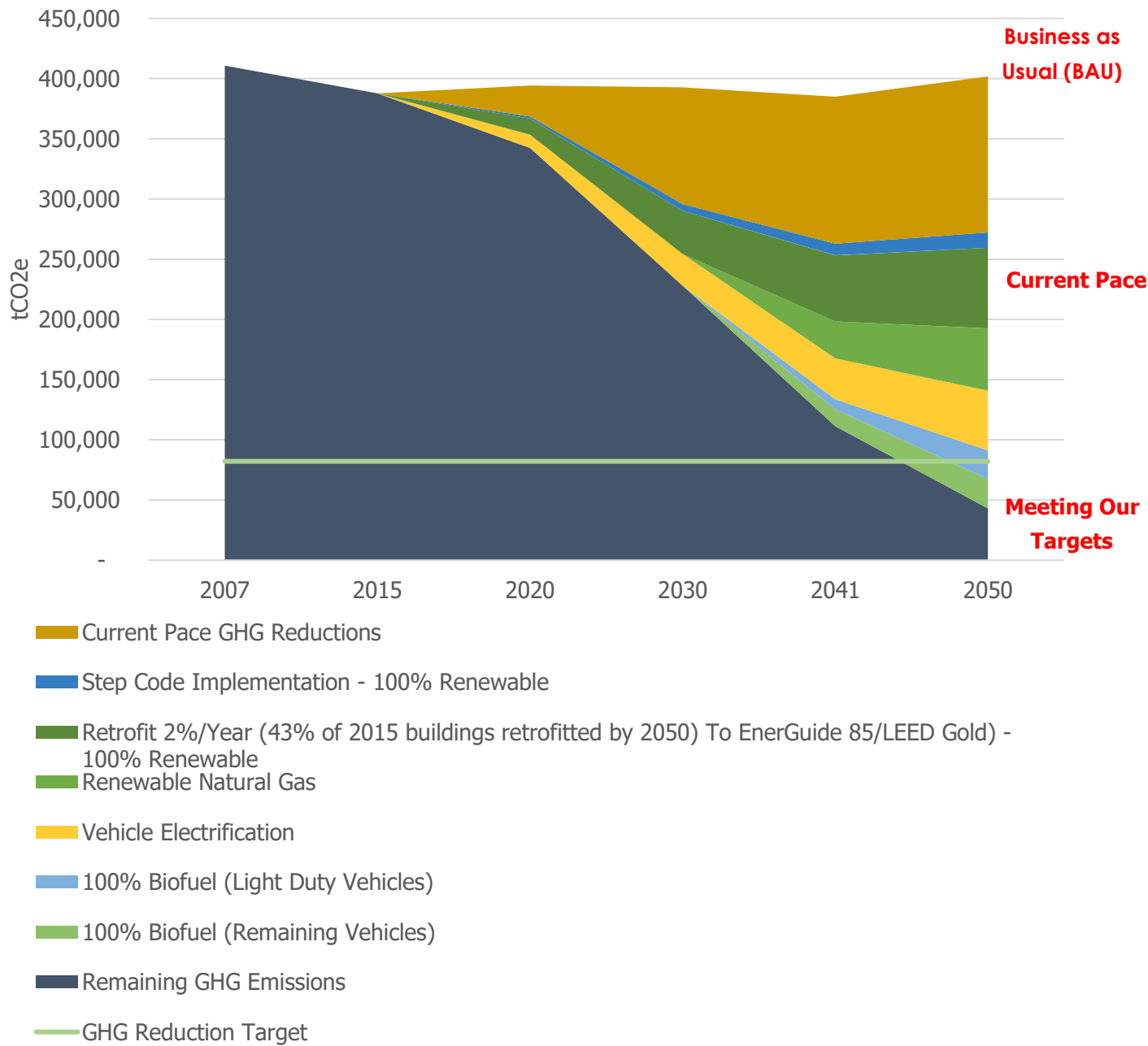


Figure 5. Trajectory of GHG emission reductions and sustainability gap relative to the 80% reduction target

## 100% RENEWABLE ENERGY TARGET

The City defines renewable energy as energy that is generated from naturally occurring processes that is replenished over a single human timescale. Through our 100% renewable energy target, by 2050

Victoria will only run on technologies that use sunshine, wind, flowing water, geothermal heat, and/or non-fossil fuels or biological processes to power our lives. A 100% renewable energy target in the same timeframe as the City’s GHG target supports many of the key pathways to achieve 80% GHG reductions by 2050, whilst also improving community resilience to climate change. For the City, the renewable energy target applies to all energy use occurring within the Victoria municipal boundary.

For the 2015 reporting year, 38% of the City’s energy usage came from renewable energy sources consisting of hydro electricity, renewable natural gas, renewable fuel content in gasoline, diesel, and heating oil, and the use of wood to heat homes, Figure 6. Reaching the 100% renewable target by 2050 will only be achieved by reducing energy demand, and through fuel switching to renewable energy sources.

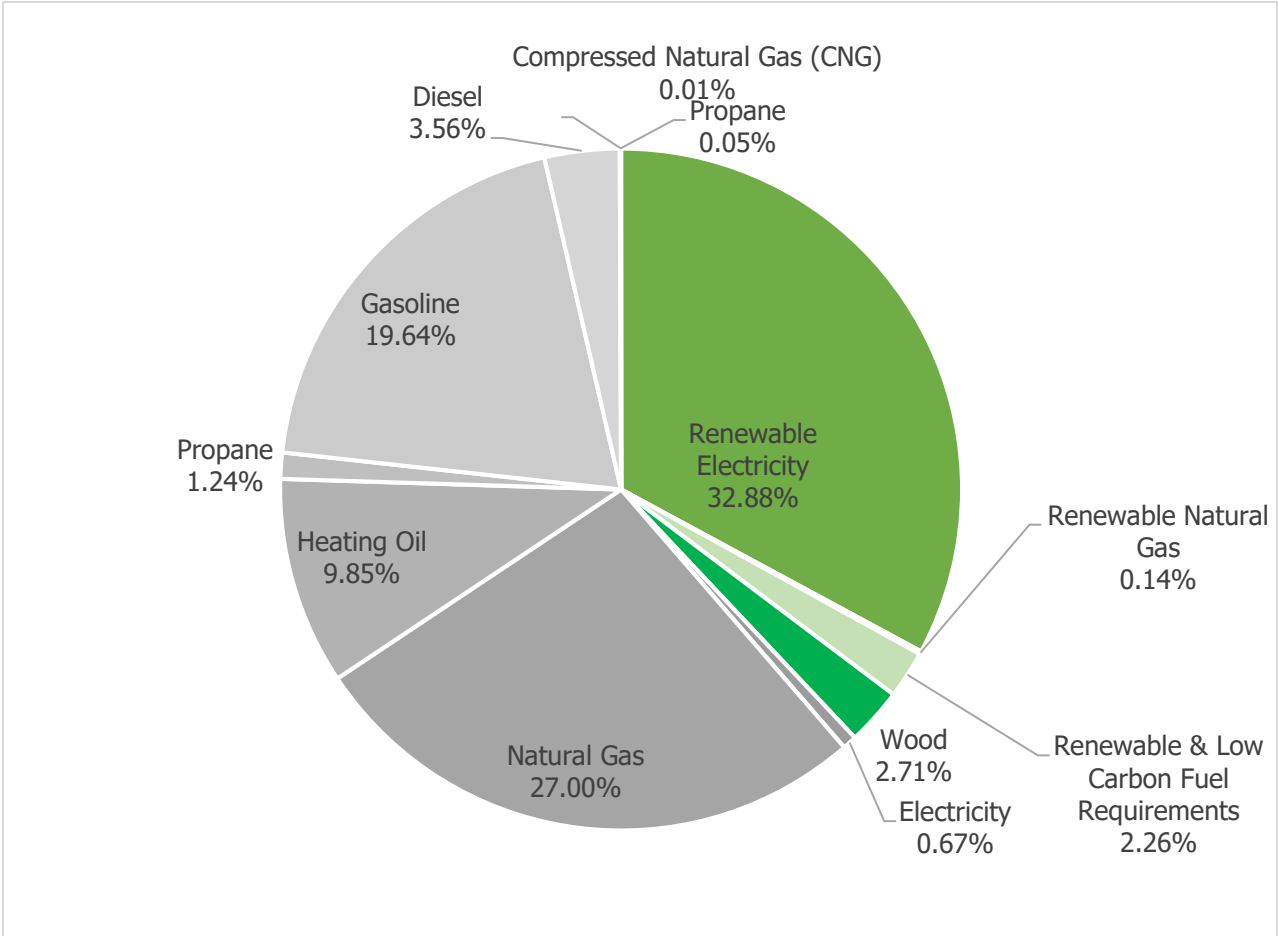


Figure 6. Current renewable **and non-renewable** energy mix in Victoria (2015)

# LOW CARBON, HIGH PERFORMANCE BUILDINGS

## 2050 VISION:

By 2050, Victorians will enjoy high-performing, comfortable buildings that are affordable to operate. New buildings are net-zero energy-ready<sup>7</sup> and powered by renewable energy. Existing buildings are upgraded to improve indoor environmental quality, minimize heating and cooling costs, with substantially reduced carbon footprint. Heating oil systems are a thing of the past, and homes and offices instead are powered by renewable energy sources such as hydro-electric, solar, and renewable natural gas for heat and power.

## BASELINE DATA

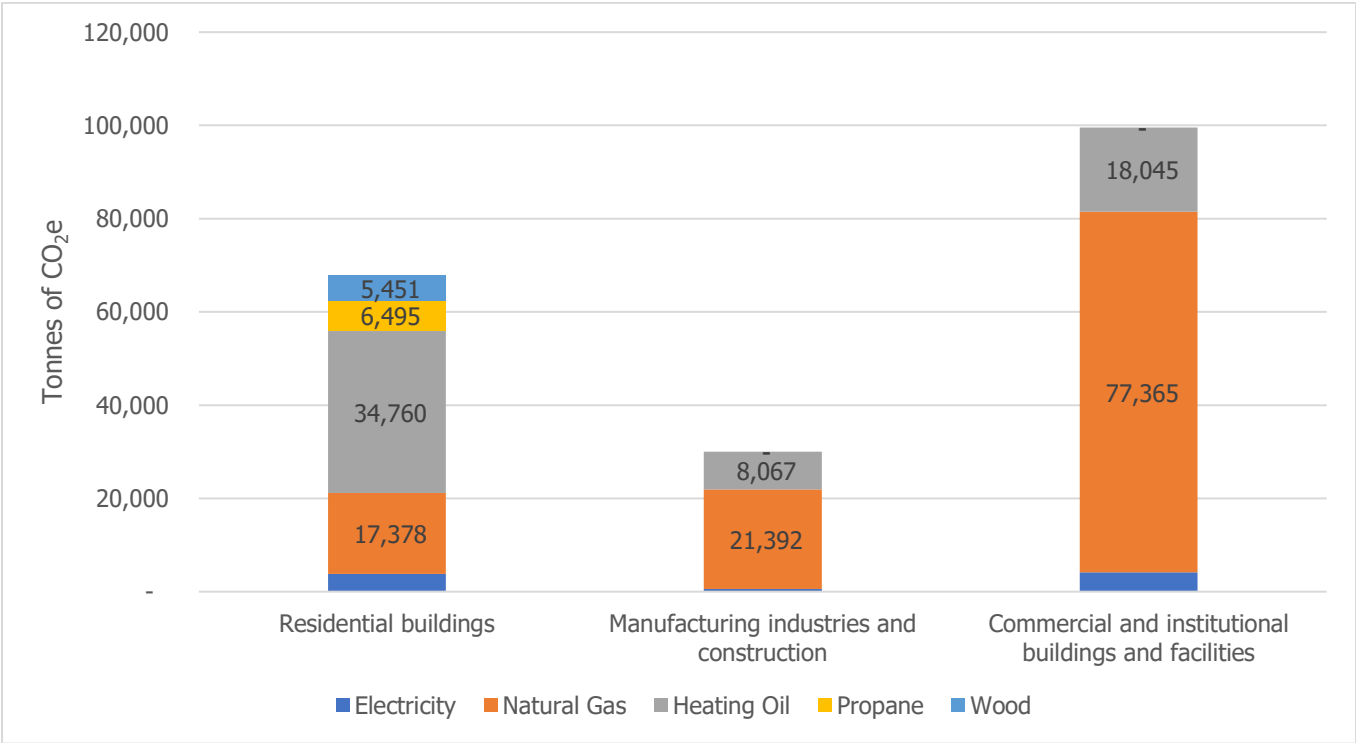


Figure 7. Building GHG Emissions by Fuel Use.

<sup>7</sup> A net-zero energy ready building is one that is designed to be ultra-efficient and 'ready' to produce all of its energy needs through the future installation of an on-site renewable energy system

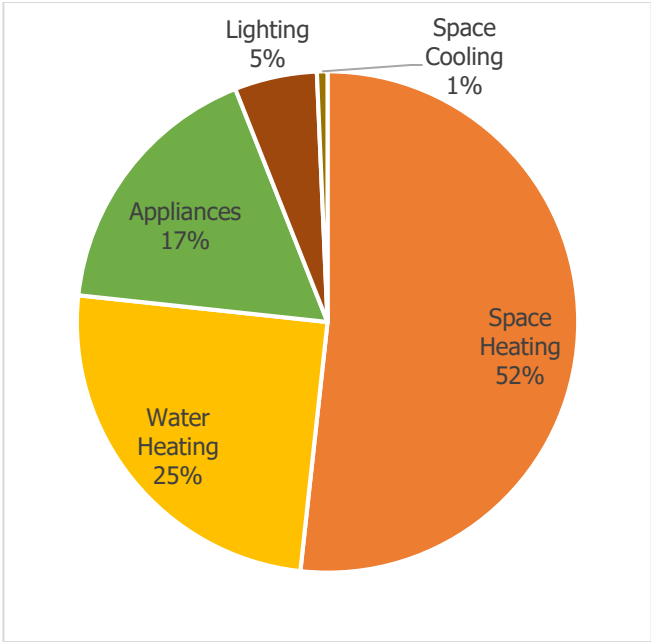


Figure 8. BC Residential Building Energy Consumption by End Use.<sup>8</sup>

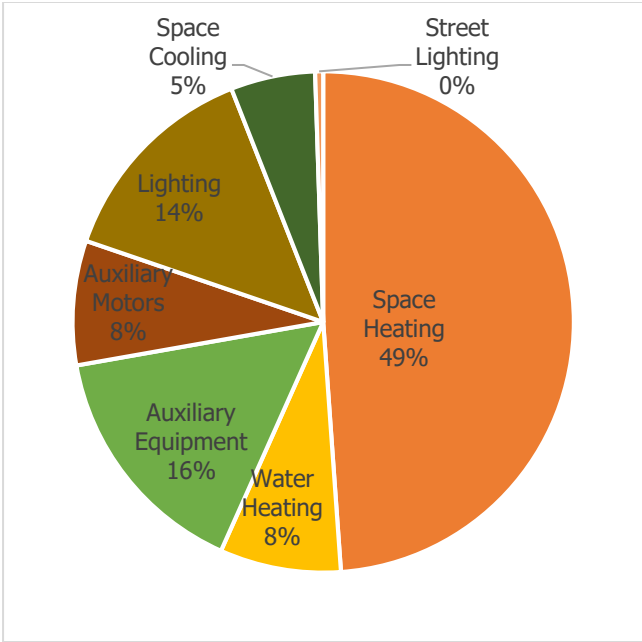


Figure 9. BC Commercial Building Energy Consumption by End Use.<sup>9</sup>

The building sector produces 50% (197,000 tCO<sub>2</sub>e) of the City’s GHGs emissions, and represents the largest opportunity for improvement. Based on our 2007 community GHG emissions, residential buildings contributed 16.5% of all GHG emissions, while commercial buildings contributed over 25%, with half of the total GHGs coming from the combustion of natural gas for building heating and cooling, (Figure 7). Of the City’s building GHG emissions, 17% come from heating oil use. High performing buildings not only result in reduced GHG emissions, they also result in more comfortable homes and offices that are cheaper to operate. Figure 8 and Figure 9 provide an overview of how energy is typically consumed in BC residential and commercial buildings.

KEY GOALS

Projecting our 2050 GHG performance using the “current commitments” (accounting for energy reduction and efficiency actions underway), the 2050 buildings emissions are estimated to remain relatively steady and we will not meet our targets. To do so, the City will need to reduce GHG emissions from buildings by at least 200,000 tCO<sub>2</sub>e. The goals, targets and actions described in this chapter, represent the City’s approach to achieving these overall targets. 2050 GHG reductions are expected to come from meeting the following goals, Table 2.

<sup>8</sup> NRCAN National Energy Use Database - Residential Sector British Columbia 2014  
<sup>9</sup> NRCAN National Energy Use Database - Commercial/Institutional Sector British Columbia 2014

Table 2 Low Carbon, High Performance Buildings Goals

| Sector                                 | Climate Action Goals                                                                                                                                                                                                           |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Carbon, High Performance Buildings | <ul style="list-style-type: none"> <li>Goal 1: Buildings are highly energy efficient, using only a small fraction of their 2017 operational energy needs</li> <li>Goal 2: Buildings are powered by renewable energy</li> </ul> |

**GOAL 1: BUILDINGS ARE HIGHLY ENERGY EFFICIENT, USING ONLY A SMALL FRACTION OF THEIR 2017 OPERATIONAL ENERGY NEEDS**

Approximately 1-2 % of Victoria’s buildings are replaced annually, and many without the necessary efficiency upgrades to ensure that through-life operational energy and GHGs are minimized. New building GHG reduction can be achieved through better design, improved building envelopes and mechanical system efficiency, and the use of renewable energy.

The new BC Energy Step Code establishes progressive performance steps in energy efficiency for new buildings from the current BC Building Code level to net zero energy ready buildings by 2032, and offers a significant opportunity for the City to establish energy efficiency requirements in new construction.

Existing residential and commercial buildings combine to contribute over 40% of the City’s GHG emissions. Dedicated strategies will realize reductions to decarbonize fuel supplies, deep energy retrofits and efficiency gains, and other strategies that incent owners and tenants to reduce energy use, each year.

Victoria’s building stock is aging, with 70% of the existing building stock built prior to 1980, and 8% of buildings requiring major repairs (2011 National Household Survey). Landlord BC estimates that over the next 10 years 10,000 rental apartment units will require significant upgrades in Victoria. This forecast represents a ‘once in a generation’ opportunity for energy retrofits and reduced GHG performance improvements.

Currently, there is no national energy code that applies to existing buildings, however, the National Buildings Strategy highlights the Federal Government’s commitment to define a model code for existing buildings by 2022. The City will work with federal partners and local stakeholders to develop strategies and actions that prioritize cost-effective building energy upgrade programs that provide resources, incentives, and financing for property owners to undertake deep and tiered energy efficiency retrofits.

**GOAL 2: BUILDINGS IN VICTORIA ARE POWERED BY RENEWABLE ENERGY**

While energy efficiency measures and programs will be prioritized, replacing fossil fuels with renewable energy sources will be required in order to meet our 100% renewable energy commitments. The City will encourage uptake of renewable energy in residential and commercial buildings by reducing barriers to implementation and supporting rebate and promotional programs.

The BC Energy Step Code and other green building requirements typically do not account for embodied emissions that occur as a result of energy used and GHGs emitted from the full life cycle of building construction, from resource extraction, production, transportation, and construction practices. This is largely due to the fact that the GHG emissions associated with the energy used in the operation of a building are much greater than the emissions embedded in the materials required for its construction. However, over time and as our operational emissions are reduced, the relative importance of

addressing GHG emissions embodied in building materials and construction practices will become a more significant consideration to reduce overall building-related GHG emissions. As an example, some building materials, such as wood, have much less embodied energy than steel or concrete and “mass timber” structures are becoming more commonly seen in Canada and around the world.

## KEY TARGETS

The following table summarizes our specific targets as it relates to each goal, Table 3.

*Table 3. Commercial and Residential Building - GHG Reduction Targets.*

| Goal                                                      | GHG Target                                                                             |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------|
| Goal 1                                                    | By 2030, all new buildings are “net zero energy ready” <sup>10</sup>                   |
|                                                           | Before 2050, all existing buildings are retrofitted to new efficiency standards (TBD)* |
| Goal 2                                                    | Oil heating is phased-out by 2030                                                      |
|                                                           | Before 2050, all buildings will only use renewable energy                              |
| <b>Total Estimated GHG tCO<sub>2</sub>e / % Reduction</b> |                                                                                        |
| <b>200,000 / 50%</b>                                      |                                                                                        |

\*These standards are being developed now, with input from federal and provincial stakeholders and will be defined in the near future.

## PRIORITY ACTIONS

By 2020, the City will implement the following priority actions:

1. Develop and implement a BC Energy Step Code adoption strategy that will review and recommend updates to bylaws and City policies.
2. Update the current Sustainability Checklist to include Step Code requirements for new buildings
3. Support the development and establishment of a “Building Centre of Excellence” in Victoria to showcase leading edge building design and construction practices and establish a culture of high performance within the building industry
4. Develop an ‘energy equity program’ to promote solutions to advance GHG reduction initiatives that are economically justified, feasible and equitable.
5. Develop and implement a ‘Deep Energy Retrofit Strategy’. As part of this strategy, the City will prioritize the following:
  - a. Actions for Single Family Homes:
    - i. Deliver a program for ‘bundled and easy to achieve’ energy retrofits that aim to deliver priority energy improvements without the recipient’s burden / barriers due to detailed administration, time and complexity, while still leveraging all available external funding.

<sup>10</sup> A net-zero energy ready building is one that is designed to be ultra-efficient and ‘ready’ to produce all of its energy needs through the future installation of an on-site renewable energy system

- ii. Train staff to gain skills unique to zero-emission buildings, and renewable energy systems
  - iii. Partner with utilities and higher levels of government to support innovative financial incentives and programs to encourage retrofit behavior and to provide a consistent process and funding source.
- b. Actions for multi-unit residential and commercial buildings:
  - i. Complete a Market Rental Revitalization Study (MaRRS) to determine how to best retrofit and revitalize existing rental housing stock while preserving affordability and improving energy performance.
  - ii. Complete a retrofit study to identify opportunities to initiate deep energy retrofits for market residential buildings (e.g. condominiums).
- 6. Partner with property owners/managers to identify the most attractive energy efficiency upgrades in commercial buildings and develop a formal plan to support rapid adoption/penetration.
- 7. Advocate for the development of a compulsory benchmarking and energy labeling program for homes and larger buildings, as committed to in the National Buildings Strategy. As an interim, support the development of a voluntary commercial building energy benchmarking program (e.g., a 2030 District).
- 8. Partner with utilities and higher levels of government to develop innovative financial mechanisms and programs to encourage retrofit behavior and to provide a consistent process and funding source.
- 9. Develop and implement a transition plan to inventory and incentivize the phasing out of heating oil systems in residential, commercial, and institutional properties by 2030, aligning benefits across cost, insurance and environmental risks.
- 10. Reduce City owned barriers to incentivize the adoption of building renewable energy systems and develop complementary planning guidance documentation and education tools to help achieve successful applications (e.g. create a "Want to go solar?" FAQ sheet to make it easier to navigate the City in terms of permits required).
- 11. Establish a program to collect data from new property developments on their estimated embodied carbon in order to inform future incentive, policy, and potentially regulatory mechanisms targeted at reducing the embodied emissions of new buildings as these become an increasingly significant portion of overall building lifecycle emissions

# LOW CARBON TRANSPORTATION AND MOBILITY

## 2050 VISION

By 2050, people, goods and services will travel around Victoria generating little or no GHG emissions. Walking, biking and renewably powered transit provide super-convenient and commonly used mobility options, connecting all residents and visitors to well-designed, complete neighborhoods with attractive and nearby amenities. The vast majority of commercial and community vehicles have been electrified, and only a few use internal combustion engines, powered by advanced, renewable biofuels.

## BASELINE DATA

Transportation activities make up the second largest GHG emissions source in the City (39.4%). Most (86%) of those emissions come from the private, single occupant vehicle (SOV), with commercial vehicles making up 14%, (Figure 10). GHG reductions may be achieved through reduction in trips, distance travelled, increased efficiencies, alternative fuels, electrification, and subsequent shifts to transit, walking and cycling.

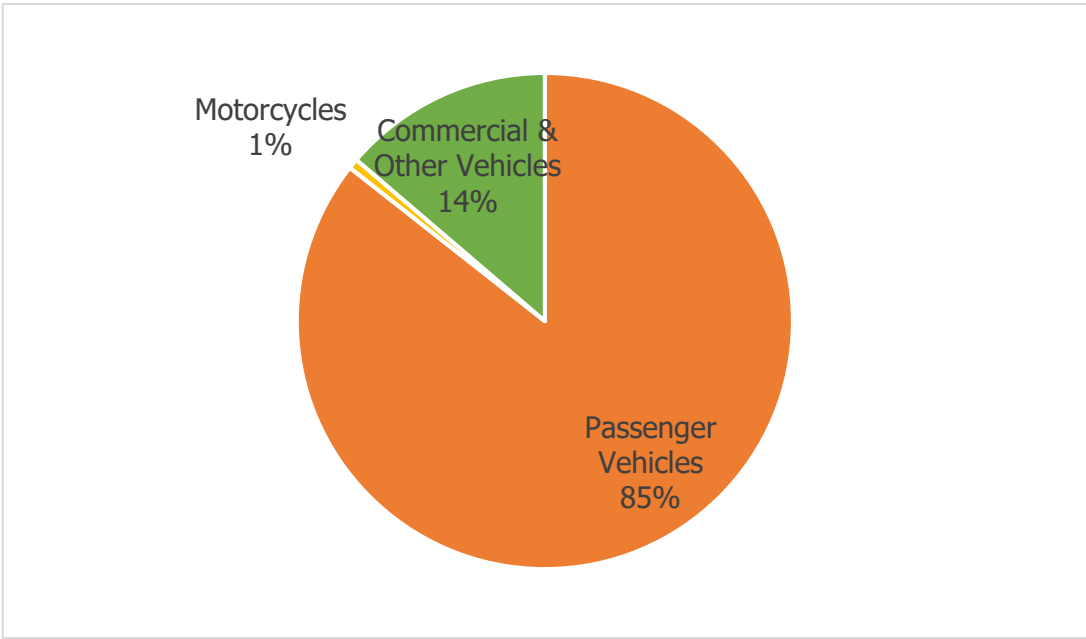


Figure 10. GHG Contribution by Vehicle Type.

Based on the current trajectory, accounting for improved vehicle fuel efficiency standards and the ongoing adoption of electric vehicles, 2050 transportation GHG emissions need to be consistent with emissions from the 2015 reporting year (157,500 tCO<sub>2</sub>e). To achieve the GHG reduction and renewable energy targets, the City will need to nearly eliminate all GHG emissions from the transportation sector, which will require implementation of several strategies to meet the following key goals, Table 4:

KEY GOALS

Table 4 Low Carbon Transportation and Mobility Goals

| Sector              | Climate Action Goals                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Carbon Mobility | <ul style="list-style-type: none"><li>• Goal 1: Vehicles are powered by renewable energy.</li><li>• Goal 2: Victorians enjoy a high-performing, affordable, sustainable, and fully integrated multi-modal transportation system.</li><li>• Goal 3: Transportation emissions are minimized through smart land-use planning that optimises urban mobility and quality of life.</li></ul> |

**GOAL 1: VEHICLES ARE POWERED BY RENEWABLE ENERGY**

Electric Vehicles (EVs), charged by renewable hydro-electricity are becoming commonplace in Victoria. Modern battery technologies provide over 300 km of vehicle range on a single charge, which is more than enough for most commuters’ needs. Auto manufacturers are increasing the number of available EV models each year, and the costs are becoming more competitive with the equivalent internal combustion engine models. The barriers preventing more widespread adoption of EVs continue to be reduced. More widespread EV adoption will be possible with more consumer confidence, vehicle availability and configuration, lower purchase price and greater ease of charging (home or destination). The City has a key role to play in unlocking many of these barriers, to incentivise a shift to electrification.

**GOAL 2: VICTORIANS ENJOY A HIGH-PERFORMING, AFFORDABLE, SUSTAINABLE, AND FULLY INTEGRATED MULTI-MODAL TRANSPORTATION SYSTEM.**

Victoria is a compact community with more than half of residents currently walking, biking or using transit to get to work or school. The City’s small size (~20 Km<sup>2</sup>), relatively gentle terrain, mild climate, and existing infrastructure has facilitated one of the highest percentages of active transportation commuters (walking and cycling) in Canada. Over three-quarters of Victoria residents live within 5 Km of their jobs, with approximately half (48%) commuting to work by private vehicle (2016 census). Providing investments in active transportation infrastructure and encouraging cycling as a part of a broader active and multi-modal transportation system will reduce GHG emissions by reducing the number of vehicle trips. The City has adopted an All Ages and Abilities (AAA) bicycle network consisting of over 32 Km of enhanced cycling infrastructure across the municipality which makes walking and cycling more a more accessible, safe, and viable option for commuters.

**GOAL 3: TRANSPORTATION EMISSIONS ARE MINIMIZED THROUGH SMART LAND-USE PLANNING THAT OPTIMISES URBAN MOBILITY AND QUALITY OF LIFE**

Land use type and density are major influencing factors in transportation choices and their related energy requirements. Higher density developments with nearby amenities, and high quality pedestrian, cycling and transit infrastructure support active and sustainable mobility choices. The city’s population will likely grow by more than 20% by 2050, which means that it is extremely important that the City

encourage compact, mixed-use developments alongside high-quality, low-carbon mobility options to minimize the volume of single passenger vehicles in the city.

## KEY TARGETS

The following table summarizes our specific targets as it relates to each goal, Table 5.

*Table 5. Low Carbon Transportation and Mobility Targets*

| Goal                                                 | GHG Targets                                                                          |               |
|------------------------------------------------------|--------------------------------------------------------------------------------------|---------------|
| Goal 1                                               | By 2050, 100% personal vehicles are renewably powered <sup>11</sup>                  |               |
|                                                      | By 2030, 30% of commercial vehicles are renewably powered <sup>12</sup>              |               |
| Goal 2                                               | By 2050, 25% of all trips in Victoria are taken by renewably powered public transit. |               |
|                                                      | By 2041, 55% of all trips are taken by walking and cycling                           |               |
| Goal 3:                                              | By 2041, 100% of neighbourhoods are complete <sup>13</sup> by design                 |               |
| Total Estimated GHG tCO <sub>2</sub> e / % Reduction |                                                                                      | 160,000 / 40% |

## PRIORITY ACTIONS

By 2020, the City will implement the following CLP priority actions that address the above objectives, in conjunction with wider mobility improvements, many of which will improve climate outcomes, via the City's Sustainable Mobility Strategy:

- Design and implement a vehicle electrification strategy to promote and support our community's transition to electric vehicles (private and commercial). As part of this strategy, the City will:
  - Design an Electric Vehicle Ecosystem Strategy (in partnership with BC Hydro and other key stakeholders) that delivers innovative charging and power management infrastructure, parking systems, and information management systems on city streets and public spaces.
  - Propel the rapid adoption of electric vehicles in public and private applications.
  - Develop EV charging design guidelines to support high levels of EV charging availability in new MURBs and commercial buildings.
- Develop a transportation GHG information strategy through partnership with CRD and ICBC, supported by monitoring, analysis and information management tools and technology to help inform all transportation GHG planning and action.
- As part of the parallel Sustainable Mobility Strategy development, finalize policies and actions to support plans and policies to support GHG reductions such as:

<sup>11</sup> We recognise this is a ambitious target beyond current projections, but is required to meet our target

<sup>12</sup> Supports EV30@30 campaign led by Clean Energy Ministerial

<sup>13</sup> Criteria for complete neighbourhoods will be determined at a future date (see actions)

- a. Design and implement a future-proof, fully integrated and sustainable mobility system, which provides a seamless network of clean, convenient, and intelligent mobility options and modes across the City, and connected across the region.
  - b. Implement actions to support a radical improvement in low-carbon rapid and frequent public transit in, out and around the City, in partnership with regional and local stakeholders.
  - c. Update the City's parking strategy, to include residential, public and private parking design, management and information.
  - d. Continue the delivery of the Bicycle Master Plan and Pedestrian Master Plan, including a renewed action plan to support and deliver enhanced mode-shift to cycling across the City.
  - e. Update off-street bicycle parking design guidelines to encourage attractive and functional bicycle parking on private property.
  - f. Complete a corporate Transportation Demand Management strategy and action plan to reduce Single Occupant Vehicle, congestion, air pollution and GHGs.
  - g. Develop a Car Share / Ride Share Strategy, policy, and action plan.
  - h. Develop regulatory frameworks to address bike-share services and other emerging transportation services, integrated seamlessly with all other mode choices.
4. Undertake research in partnership with academic institutions on electric bicycle and autonomous vehicle demand and GHG reduction potential to better understand risks, benefits and potential roles for local government.
  5. Petition, partner and collaborate with the Province to deliver significant improvements in community and commercial vehicle performance and usage information, vehicle fuel efficiency and air quality standards and monitoring.
  6. Develop new, modern and effective strategies to improve neighborhood design to provide increased opportunities for active transportation, reduced single occupant vehicle use and improved connections to 3<sup>rd</sup> places (i.e. key destinations other than home and work).
  7. Prioritize projects that optimize and harmonize GHG, mobility and improved air-quality objectives.
  8. Support the continued implementation of the Province's low-carbon fuel strategy.
  9. Define complete neighbourhood criteria for target tracking.

## LOW CARBON WASTE MANAGEMENT SYSTEMS

### VISION 2050

**By 2050, residents, employers, employees, and visitors will each manage organic materials responsibly, and ensure they reach industrial composting facilities. The overall waste management system will be powered by electricity or by renewable fuels to reduce total system GHG emissions by at least 80%. The City will have taken significant action to minimize consumption and waste across all sectors, and will benefit from a healthy, job-rich marketplace for used and repurposed materials, that continually flow throughout the economy as reintroduced material-nutrients for essential processes. The community's organic waste will be processed locally, affordably and sustainably, and reintroduced as feedstock for growing more food.**

### BASELINE DATA

Victoria residents and businesses generate approximately 65,000 tonnes of solid waste that ends up at Hartland Landfill. The Capital Regional District (CRD) currently diverts approximately 50% of the collected solid waste thanks to recycling and other stewardship programs. The Hartland Landfill captures and combusts over 60% of the landfill gas created to generate electricity, for on-site power or metered electricity to the grid. The decomposition of only the City's organic waste is estimated to generate some 37,500<sup>14</sup> tonnes of annual GHGs, which is approximately 7% of the city's total GHG emissions.

### KEY GOALS

As part of achieving our GHG emission reduction targets, our aim is to eliminate all GHG emissions from the waste sector. This means that all our discarded food and yard organic materials avoid landfilling. Furthermore, we need to start considering the embodied GHGs from the goods and services we consume. The development of the City's Sustainable Waste Management Strategy will be focussed on how to ensure we minimize all wastes, and ensure materials are retained and re-introduced as materials for other processes. This 'closed loop' materials management system is now known as the 'circular economy', which requires residual materials to have value and markets to ensure they are captured and repurposed. The City's waste goals all rely on bold actions by maximizing the 7rs of zero waste: reduce, rethink, refuse, recycle reuse, and repair". Our 2050 GHG reductions are expected to come from meeting the following goals, tabulated below, Table 6.

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<sup>14</sup> From Draft City of Victoria 2015 Community Greenhouse Gas Emissions Inventory Report

Table 6 Low Carbon Waste Management System Goals

| Sector                   | Climate Action Goals                                                                                                                                                                                                                                                                |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Carbon Waste Systems | <ul style="list-style-type: none"><li>• Goal 1: All residual organic materials are reduced, recovered, and reused.</li><li>• Goal 2: Systems are in place to optimise the continual use and reuse of materials, to eliminate landfill waste and related greenhouse gases.</li></ul> |

**GOAL 1: ALL RESIDUAL ORGANIC MATERIALS ARE REDUCED, RECOVERED, AND REUSED**

Our objective is to reduce all waste to zero, and avoid any future expansion of regional landfill, which can only be achieved through a shift to a local, regional and perhaps even national - circular economy. The CLP aims to deliver actions that reduce the GHGs associated with waste, namely organic waste decomposition and waste-management system GHGs (transport, processing, etc.). Any GHG reductions will rely on waste reduction programs, capture and process organic wastes, fuel switching and electrification of the waste management system, and redesign of waste management systems overall. Achieving the 2050 GHG reduction targets will require the elimination of all organic waste GHG emissions.

**GOAL 2: SYSTEMS ARE IN PLACE TO OPTIMISE THE CONTINUAL USE AND REUSE OF MATERIALS, TO ELIMINATE LANDFILL WASTE AND RELATED GREENHOUSE GASES**

Victoria’s solid waste encompasses a wide range of materials that are discarded by residents and businesses. GHG emissions related to embodied-energy occur as a result of landfilling, recycling, and processing of all materials. Any shift to a zero-waste system requires strategies that avoid or reduce waste, and find innovative ways to recover and repurpose materials for feed-stocks into other processes.

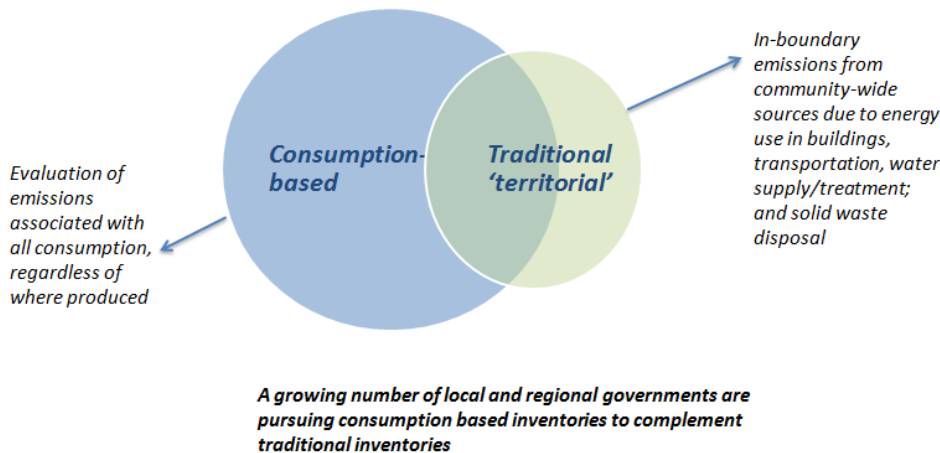


Figure 11. Consumption and Traditional GHG Emission Inventories

The eco-footprint tool, being developed by BCIT in partnership with the City and USDN aims to inform a broader set of planning initiatives at the City. The interim results show the emissions that are not directly produced in our municipality, but are a result of the operations, services and activities in the City. These measures of urban metabolism will help illuminate what other areas must be approached if

we are to achieve net sustainability and GHG reductions, Figure 11. Preliminary results show that the food system is a major contributor to community owned emissions, due to the embodied emissions associated mainly with the meat and dairy industries.

*“These results demonstrate that the largest priority for reducing the City’s food [carbon] footprint is to target meat and dairy consumption, both in terms of reducing overall consumption levels and in terms of reducing the land and energy demands associated with their consumption”.<sup>15</sup>*

The City is developing our Sustainable Solid Waste Management Strategy, which will examine, evaluate, and recommend a suite of strategies and actions towards a goal of net zero waste. The actions advanced in the CLP focus only on those areas of waste reduction where substantial GHG emissions reductions can be achieved.

## KEY TARGETS

The following table (Table 7) summarizes our specific targets as it relates to each goal:

*Table 7. Low Carbon Waste Systems GHG Targets.*

| Goal                                                 | GHG Reduction Target                                                                                                         |              |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------|
| Goal 1                                               | Achieve 100% residential organic waste (food and yard) diversion by 2022.                                                    |              |
|                                                      | Partner with local business to divert 90% of commercial organic food waste by 2025.                                          |              |
|                                                      | Partner with the CRD to deliver a regional, industrial composting facility for City organic waste by 2025*.                  |              |
|                                                      | 100% of the GHGs from collected organic food and garden waste collection is transformed into renewable natural gas, by 2025. |              |
| Goal 2                                               | Ensure less than 5% of local residual materials reach the landfill by 2050.                                                  |              |
| Total Estimated GHG tCO <sub>2</sub> e / % Reduction |                                                                                                                              | 40,000 / 10% |

\* Goals not owned by the City, but influenced by City and its partners.

## PRIORITY ACTIONS

By 2020, the City will implement the following CLP priority waste GHG actions:

1. Establish sectoral organic waste diversion targets that support the goals of eliminating organic waste going to landfill by 2050, and achieving the City’s GHG emission reduction target.
2. Implement a waste tracking program to develop a baseline of waste volumes, waste composition, and diversion rates across waste streams.
3. Work with the CRD and local food stakeholder groups to develop a restaurant food waste reduction pilot project to demonstrate the wide range of benefits, such as reduced disposal

<sup>15</sup> City of Victoria EcoCity Footprint Tool Pilot Draft Report, BCIT/Hallsworth Consulting (2017)

costs, labor, energy, and environmental impacts. Contribute to the pilot projects through marketing, administrative services, or assisting with financing such as providing start-up funding and the dissemination of the results. Support implementation with a waste audit and a waste reduction toolkit, including tips to help monitor kitchen food waste, and consumers reduce their food waste at home.

4. Foster social behavior change and implement initiatives like “Meatless Mondays” or like Metro Vancouver’s “Love Food Hate Waste” campaign, to increase organic waste diversion.
5. Complete a barriers analysis to understand opportunities to reduce waste, and contamination of the waste streams.
6. Develop a building deconstruction plan to divert 100% of non-hazardous demolition waste from the landfill where feasible.
7. Partner with regional governments to complete a study to assess the highest and best use of organic waste by stimulating end markets that recover value, and where possible, maintain the local nutrient cycle, from organic waste streams. Implement the recommendations.
8. By 2020, provide a toolkit to help the community understand the embodied carbon emissions of the goods and services that we consume.
9. Develop an integrated sustainable waste management plan that embraces the principles of the circular economy.

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# ADAPTATION – PREPARING FOR A CHANGING CLIMATE

## 2050 VISION

All community properties enjoy strengthened infrastructure and support healthy, abundant natural ecosystems that contribute to our City's resilience. Restorations were made early and steadily to ensure affordability and the least disruption to our City's quality of life. The City has already and affordably completed infrastructure improvements to adequately manage severe and prolonged storms, heat, increased flooding, and other weather events.

## OVERVIEW

Climate change poses a unique and complicated problem for society, due to the dynamic, geographic, political, conflicting, and uncertain factors that shape how it is experienced. Air emissions are shared across the planet, which requires a common responsibility to reduce GHGs, but also a requirement to prepare now for the changes that we face in the years to come.

If all current human caused GHG emissions ceased today, global warming and its associated impacts would continue for many decades, due to the long lifespan of carbon in the atmosphere. For this reason, it is not sufficient to merely reduce future GHG emissions, the City and its residents must also prepare for a changing climate and its uncertainties, and how those may impact our community's well-being and way of life.

This preparation is described as climate change 'adaptation' – adjustment in natural or human systems to a new or changing environment – and is now an essential requirement for managing our urban and municipal environments and our personal and public assets and infrastructure.

## KEY GOALS

Successful climate change adaptation and preparation reduces climate-related vulnerabilities, whilst enabling the City and its residents to effectively respond to, and recover from the climatic related events. On this basis, the following goals have been set for the City, Table 8:

*Table 8 Adaptation - Preparing for a Changing Climate Goals*

| Sector     | Climate Action Goals                                                                                                                                                                                                                                                                                              |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adaptation | <ul style="list-style-type: none"><li>• Goal 1: All climate-related risks are minimized through early and wise planning and action.</li><li>• Goal 2: Local, natural habitats flourish in a changing climate.</li><li>• Goal 3: Victorians are prepared for all climate related events and emergencies.</li></ul> |

***GOAL 1: ALL CLIMATE-RELATED RISKS ARE MINIMIZED THROUGH EARLY AND WISE PLANNING AND ACTION.***

**The City's assets and services are ready to protect and respond to the risks associated with a changing climate.** The City of Victoria delivers a wide array of services to residents, businesses and visitors. Maintenance and provision of these services requires resources, planning and extensive infrastructure networks. The actions supporting this goal identify and mitigate climate change risks specific to services and infrastructure sectors, expand planning and operations in services where gaps are recognized and support others to develop resilience in their community services and infrastructure.

**Risks, vulnerabilities, and resiliency are measured, monitored, and reported.** Victoria as a community has a myriad areas of strengths and weaknesses. Information both qualitative and quantitative helps identify areas where the community is more at risk, whether due to social inequity, aging infrastructure, or environmental change. Collection and analysis of information on climate change, particularly in areas of weakness, is a valuable approach to effectively managing a changing climate.

***GOAL 2: LOCAL, NATURAL HABITATS FLOURISH IN A CHANGING CLIMATE.***

**Natural habitats support healthy fish, wildlife, and plant populations and healthy ecosystem function, in a changing climate.** Climate change impacts have been evident in Victoria's parks and the natural environment for many years and steps have been taken to address those impacts. While it is important to look at individual impacts and sensitivity factors, their nature and breadth is such that it is also necessary to look at areas where these impacts may compound and further elevate stress on Victoria's natural environment. While warmer days and a longer growing season will bring some benefits to Victoria's parks and gardens. The additional stresses, (e.g. droughts, and increased storm intensity) need to be carefully managed to retain the natural values and landscapes that form part of Victoria's identity. The actions supporting this goal focus on reducing environmental stresses on our local environment, while building understanding and expertise in areas that will deliver opportunities for better management.

***GOAL 3: VICTORIANS ARE PREPARED FOR ALL CLIMATE RELATED EVENTS AND EMERGENCIES.***

**The community is knowledgeable and prepared to address the impacts from a changing climate.** The risks and impacts of climate change, while generally low or moderate for the community, are broad and complex and potentially serious for some groups. Actions to address those impacts are consequently diverse, ranging from areas where the City would seek to advocate and educate others, to taking a hands-on approach to reducing the community's risks from climate impacts.

**Adaptation efforts are shared across the economy and support overall sustainability.** The possible impacts of climate change on the economy are not well understood. Though potential climate change impacts such as flooding and power outages, transportation and communication disruptions will result in negative economic impacts, (such as costs to repair damaged buildings and infrastructure, lost business revenues, lost earnings, etc.) other impacts may bring an economic benefit from climate change. For example, warmer drier summers may attract more visitors and regional agriculture may flourish. Overall, the vulnerabilities, risks, and opportunities that climate change presents to the local economy have not been studied. Nonetheless a significant proportion of the projected impacts also

have indirect impacts on the local economy, indicating a need to develop a better understanding of the vulnerabilities and risks climate change poses to the local economy.

The following table, (Table 8) summarizes our specific targets as it relates to each goal:

*Table 9. Adaptation Targets*

| Goal   | Climate Adaptation Targets                                                                                                    |
|--------|-------------------------------------------------------------------------------------------------------------------------------|
| Goal 1 | The City's assets and services are ready to protect and respond to the risks associated with a changing climate.              |
|        | Risks, vulnerabilities, and resiliency are measured, monitored, and reported.                                                 |
| Goal 2 | Natural habitats support healthy fish, wildlife, and plant populations and healthy ecosystem function, in a changing climate. |
| Goal 3 | The community is knowledgeable and prepared to address the impacts from a changing climate.                                   |
|        | Adaptation efforts are shared across the economy and support overall sustainability.                                          |

## PRIORITY ACTIONS

By 2020, the City will implement the following priority actions, through normal emergency preparedness programs, or adaptation specific initiatives.

The City will take steps to ensure the community is knowledgeable and prepared to address the impacts from a changing climate.

1. Work in collaboration with stakeholders and First Nations to expand public knowledge of the impacts of climate change and the preparation required for all Victorians.
2. Complete hazards, risks and vulnerability assessments (HRVAs) for people and assets due to climate change.
3. Improve public communication methods/options in advance of extreme weather events and emergencies.

The City's assets and services are ready to protect and respond to the risks associated with a changing climate.

4. Continue to implement climate preparation planning and best practices in City operations, and planning.
5. Install natural and man-made measures to enhance storm water system performance under sea-level rise and storm surge conditions.
6. Update the Emergency Preparedness Strategy to include climate related actions.

The City will take steps to ensure that natural habitats support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate.

7. Continue to use climate change projections as part of evaluation criteria to manage new plant, animal, and invertebrate pests and diseases that arrive or become invasive in parks or public lands.

8. Support CRD initiatives and investments to acquire, expand and protect green spaces across the region.
9. Increase native plantings on city owned and managed land to enhance biodiversity and support ecosystem migration.
10. Invest in the support of ecosystems health and the management of rare and endangered species in city owned and managed lands.
11. Explore the creation of Environmental Development Permit Area or other mechanism to protect and enhance shoreline and marine habitats.
12. Develop or amend landscaping guidelines to encourage private developments to use high quality native tree stock that is adapted/resilient to future climate change and climate extremes.
13. Work with partners to engage, educate and influence the general public to manage privately owned urban forest to be resilient to climate change.

Adaptation efforts are shared across the economy and support overall sustainability.

14. Complete a full economic assessment of adaptation risks, measures, investments and recommended actions.
15. The City will ensure that climate risks, vulnerabilities, and resiliency are measured, monitored, and reported.
16. Develop a set of measures and indicators, baselines and reporting structures to track progress on mitigating risks and climate resiliency progress.
17. Develop a program to measure and assess infrastructure resilience in a changing climate, with standards and recommendations.

# CITY LEADERSHIP & MUNICIPAL OPERATIONS

## 2050 VISION

By 2040, City fleet and facilities will be 100% renewably powered. By 2030, the City and staff reached exemplary GHG reduction levels, ahead of the rest of the community, in building, transportation, and operational energy use. Staff at the City set the example in the community as well, travelling around the community in a mix of low-carbon mobility options. The City works hard to eliminate waste in all its forms, and staff have found innovative ways to minimize energy consumption and GHGs without diluting quality or level of public service.

## BASELINE DATA

GHG emissions from corporate operations in 2015 were 3,868 tCO<sub>2</sub>e, and represents a 12.7% decrease from the 2007 baseline (see Figure 12). The declining trend in GHG emissions is due to a combination of deliberate local and provincial energy management initiatives, including primary electricity decarbonisation, building electrical efficiency upgrades and reductions to building inventories.

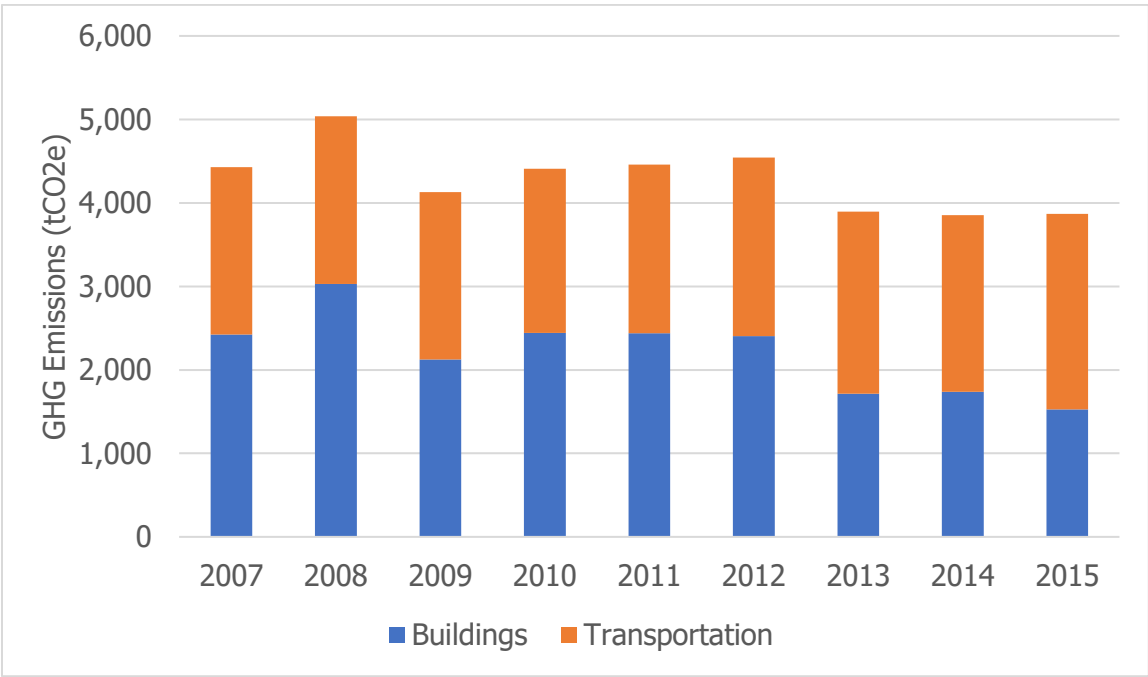


Figure 12. City of Victoria Corporate GHG Emissions

Since 2007, the City’s corporate building GHG emissions (directly from natural gas, and indirectly from electricity) have declined by 40% due to reductions in facilities (11,000 sq. foot decline), and energy efficiency improvements (such as HVAC system optimizations at VCC and City Hall). GHG emissions from City fleets have increased 16.6% due to an increase in fleet size and usage to deliver services to

the growing community needs. Greater investment in facility and fleet energy frugality and GHG reductions are required year on year, to meet the 2050 targets, Table 10.

KEY GOALS

Table 10. City Leadership & Municipal Operations Climate Action Goals.

| Sector                                 | Climate Action Goals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Municipal (City) Operations Leadership | <ul style="list-style-type: none"><li>• Goal 1: The City is a recognized leader in climate mitigation and adaptation action.</li><li>• Goal 2: City climate action is informed by a full understanding of through-life social, environmental, and economic costs, risks and benefits.</li><li>• Goal 3: Victorians have access to timely and accurate data to support strong climate mitigation and adaptation actions.</li><li>• Goal 4: Climate action is integrated across City programs.</li></ul> |

**GOAL 1: THE CITY IS A RECOGNIZED LEADER IN CLIMATE MITIGATION AND ADAPTATION ACTION**

The City will demonstrate leadership in curbing GHG emissions by strategically managing its own assets and cutting GHGs by over 3,000 tonnes. At present, we have the following energy, GHG reduction and adaptation initiatives underway:

- Facility Upgrades (Boiler replacements, renewable natural gas switching)
- Streetlight and Parkade LED replacement projects
- Fleet electrification program, including telematics (fleet monitoring and optimisation)
- Electric Bike Program
- Kitchen Scrap and Leaf Management waste collection/recovery programs
- Sea Level rise and flood mitigation planning for capital assets

**GOAL 2: CITY CLIMATE ACTION IS INFORMED BY A FULL UNDERSTANDING OF THROUGH-LIFE SOCIAL, ENVIRONMENTAL, AND ECONOMIC COSTS, RISKS AND BENEFITS.**

Only with a strong and informed understanding of full, life-cycle asset management can we hope to make wise decisions and investments in energy and GHG reductions, and sustainability improvements. Understanding the full suite of sustainability risks and benefits for each asset and service area will allow us to make frugal investments to reduce the most amount of GHGs per dollar of investment.

**GOAL 3: VICTORIANS HAVE ACCESS TO TIMELY AND ACCURATE DATA TO SUPPORT STRONG CLIMATE MITIGATION AND ADAPTATION ACTIONS.**

Successful GHG and energy management relies on accurate and timely energy/GHG information and decision making tools. It continues to be a challenge to obtain accurate and timely local GHG information by sector, asset, or asset group, and is thus, very difficult to model, forecast and make decisions on priority investments. Our goal is to develop a systematic Energy and GHG information

management strategy (EGIMS) which would define, understand and track energy and GHG production across all sectors, and be available for public consumption to support localized decision making.

**GOAL 4: CLIMATE ACTION IS INTEGRATED ACROSS CITY PROGRAMS.**

Climate change has been integrated into a number of city plans and policies from parks to underground utility improvements. To ensure a consistent and continued focus on reducing GHG emissions and climate risks, city plans and policies will be managed such that as plans are renewed, climate change can be addressed using the latest information on emission reduction best practices and projected climate impacts.

## KEY TARGETS

The following table summarizes our specific targets as it relates to each goal, Table 11.

*Table 11. City Leadership & Municipal Operations Climate Action Targets.*

| Goal                                                 | Target                                                                                                                         |            |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------|
| Goal 1                                               | All City’s facilities are renewably powered by 2040.                                                                           |            |
|                                                      | All new facilities are renewably powered.                                                                                      |            |
|                                                      | 80% of Fleet is electrified or renewably powered by 2040                                                                       |            |
|                                                      | All power tools and small equipment is electrified or renewably powered by 2025.                                               |            |
| Goal 2                                               | By 2020, the City uses a triple bottom line accounting system for all business planning.                                       |            |
| Goal 3                                               | By 2022 all relevant City plans and policies address GHG emissions reductions and climate risks.                               |            |
| Goal 4                                               | By 2030, the City has completed a Genuine Progress Indicator Assessment, and uses this information to set a GPI goal for 2030. |            |
| Total Estimated GHG tCO <sub>2</sub> e / % Reduction |                                                                                                                                | 4,400 / 1% |

## PRIORITY ACTIONS

By 2020, the City will implement the following priority GHG reduction actions:

1. Develop a Corporate Energy Management Plan (CEMP) to guide systematic energy and GHG management strategies, including energy waste reduction and avoidance, deep efficiency retrofits and low-carbon investments in City facilities and fleet, and operations. This plan will integrate with other existing plans and assessments and include the following broad requirements:
  - a. Facility, fleet and operational energy and GHG baselining,
  - b. Clear departmental energy and GHG accountabilities,
  - c. Long term financial planning,
  - d. Education and training,

- e. Annual reporting and tracking,
- f. The plan should also address:
  - i. Energy and GHG financial investment planning and business case development
  - ii. Carbon pricing for the City, which would include an internal cost of carbon, by 2020.
  - iii. Incorporate climate action performance measures into the City's annual budgeting process.
- 2. Update the corporate building policy to reference BC Energy Step Code requirements. Support the adoption of the change through staff training.
- 3. Manage fleet GHG and air-quality performance as part of the City's Fleet Master Plan completion in 2018, to include action such as:
  - a. Implement fleet telematics program to define fleet operational energy patterns and inform decision making.
  - b. Reduce per-asset GHG emissions through operational and maintenance programs (including "right sizing").
  - c. Plan for City vehicle electrification systems and networks.
  - d. Fuel-switch to low carbon fuels if required due to longer term availability of suitable electric alternatives.
  - e. Partner with other municipalities and orders of government to support the development of the EV suite of municipal fleet vehicles.
- 4. Pilot new technologies in City owned assets to assess suitability for broad community application:
  - Expand procurement policies to include sustainability performance criteria, including GHG production, and avoidance of all types of waste.
- 5. Partner with BC Hydro and join their Corporate Energy Manager Program. Use Climate Action Reserve Fund to match BC Hydro funding and hire position for a two-year term.
- 6. Develop a community accessible Energy and GHG information management System (EGIMS) to define, communicate and track community energy and GHG reduction across all sectors.
- 7. Develop a GHG mitigation and adaptation economic assessment tool to determine what programs across community should deliver the most affordable GHG reductions for buildings, transportation and waste management.
- 8. Develop the City's web-based GHG / Energy education, awareness and information exchange portal to promote information sharing and enable the public to achieve 'real time' high-value, community GHG reductions that we can monitor and measure.
- 9. Develop tools and ideas that ensure GHG information is visible and available for the public all decision makers.
- 10. Develop tools, programs and incentives to overcome behaviour barriers and never miss the opportune time to achieve low-carbon community performance.

11. Build an education program to improve staff's capacity for energy and GHG management in their day-to-day decision making.
12. Teach staff and community leaders on energy valuation, risk and opportunity in order to open access to funding and priority investments.

## PARTNERSHIPS AND COLLABORATION

The purpose of the various actions in the CLP is to inspire a change in the way that we consume energy, and produce GHGs. As a local government, we can use certain powers granted by legislation and within our mandate to manage energy use, transition to renewable energy use, reduce waste, and reduce GHG emissions. While the CLP identifies actions that fall within our mandate, it also identifies actions that can only succeed with the help of partners and residents. In this sense, the CLP relies on a three-part partnership between the City, its community partners, and residents, (Figure 13).

This joint responsibility poses a unique circumstance in that we do not fully control the actions of our fellow Victorians and community partners. We can seek to influence others and rely on their good will to work jointly towards common goals. By

conceptualizing the influence that we have we can better identify strategies that are actionable, measurable, and realistic for us to achieve, while limiting expenditure of effort on sectors where action will be dependent on other partners that are better suited to lead action. As part of our process, all of actions have been assessed on our ability to influence through control, influence, and education/information, and encourage type actions.

The process to implementing these actions will vary greatly between control type actions and influence and encourage type of actions. We can only achieve meaningful change, reduced GHGs and the co-benefits from a low-carbon, and prosperous future, if we develop strong partnerships across community. Examples of these partnerships include the following:



Figure 13 Victoria Three-Part Partnership

### BUILDINGS:

- Construction / Building associations, Federal Government, Provincial Government, CRD, other Local Governments, BC Hydro, Fortis, NGOs, Developers, Building Owners, Managers, and Tenants, UVic, HVAC professionals.

### TRANSPORTATION:

- Global cities exemplifying best practice, Province, CRD, Neighbouring Municipalities, BC Transit, Mobility Businesses, Digital service providers, BC Hydro, Users, and Developers.

## WASTE MANAGEMENT:

- CRD, Commercial Haulers, Waste Mangers, Residents, Food Service Providers, Suppliers, Hoteliers, Restaurants.
- 

## MEASURING SUCCESS

To ensure we remain on the right track, we will need to frequently report to Council and to the community about our overall progress, required improvements, successes and failures. We will need to do so, completely and transparently. The City commits to the following key measures:

- Review and remain apprised of best practice climate science, trends, and technologies.
- Foster and develop a tri-disciplinary collaboration between the City, research centers (e.g. the University of Victoria), and the private sector to stimulate the creation and piloting of emergent energy and sustainable technologies.
- Deploy an adaptive management approach utilizing best practices (e.g. SROI, CBSM, etc.) that enables the City to implement and re-prioritize, as necessary, the 2020 initiatives described in this plan.
- Re-examine and update the CLP in 2020. After 2020, update the Climate Leadership Plan every 5 years.
- Report on progress toward implementing the initiatives outlined in this CLP annually.
- Provide ongoing opportunities for the public to receive information, as well as to provide input as our CLP implementation process proceeds.

We will monitor and report on our progress annually, and learn from our experiences, insights, and from others. Unplanned or disruptive changes and unforeseen circumstances will also shape our approach, including technological advancements, energy price changes, grant funding, etc, which will all be considered in future recommendations and updates as well.

Proposed primary and secondary indicators for this plan are outlined below. Suggested data sources are also described.

On an annual basis, the City will report on its progress towards its targets and climate action goals. The purpose of annual reporting is to:

1. Raise awareness and increase understanding of climate change, its trends and consequences, and the City's specific characteristics/challenges/opportunities with staff and Council.
2. Inform and collaborate with senior management and staff to identify and build support for, and commitment to, the key strategies and actions can be taken in City operations to reduce energy (including electricity) and GHG emissions.
3. Inform and consult with Council and stakeholders on process methodology, findings, and recommendations to empower their approval of the CLP and the prioritization of its recommended actions.

4. Foster a shared sense of pride and enthusiasm in the workplace by sharing success stories and progress towards the City's climate action goals.
- 

## NEXT STEPS

This plan is the first complete draft of the City's Climate Leadership Plan, and represents the first key step towards achieving our goals. This draft is meant for public comment, and a rigorous and comprehensive review process, to drive accuracy, detail, insights, ideas, strategies and improvements over the coming months, in preparation for a formal and final CLP to be recommended to Council in June, 2018. In the meantime, while this document takes shape and firms-up, the team will push on the 'no regret' actions to complete priority studies, actions and strategy-development, so that the 2019 budget is informed by climate action needs, and so that community is supported in our common bid to make bold and meaningful improvements to our GHG burden, and in order to strengthen our city. We will work closely with community to improve our plan and the awareness and education of our community. The following critical next steps will be completed in the coming months:

1. CLP engagement and review with all key stakeholder groups
2. Priority action progress
3. Analysis and strategy progress and review
4. Community communications, education and engagement planning and implementation
5. Climate Leadership Events
6. Formal CLP review, improvement, and refinement
7. Formalizing partnerships, collaboration and planning

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## GLOSSARY

**Active transportation** – Any form of human-powered transportation (e.g. bike, walk, in-line skating, etc).

**Air pollution** – The presence of toxic chemicals or materials in the air, at levels that pose a human-health risk.

**Autonomous vehicles** – Self-driving vehicles in which some aspects of a safety critical control function (e.g., steering, acceleration, or braking) occur without direct driver involvement.

**Baseline** – this is the reference or starting year to which targets and GHG emissions projections are based.

**BC Climate Action Charter** – A voluntary agreement signed by local governments in British Columbia. Signatories commit to working to achieve three goals: becoming carbon neutral in respect of their corporate operations; measuring and reporting on community GHG emissions; and creating compact, complete, and energy-efficient communities.

**BC Energy Step Code** - A voluntary provincial standard enacted in April 2017 that provides an incremental and consistent approach to achieving more energy-efficient buildings that go beyond the requirements of the base BC Building Code

**Bike share** - A model of bike rental where people rent bikes for short periods of time, often by the hour.

**Biodegradable** – Materials or substances that can be naturally broken down by microscopic organisms.

**Building retrofit** – Modification to the structure, or operational systems of a building that result in improved energy efficiency, and/or decreased energy demand.

**Business-as-usual (BAU) GHG emissions** – GHG emissions that what would have occurred in the absence of any additional or new actions by the City.

**Carbon dioxide equivalent (tCO<sub>2</sub>e)** – A unit that expresses any greenhouse gas in terms of its global warming potential (GWP), using carbon dioxide as the baseline measure. This is usually expressed as tonnes of CO<sub>2</sub>e.

**Carbon emissions** – See GHG emissions.

**Carbon offsets** – A purposeful reduction, or removal of greenhouse Gas (GHG) emissions from the atmosphere that can be monitored, measured, verified, and sold to compensate for the release of GHG emissions elsewhere. Usually measured in tonnes CO<sub>2</sub>e.

**Car-Share** - A model of car rental where people rent cars for short periods of time, often by the hour, for a fee. Also, referred to as ride share.

**Circular economy** – Looking beyond the current "take, make and dispose" extractive industrial model, the circular economy is restorative and regenerative by design. Relying on system-wide innovation, it aims to redefine products and services to design waste out, while minimising negative

impacts. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural and social capital.

**Climate change** - A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing's such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2014).

**Climate change adaption** - The practice of making changes to moderate the impacts, losses, or exploit opportunities, that a changing climate may have on built, natural, and human systems.

**Climate change hazards** – A climate based phenomenon that may result in the loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.<sup>16</sup>

**Climate change impacts** - The effects that global climate change, in terms of storm events and associated hazards, have on built, natural, and human systems.

**Climate change mitigation** – The practice of reducing the amount of GHG emissions released into the atmosphere to limit the moderate the influence that GHG emissions have on the global climate.

**Climate change risk** - The likelihood or probability of occurrence of climate events occurring resulting in an impact to built, natural, and human systems.

**Climate change vulnerability** – The degree to which built, natural, and human systems are susceptible to, or unable to cope with, a climate impact.

**Co-benefits** – Direct and indirect effects that materialize as a result of reducing GHG emissions and/or minimizing the impacts of climate change (e.g. reduced air pollution associated with the reduction of fossil fuels, as a result of reduced congestion, etc.). Also, known as ancillary, or secondary benefits.

**Community GHG emissions** – GHG emissions arising from all significant activities occurring within the territorial boundaries of a community. This typically includes stationary energy sources, transportation, and waste.

**Complete neighborhoods** – Refers to a neighborhood where a resident has safe and convenient access to the goods and services needed in daily life (e.g. a mix of housing, and within close distance to schools, parks, shopping, and recreational opportunities).

**Corporate / municipal GHG emissions** – GHG emissions directly produced because of a local government's delivery of "traditional services", including fire protection, solid waste management, recreational / cultural services, road and traffic operations, water and wastewater management, and local government administration.

**Decarbonize** – Going beyond reducing GHG emissions by eliminating the use of carbon-intensive fuels and processes.

**District energy (DE)** - District energy is any local energy network that connects an energy supplier to multiple consumers.

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<sup>16</sup> <http://resilient-cities.iclei.org/resilient-cities-hub-site/resilience-resource-point/glossary-of-key-terms/>

**Electric vehicles (EV)** – Vehicles that use electricity as their primary fuel source, or to improve the efficiency of the internal combustion engines, such as hybrid-electric vehicles.

**Electric vehicle (EV) ecosystem** – An adaptive transportation system that supports the continued use and adoption of EVs by ensuring that the distance between charging stations are less than the range of the average vehicle, and that the capacity of the charging stations satisfies demand, in a timely, efficient, and cost-effective manner.

**Embodied energy** – Energy that goes into making a building, including energy required to extract and transport raw materials, the energy required to manufacture, transport, and assemble building materials and components, and the energy needed to maintain and operate a component throughout its life.

**Energy efficiency** – The improvement in the ratio of energy consumed to the output produced or service performed.

**Energy retrofits** – Upgrades to energy-consuming systems which result in reduced energy use.

**Extreme weather events** – Unprecedented, unexpected, unusual, or unpredictable severe or unseasonal weather patterns that are near or exceeding historical norms.

**Fossil fuels** - A hydrocarbon deposit derived from the accumulated remains of ancient plants and animals which is used as an energy source.

**Full-cost accounting** – A method of cost accounting that recognises and accounts for the environmental, social, and economical direct and indirect costs as a result of business activities and operations. It is also known as “triple-bottom line”.

**Gigajoule (GJ)** - A gigajoule (one billion joules) is a measure of energy. One GJ is about the same energy as: natural gas for 3-4 days of household use; 25-30 litres of diesel or gasoline; the electricity used by a typical house in 10 days.

**Genuine progress indicator (GPI)** – An alternative to the Gross Domestic Product (GDP). The GPI takes everything the GDP uses into account, but also accounts for negative effects related to economic activity (e.g. cost of crime, pollution, etc.).

**Global warming potential (GWP)** – An index measuring the radiative forcing following an emission of a unit mass of a given substance, accumulated over a chosen time horizon, relative to that of the reference substance, carbon dioxide (CO<sub>2</sub>). The GWP thus represents the combined effect of the differing times these substances remain in the atmosphere and their effectiveness in causing radiative forcing. The Kyoto Protocol is based on global warming potentials over a 100-year time-frame (IPCC 2014).

**Greenhouse gas (GHG) emission** – A gas emitted to the atmosphere from natural and human activities. GHG emissions include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Also, referred to as carbon emissions.

**GHG intensity** – The annual rate to which GHG emissions are released in the atmosphere, relative to a specific intensity. For the purposes of the CLP, the GHG intensity is measured on a per-persona basis.

**Global warming** – A gradual increase in the Earth’s temperature which is attributed to the greenhouse effect caused by the release of greenhouse gas (GHG) emissions into the atmosphere.

**Greenhouse effect** – The process to which trapped greenhouse gas (GHG) emissions in the atmosphere warm the planet’s temperature more than what would be without an atmosphere present.

**Gross domestic product (GDP)** – An economic measure of all goods and services produced in an economy.

**Heat pump** - a device that transfers heat energy from a source of heat to a heat sink for use or release into the atmosphere (e.g. refrigerator).

**Human well-being or health** – The state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity.

**Indicator** - A quantitative or qualitative measure that reveals a condition, trend, or emerging issue over time.

**Marginal carbon cost of abatement curve** - A visual method to present GHG emissions reductions options relative to a set baseline. Marginal cost of abatement curves are calculated by taking the total dollar costs and savings of an action or policy, putting it into today's dollars, and dividing it by the GHG emissions reductions that are generated over the lifetime of that action or policy.

**Municipal waste** – Waste consisting of everyday items, both biodegradable and non-biodegradable, that are discarded by the community.

**Net zero building** – A building that consumes less than or equal to the total amount of renewable energy than it generates.

**Organic waste** – Discarded biodegradable materials including food, garden, lawn clippings, animal and plant based material, and degradable materials such as paper, cardboard, and timber.

**Paris Agreement** – An agreement within the United Nations Framework Convention on Climate Change (UNFCCC) dealing with greenhouse gas emissions mitigation, adaptation and finance starting in the year 2020.

**Passive design** – The design of buildings to utilize energy from the sun for the heating and cooling of living spaces.

**Resilience** – The capacity of the built, natural, and human systems to cope and recover from climate impacts in an efficient and timely manner.

**Renewable energy** - Any energy that is generated from any naturally occurring processes that are replenished over a single human timescale, such as sunshine, wind, flowing water, geothermal heat, and/or non-fossil fuels, or biological processes.

**Renewable natural gas (RNG)** – Natural gas that is generated from resources which are naturally replenished over a human timescale (e.g. capturing methane from decomposing waste).

**Ride share** – See car share.

**Sea level rise** - An increase in the mean level of the ocean.

**Sustainable return on investment (SROI)** – A methodology for identifying and quantifying environmental, societal, and economic impacts of investment in projects and initiatives.

**Vehicle fuel efficiency standards** – Regulations that require the improvement in the average fuel economy of cars, trucks, vans, and sport utility vehicles produced for sale.

**Zero-waste economy** – An economy that eliminates waste and avoids pollution by maximizing design, use, and re-use of materials so that there is no waste. It is a model that embodies principles such as “cradle to cradle” where waste is used as an input into another process.

Please comment and help make the City of Victoria's CLP  
the most effective GHG reduction / 100% renewable energy plan  
on the planet!