



ADMINISTRATIVE REPORT

Report Date: October 24, 2017
Contact: Matt Horne
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Meeting Date: November 1, 2017

TO: Standing Committee on Policy and Strategic Priorities
FROM: General Manager, Planning, Urban Design and Sustainability
SUBJECT: Renewable City Strategy Update

RECOMMENDATION

- A. THAT Council approve the Renewable City Action Plan, as summarized in this report and in Appendix A and direct staff to begin its implementation.
- B. THAT staff report back in approximately 5 years (2022) with an overall review of the Renewable City Action Plan.

REPORT SUMMARY

The purpose of the Renewable City Strategy (RCS), adopted in 2015, is to ensure that Vancouver derives all of its energy from renewable sources prior to 2050. Achieving the goal will help us save money, lead to cleaner air and a healthier environment, and strengthen our economy. We'll have better buildings that use energy more efficiently, and improved transportation choices so we can get around without relying on fossil fuels. We'll also be helping to reduce future climate change impacts affecting the planet, such as sea level rise, and worsening wildfires, droughts and windstorms.

The purpose of this report and the appended document, the Renewable City Action Plan (RCAP), is to keep the City on track for its climate change and renewable energy targets, and realize the range of potential economic, environmental and health benefits. In particular, the RCAP contains:

- Principles to shape current and future actions.
- Interim targets that will guide progress towards the City's long term climate and renewable energy objectives.
- A monitoring, reporting and evaluation framework.
- A schedule of the actions the City will undertake over the next ten years.

COUNCIL AUTHORITY/PREVIOUS DECISIONS

In June 2017, as part of the RCS, Council approved the Curbside Electric Vehicle (EV) Charging Pilot Program and the charging of fees at EV stations to address the demand for both residential and non-residential EV charging.

In November 2016, as part of the RCS, Council approved updates to the Green Buildings Policy for Rezoning which included adopting limits on greenhouse gas emissions, thermal energy and total energy use.

In October 2016, as part of the RCS, Council approved the EV Ecosystem Strategy which established 32 priority actions to be undertaken from 2016 to 2021 with the aim of achieving broader home, workplace and public charging opportunities for a growing EV market.

In July 2016, as part of the RCS, Council approved the Zero Emissions Building Plan (ZEBP), which established a framework to reach zero emissions in all newly permitted buildings by 2030.

In November 2015, Council approved the Renewable City Strategy (RCS), adopting the target to derive 100% of the energy used in the City of Vancouver from renewable sources before 2050 and recommitted to reduce greenhouse gas emissions within the City of Vancouver by at least 80% below 2007 levels before 2050. Staff were directed to report back with recommended interim renewable energy and greenhouse gas targets and associated work plans between 2020 and 2050.

In June 2015, staff provided Council with the Greenest City Action Plan 2015-2020 Update that included an update on current actions and recommended new high priority actions.

In October 2014, the Healthy City Strategy was adopted by Council, providing a comprehensive and integrated plan for social sustainability that complements the economic and environmental aspects of the Renewable City Strategy.

In October 2012, Council approved the Neighbourhood Energy Strategy, to address the Greenest City Action Plan objective of reducing 120,000 tonnes of carbon dioxide per year through deployment of renewable thermal energy systems for high-density neighbourhoods.

In July 2011, the Greenest City Action Plan was adopted by Council.

In January 2011, Council adopted 14 Greenest City targets as Council policy. Staff were directed to develop a 15th target on greening existing workplaces, as well as to continue the public engagement process with the purpose of finalizing the Greenest City 2020 Action Plan in consultation with stakeholders and the community.

In September 2011, the Vancouver Economic Action Strategy was created, and acts as the City's economic sustainability plan.

In February 2010, Council adopted the long term goals recommended by the Greenest City Action Team (GCAT) and directed staff to proceed with the development of a Greenest City 2020 Action Plan.

In October 2009, Council received the Greenest City Action Team's report entitled *Vancouver 2020: A Bright Green Future*, which recommended ten long-term goals and thirteen 2020 targets that would chart Vancouver's course in becoming the greenest city in the world by 2020. Council approved a motion directing staff to report back with an implementation plan for the recommended actions.

In January 2008, Council adopted the World Mayors and Local Government Protection Agreement that committed the City to "constantly work to increase reductions such that by 2050 greenhouse gas emissions will be reduced...by 80% from 1990 levels...."

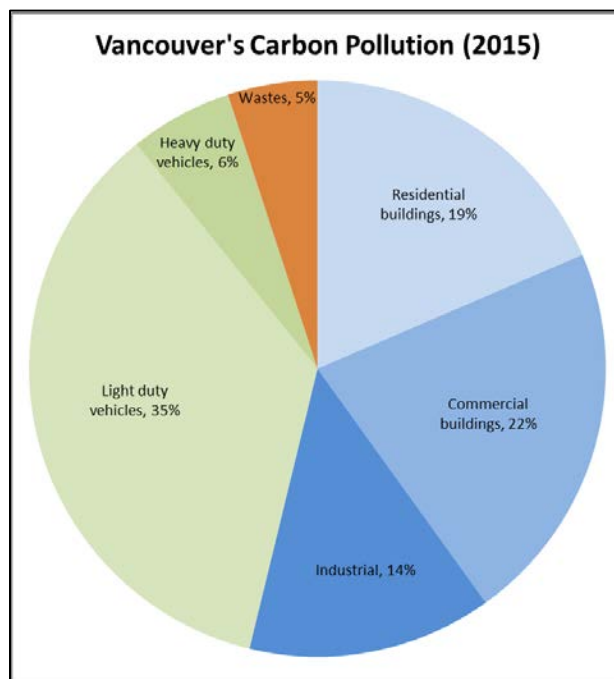
CITY MANAGER'S/GENERAL MANAGER'S COMMENTS

The City Manager and General Manager of Planning, Urban Design and Sustainability recommend approval of the foregoing.

REPORT

Background/Context

Vancouver's carbon pollution comes from buildings (55% in 2016), transportation (41% in 2016), and solid waste (4% in 2016). The three sectors are further segmented below.¹



¹ The figure uses 2015 data because the 2016 data does not disaggregate commercial and industrial sources.

The City's existing climate change and renewable energy targets are to:

- Reduce carbon pollution by 33% below 2007 levels by 2020.
- Reduce carbon pollution by at least 80% below 2007 levels before 2050.
- Derive 100% of the energy used in Vancouver from renewable sources before 2050.

Meeting the 2050 targets will allow Vancouver to do its part in helping Canada fulfill its commitments under the Paris climate agreement. The 2050 climate target is also consistent with those of the BC government (at least 80% below 2007 levels by 2050) and the federal government (80% below 2005 levels by 2050).

The reason that 100% renewable energy does not translate to a 100% reduction in carbon pollution is that there will continue to be sources of carbon pollution from wastes and some biofuels even if we successfully transition to entirely renewable energy. While we can, and are working to, reduce those sources, we don't yet have solutions to completely eliminate them.

In 2016, Vancouver was responsible for 2.5 million tonnes of carbon pollution, which was 11% below 2007 levels. Also in 2016, 30% of Vancouver's energy was derived from renewable sources, up from 27% in 2007. Since 1990, GHG emissions on a per-capita basis have decreased 35 percent, while population has grown 36 percent and the number of jobs increased 32 percent.

Since the Renewable City Strategy was approved in 2015, much of the climate change and renewable energy context has shifted. Some highlights:

Globally: The Paris Agreement, which came into force in April 2016, provides the world's first global framework to fight climate change with the support of all but three countries globally. President Trump's intent to withdraw the US from the agreement was damaging, but other signatories (including Canada) and many US states and cities have signalled their intent to continue working towards the objectives established in the agreement. This includes over 100 cities and regions that are working towards 100% renewable energy commitments.

Canada: Nationally, the Pan-Canadian Framework on Clean Growth and Climate Change was signed by the federal government and 11 provinces and territories in December 2016. The agreement provides a pathway for progress on a number of fronts including low carbon transportation and buildings, carbon pricing, and clean electricity grids.

BC: The province has a strong foundation of climate policy as established in the 2008 Climate Action Plan. While progress on that plan had slowed, the new provincial government has committed to building on that foundation and taking action across ministries to get the province back on track for its climate change targets. Specifically, the Minister of Environment and Climate Change Strategy is mandated to: *"Implement a comprehensive climate-action strategy that provides a pathway for B.C. to prosper economically while meeting carbon pollution reduction targets, including setting a new legislated 2030 reduction target and establishing separate sectoral reduction targets and plans."*

Technology: The costs of renewable energy and energy efficiency continue to drop, while their quality and availability continue to improve. For example, electric vehicle manufacturers continue to add new models, some cars can now drive 400 km on a single charge, and prices are rapidly approaching parity with gasoline vehicles. The costs and performance of wind and solar electricity, and a wide range of energy efficiency technologies continue to improve. Because of advances like these, the global clean energy economy was worth \$1.4 trillion US in 2016.

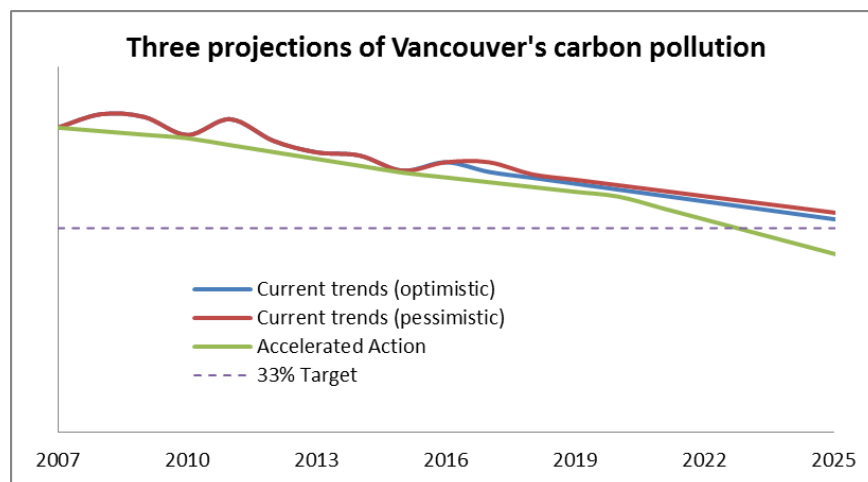
Building on past progress, the City has moved forward with numerous new actions since the Renewable City Strategy was approved in 2015. These include:

<p>Buildings</p> <ul style="list-style-type: none"> • The Zero Emissions Buildings Plan sets out a roadmap for new building construction in Vancouver with a strong focus on ongoing improvements in energy efficiency. • For new construction, the updated Green Buildings Policy for Rezoning and Vancouver Building Bylaw will result in buildings that are more energy efficient and produce less carbon pollution. • Ongoing expansion of the City's Neighborhood Energy Utility to new developments in Southeast False Creek and the Great Northern Way Campus Lands. • A commitment to build the new Fire Hall 17, and other new City buildings, to the Passive House standard. • Support for BCIT training to offer a Passive House trades training course. • Involvement in the development of the BC Energy Step code (approved by the BC government in May 2017), which establishes a series of steps from current building practices to much higher levels of energy efficiency.
<p>Transportation</p> <ul style="list-style-type: none"> • Mobi by Shaw Go (Vancouver's public bike share program) has installed 120 stations and 1,200 bikes since launching in July 2016. • All three levels of government have committed to advance the first phase of the Metro Vancouver Mayors' 10-Year Transportation Vision. • The Congestion Management Strategy and Complete Streets Framework were developed and approved by Council. • The Arbutus Greenway was purchased and an average of 700 pedestrians and 2,000 riders are using the temporary path daily. • The Electric Vehicle Ecosystem Strategy lays out a five year plan to ensure Vancouver residents and businesses can access charging stations when and where they need them. • EV drivers can currently access approximately 300 Level 2 charging points across Vancouver, of which the City manages approximately one third, along with one "DC Fast Charger" in partnership with BC Hydro. • The City launched pilot programs for curbside charging for homeowners without access to off street parking, and separately for businesses interested in providing publicly accessible charging stations. • The City continues to expand its fleet of lower emissions vehicles with 33 electric vehicles, the largest municipal electric fleet in Canada, and 29 compressed natural gas vehicles.
<p>Solid Waste</p> <ul style="list-style-type: none"> • The City continues to supply gas from the Vancouver Landfill to generate electricity and provide heat to the Village Farms greenhouses. • The City continues to work with FortisBC to develop a project that would upgrade a portion of the gas produced by the Vancouver Landfill to be sold as renewable natural gas.

Strategic Analysis

Despite the progress that has been made in the last decade, the City is not on track for the 2020 carbon pollution target. This is based on three different projections, as shown in the figure below:

1. *Current trends (optimistic)*: If the trend between 2007 and 2016 is extrapolated forward, we would achieve a 20% reduction by 2020 (a gap of 355 thousand tonnes from the target) and the targeted 33% reduction by 2027.
2. *Current trends (pessimistic)*: If the increase in carbon pollution from buildings in 2016 is due to more than the cold winter and progress is slower in 2017 and beyond as a result, we would achieve a 19% reduction by 2020 (a gap of 396 thousand tonnes from the target) and the targeted 33% reduction by 2028.
3. *Accelerated action*: A third projection is drawn from economic modelling completed by Navius Research to explore viable pathways for Vancouver to achieve the 2050 Renewable City Strategy objectives (see Section 9 for more detail on the modelling). This projection points to a 23% reduction in 2020 (a gap of 201 thousand tonnes). This is a smaller gap than either of the current trend scenarios and the curve begins to bend down faster after 2020, enabling us to achieve the 33% reduction by 2023.



Unfortunately, we do not see a realistic pathway to meeting Vancouver's climate target for 2020. While residents and businesses can choose solutions like transit or active transportation (e.g. walking and cycling) at any time, they are much more likely to do so if safe, convenient and affordable options are available. Making transit and active transportation more attractive and viable for more people depends on good land-use decisions and investments, which takes time. Similarly, technology changes (e.g. upgrading a furnace to a heat-pump or switching to an electric vehicle) typically happen when a resident or business is ready to replace the existing technology, and there are a limited number of those windows of opportunity between now and 2020.

That said, we are confident we can accelerate the pace of progress to put ourselves on target for our mid-century goals, minimize the gap in 2020, and achieve the 33% reduction target by 2023. The RCAP aims to achieve this outcome through a mix of City actions, partnerships with

other levels of government and utilities, and increased engagement with Vancouver residents and businesses to help them use energy more efficiently and transition to renewable energy.

As we move forward, there are three areas where we've had excellent success that we intend to continue:

1. *We need to continue to make land use and transportation decisions that encourage transit and active transportation.* The percentage of trips Vancouverites take by walking, cycling and transit rose to 50% in 2016 from 47% in 2013. Those shifts help to reduce carbon pollution, save people money, improve air quality and reduce congestion. Through the ongoing implementation of Transportation 2040, we will continue to integrate land use and transportation planning, and invest in sustainable transportation infrastructure. We are aiming for at least two-thirds of trips to be taken by walking, cycling and transit by 2040.
2. *We need to follow through on the Zero Emissions Buildings Plan:* Approved in 2016, the Zero Emissions Building Plan provides a roadmap for new construction in the City that will lead to buildings that are progressively more energy efficient and lower carbon between now and 2030. The 2017 update to the Green Building Policy for Rezoning and the 2018 update to the Vancouver Building Bylaw for 3-6 story buildings are the first approved steps in that roadmap. Subsequent steps combined with supporting actions like the Zero Emissions Building and Construction Innovation Centre of Excellence will enable the City to achieve its objectives for new buildings.
3. *We need to continue reducing carbon pollution from solid waste:* Between 2007 and 2016, the carbon pollution from solid waste has dropped by 50%. The ongoing development of Vancouver's Zero Waste Strategy and efforts with FortisBC to upgrade methane gas from the Vancouver Landfill to renewable natural gas are key opportunities to continue the trend.

In addition to building on these successes, we will also need to address several areas where progress to date has not been adequate:

1. *We need to do more to increase the uptake of zero emissions vehicles and low carbon fuels.* The City's carbon pollution from transportation is a major reason for the gap forecast for 2020 because they are equal to 2007 levels, and have been rising slowly since 2014. This is in spite of the encouraging results from the City's efforts to increase the number of trips Vancouverites take by walking, cycling and transit. Potential explanations for the rising carbon pollution from transportation are an increase in larger, less efficient personal vehicles, more commercial transportation, or more trips within Vancouver and into the City from the surrounding region.
2. *We need to do more to reduce carbon pollution from existing buildings.* Natural gas prices have been lower than anticipated when the Greenest City Action Plan was developed and they aren't projected to change significantly in the near future due to an abundance of relatively low cost supply. This makes it more difficult to increase investment in technologies that use natural gas more efficiently and/or switch to renewable sources of energy - particularly in existing buildings, where the economics are more challenging relative to new construction. A good example of this challenge is

the downtown district energy system, which currently runs on natural gas, and will not switch to a low carbon energy source by 2020 as originally anticipated.

3. *We need to do more to work with the federal and provincial governments to encourage them to adopt new actions.* While Vancouver has an important role to play in the transition to renewable energy, we need the federal and provincial governments to be taking complementary actions if we're going to achieve our objectives. Good examples include the clean energy requirements, low carbon fuel standard, and carbon tax from BC's 2007 Climate Action Plan. From 2012 through 2016, we didn't have significant advances in provincial or federal climate change policies that could have helped us make more progress reducing carbon pollution. The pan-Canadian Framework on Clean Growth and Climate Change and the renewed interest in accelerating action provincially should both help, and we will increase our efforts to partner and engage with other levels of government to encourage ongoing progress.

For each sector we are targeting the following outcomes:

1. *Buildings* - New and existing buildings will have much more energy efficient walls and windows, and will be heated and cooled using solutions like heat pumps and renewable natural gas. Windows, insulation and heating equipment will be upgraded over time to be more efficient and renewable. Buildings will be healthier and more comfortable.
2. *Transportation* - Residents and businesses will be able to choose healthier, more convenient and safer options for walking, cycling, transit and car-sharing. All of these mean we can move people through the city with less energy. When people want to drive, the cars and trucks on the road won't rely on fossil fuels anymore. They will be powered by a mix of batteries, hydrogen fuel cells, renewable natural gas and renewable diesel.
3. *Waste* - Vancouver as a community will be minimizing the amount of waste produced and increasingly recycling and utilizing what is still produced through a circular economy. For the wastes in our landfill, we'll be maximizing the capture and utilization of the methane produced.

The short and medium term actions that will lead to these outcomes are detailed in the Plan in Appendix A. They are pragmatic, outcome-oriented projects that will accelerate carbon pollution reductions in a way that will help Vancouver residents and businesses lower costs, increase choice and use energy and resources more efficiently. Examples of short term priority actions include:

- Work with other governments, utilities and building owners and manager to develop targeted incentives to encourage deep energy and emissions retrofit projects (i.e. cuts in carbon pollution in the range of 80%).
- Explore a program that would allow residents and businesses to purchase the renewable natural gas needed for the typical lifetime operation of relatively low use appliances like decorative fireplaces when those appliances are purchased.
- Launch the Zero Emissions Building Centre of Excellence and continue to work with the federal and provincial government to share knowledge and expertise, and secure additional funding.

- Develop a preferential parking policy to encourage the use of zero emissions vehicles relative to conventional vehicles.
- Lead an initiative with various stakeholders and the BC Utilities Commission to streamline regulation in respect of electric vehicle charging to encourage more private investment in charging stations and reduce the need for public sector investment.
- Lead and finalize the new regional fuel purchasing consortium agreement with an objective of decreasing the carbon intensity of fuels.
- Evaluate additional opportunities to develop further heat recovery opportunities (e.g. from sewers or data centres) and renewable natural gas from waste sources within the City of Vancouver, and work with partners to increase the supply of renewable natural gas throughout the region.
- Develop and implement a corporate carbon pricing policy building on the leadership shown by Metro Vancouver through the development of a similar policy in July 2017.
- Evaluate the business case for expansion of the Southeast False Creek Neighbourhood Energy Utility to Main Street South, the False Creek Flats, Northeast False Creek and potentially other areas in the Downtown and Cambie corridor.
- Work with partners to support the conversion of the Downtown and hospital steam heat systems to low carbon energy sources
- Pursue recovery of waste heat from sources such as sewers, commercial cooling and data centres, using low carbon energy systems

While we are confident that the cost and quality of solutions will continue to improve, we will adjust course if a step in the transition to renewable energy isn't cost-effective or viable. For example, in 2030 when all new buildings are intended to be zero emissions, we are anticipating that there will be viable and cost-effective alternatives to natural gas stoves (e.g. renewable natural gas or induction stoves). If there is no viable and cost-effective alternatives for natural gas stoves, City staff will bring a report forward to Council to consider excluding gas stoves from the regulation.

Public/Civic Agency Input (if applicable)

Consultation on the RCAP took place throughout the summer of 2017. Five sectors were targeted: other levels of government and utilities, academics/researchers, the business community, environmental groups and the general public.

The Plan's consultation is summarized below.

Other Levels of Government and Utilities: Through meetings and/or reviews of draft materials, we engaged with the federal and provincial government, Metro Vancouver, Translink, several local governments through the region, and local utilities. The economic modelling to inform the plan was commissioned jointly with BC Hydro.

Academic/Research Sector: A meeting was held in May 2017 to seek input from a variety of academics and researchers, mainly from UBC, SFU and BCIT. Additional feedback on the Action Plan was coordinated through the Pacific Institute for Climate Solutions in August 2017.

Environmental Sector: An initial meeting of over a dozen local environmental non-governmental organizations took place in May 2017 to share information and begin dialogue. A second meeting providing specific feedback on the Action Plan took place in August 2017.

Business Community: Consultation with the business community took place through key industry associations and one-on-one meetings with specific businesses affected by the RCS.

General Outreach: Broader information and feedback was received from the general public using social media channels, information and videos at www.vancouver.ca/renewablecity and through presentations. Staff offered the '100RE Talks' service, whereby a group of 10 or more people could request that City staff come and talk with them about the RCS. Between May 1, 2017 and August 31, 2017, a total of thirty-five events and presentations were held with over 1,800 people.

Overall, feedback across all sectors was consistent. Stakeholders acknowledged and agreed with the need to take action to address the issue of climate change and the associated impacts upon Vancouver itself, and at the regional, national and global level. Support for the general direction of the Action Plan was high with feedback indicating that the inclusion of specific actions with an assigned timeline was helpful for planning purposes. Support was also consistently high for the nine principles outlined in the RCAP, which serve to guide current and future actions. Interest was expressed in participating in the Advisory Committee for the next modelling review and the Task Force on the principles of an Equitable and Just Transition.

It was recognized that determining specific actions all the way out to 2050 was not possible due to uncertainty but there was a comfort with the City's commitment to continue to consult and engage along each step of the way.

Main concerns with the Action Plan - that of cost, choice and feasibility - were addressed in the guiding principles to the satisfaction of the majority of stakeholders. Some stakeholders were not confident that reaching the targets would be achievable but all were appreciative of the consultation and outreach and were willing to continue to engage as the RCS moves forward.

There were three main areas that received the most questions and comments.

1. Questions around the future role of district energy systems and decentralized energy production (especially solar) were raised by a number of organizations. In response, we have provided greater resolution on the actions relating to district energy and committed to reassessing the opportunities to support solar energy and other distributed generation technologies.
2. Several of the business organizations emphasized the need to support technology innovation and development to ensure that options are in place when natural stock turnover takes place. In response, we agree with the need to support technology innovation and will endeavour to work more closely with our clean energy, clean tech and energy efficiency companies through the implementation of the RCAP.
3. There was interest in the details of programs that will encourage deep energy retrofits as this was considered a particularly challenging area. Staff have tracked those expressions of interest and will engage in more detail with interested stakeholders as those actions are developed.

The full list of organizations actively involved in the development of this Plan is listed in Appendix B. Inclusion of an organization in the list of consulted groups does not indicate endorsement of the RCAP. These organizations were provided the opportunity to respond to the RCAP through in-person meetings with staff and/or by providing written comments.

Transition of Fossil Fuel Products

The City of Vancouver recognizes that technology advances are providing more and more opportunities to transition toward renewable energy where fossil fuels have typically been used. Examples of this include battery electric and fuel cell cars, electric lawn mowers and leaf blowers, and battery systems that replace gas/diesel generators.

As part of the Renewable City Action Plan, staff will bring forward a report as appropriate for council's consideration on using the City's regulatory powers to, where authorized under the *Vancouver Charter*, help fast-track this transition toward renewable energy uses and products. This report would include a list of all of fossil fuel burning products used in Vancouver and their status with respect to transitioning to renewable energy fuel sources. The City would test these new technologies within City operations to assess their viability on a City-wide basis.

When a product is deemed to have a viable renewable energy replacement that is both cost effective and readily available staff will recommend an approach for council's consideration. This approach may include incentives, disincentives or a request to the Province for certain *Vancouver Charter* amendments to give the City broader powers to help enable a transition - possibly including an outright ban on a product's use. This approach will accelerate Vancouver's transition to a healthier, quieter and more resilient city for its residents, businesses and visitors.

Prior to bringing any recommendations to council on fossil fuel product transitions, staff will consult with industry, the public and users of the products to ensure their perspectives are included in the analysis. The City will also endeavour to make these product transitions in our own operations to test the cost and viability prior to considering it for the community.

Fossil fuel burning products that are core components of buildings like furnaces and hot water tanks will continue be dealt with under the Green Buildings Program.

Employment

Progress on the Greenest City Action Plan has created 8,100 new green jobs within Vancouver between 2010 and 2016, a 49% increase. In part due to the City's green building policies, jobs in green building design and construction, and associated products, has increased 40%.

The potential for growth in jobs as we transition to 100% renewable energy is significant. A recent study from the Columbia Institute ('Jobs for Tomorrow: Canada's Building Trades and Net Zero Emissions') showed that getting to net zero emissions by 2050 could generate nearly 20 million jobs in Canada. The study states that, 'Based on current construction employment figures in the green building sector, and predicting a scenario with ecofriendly standards, the green building sector as we approach a 2050 net zero scenario amounts to 1,997,640 direct non-residential building construction jobs.' Similarly, a recent update to the Pembina Institute's Green Buildings Map for BC found 31,700 employed in BC's green building industry.

Implications/Related Issues/Risk (if applicable)

Financial

As the City develops specific projects associated with this Plan, the financial impacts and potential trade-offs will be presented to Council for their consideration and approval.

The 2019-2022 Capital Plan will aim to include highest priority Renewable City actions as much as possible within the available fiscal envelope. Future Capital and Operating Budget processes will also integrate Renewable City requests within the available fiscal envelope. Significant new policy, regulatory, planning or programmatic recommendations will come to Council on their own as they are developed.

Staff will work to achieve the Renewable City Action Plans as much as possible using existing financial and staff resources, and will also look to leverage its own investments through partnerships and access external funding where possible.

Environmental

As described herein, approval of this report would result in significant environmental benefits with the reduction of Vancouver's carbon pollution by at least 80% before 2050.

CONCLUSION

This report builds upon and further focuses the work begun in 1990 with the City of Vancouver's Clouds of Change report. Successive Vancouver City Councils continue to demonstrate leadership when faced with the dire consequences associated with climate change. If approved, this report will ensure current and future generations will benefit from the evidence based science and concrete actions outlined in this report. A renewable future will not only provide economic resilience but will also ensure a safer, healthier Vancouver.

* * * * *

Renewable City Action Plan

Section 1 - Purpose and structure

The purpose of the Renewable City Strategy (adopted in 2015) is to ensure that Vancouver derives all of its energy from renewable sources prior to 2050. Achieving the goal will help us save money, lead to cleaner air and a healthier environment, and strengthen our economy. We'll have better buildings that use energy more efficiently, and improved transportation choices so we can get around without relying on fossil fuels. We'll also be helping to reduce future climate change impacts affecting the planet, such as rising seas, and worsening wildfires, droughts and storms.

The purpose of this document, the Renewable City Action Plan (RCAP), is to keep Vancouver on track for its climate change and renewable energy targets, and realize the range of associated economic, environmental and health benefits. In particular, the RCAP contains:

- Principles to shape current and future actions.
- Interim targets that will guide progress towards the City's long term climate and renewable energy objectives.
- A monitoring, reporting and evaluation framework.
- A schedule of the actions the City will undertake over the next ten years.

The RCAP is structured as follows:

- Section 2 provides an overview of the context within which the Renewable City Action Plan sits.
- Section 3 provides a high-level summary of the action areas in the RCAP.
- Section 4 describes the progress made to date in reducing carbon pollution and increasing renewable energy.
- Section 5 explains the principles underpinning the actions in the RCAP.
- Section 6 includes the interim targets for the Renewable City Strategy.
- Section 7 explains how the monitoring, reporting and evaluation of the RCAP will take place.
- Section 8 shows how the actions in the RCAP will unfold over time and which departments are responsible for leading the actions.
- Section 9 summarizes the modelling completed to inform the interim targets and actions.

Section 2 - Context

The City's existing climate change and renewable energy targets are to:

- Reduce carbon pollution by 33% below 2007 levels by 2020.
- Reduce carbon pollution by at least 80% below 2007 levels before 2050.
- Derive 100% of the energy used in Vancouver from renewable sources before 2050.

Meeting the 2050 targets will allow Vancouver to do its part in helping Canada fulfill its commitments under the Paris climate agreement. The 2050 climate target is also consistent

with those of the BC government (at least 80% below 2007 levels by 2050) and the federal government (80% below 2005 levels by 2050).

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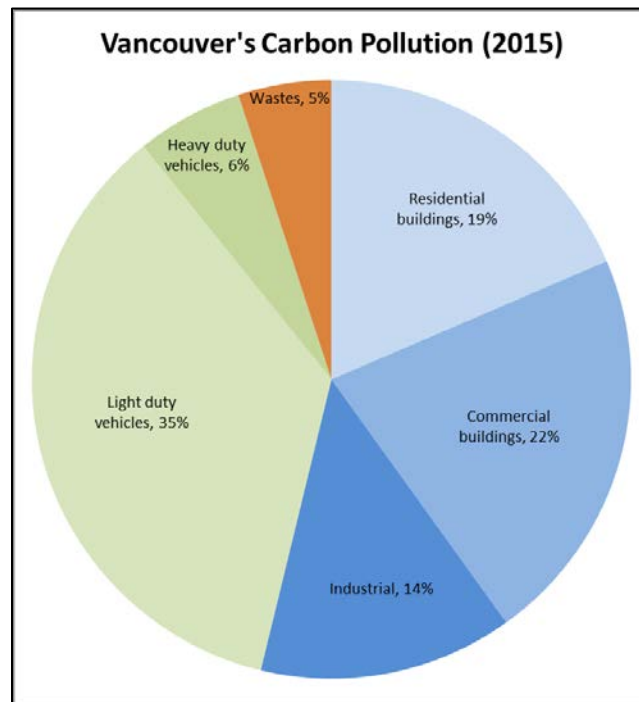
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2. *Canada*: Nationally, the Pan-Canadian Framework on Clean Growth and Climate Change was signed by the federal government and 11 provinces and territories in December 2016. The agreement provides a pathway for progress on a number of fronts including low carbon transportation and buildings, carbon pricing, and clean electricity grids.
3. *BC*: The province has a strong foundation of climate policy as established in the 2008 Climate Action Plan. While progress on that plan had slowed, the new provincial government has committed to building on that foundation and taking action across ministries to get the province back on track for its climate change targets. Specifically, the Minister of Environment and Climate Change Strategy is mandated to: *"Implement a comprehensive climate-action strategy that provides a pathway for B.C. to prosper economically while meeting carbon pollution reduction targets, including setting a new legislated 2030 reduction target and establishing separate sectoral reduction targets and plans."*
4. *Technology*: The costs of renewable energy and energy efficiency continue to drop, while their quality and availability continue to improve. For example, electric vehicle manufacturers continue to add new models, some cars can now drive 400 km on a single charge, and prices are rapidly approaching parity with gasoline vehicles. The costs and performance of wind and solar electricity, and a wide range of energy efficiency technologies continue to improve. Because of advances like these, the global clean energy economy was worth \$1.4 trillion US in 2016.

Section 3 - Action areas and approach

Vancouver's carbon pollution comes from buildings (55% in 2016), transportation (41% in 2016), and solid waste (4% in 2016). Of the total 2.5 million tonnes in 2016, the carbon pollution from the City of Vancouver's corporate operations (buildings, vehicles and equipment) are responsible for 39 thousand tonnes (2% of the community-wide total). The three sectors are further segmented in the figure below.¹



For each sector we are targeting the following outcomes:

1. **Buildings** - New and existing buildings will have much more energy efficient walls and windows, and will be heated and cooled using solutions like heat pumps and renewable natural gas. Windows, insulation and heating equipment will be upgraded over time to be more efficient and renewable. Buildings will be healthier and more comfortable.
2. **Transportation** - Residents and businesses will be able to choose healthier, more convenient and safer options for walking, cycling, transit and car-sharing. All of these mean we can move people through Vancouver with less energy. When people want to drive, the cars and trucks on the road won't rely on fossil fuels anymore. They will be powered by a mix of batteries, hydrogen fuel cells, renewable natural gas and renewable diesel.
3. **Solid Waste** - As a community, Vancouver will be minimizing the amount of solid waste produced, increasing recycling and composting, and utilizing what is still produced

¹ The figure uses 2015 data because the 2016 data does not disaggregate commercial and industrial sources.

through a circular economy. For the wastes in our landfill, we'll be maximizing the capture and utilization of the methane produced.

We place a high priority on helping Vancouver residents and businesses use energy and resources more efficiently because it helps to lower costs and reduce carbon pollution. We take a broad view of energy efficiency to include solutions such as better insulated buildings, electric vehicles (which are much more efficient than internal combustion vehicles), and transit and active transportation (e.g. walking and cycling).

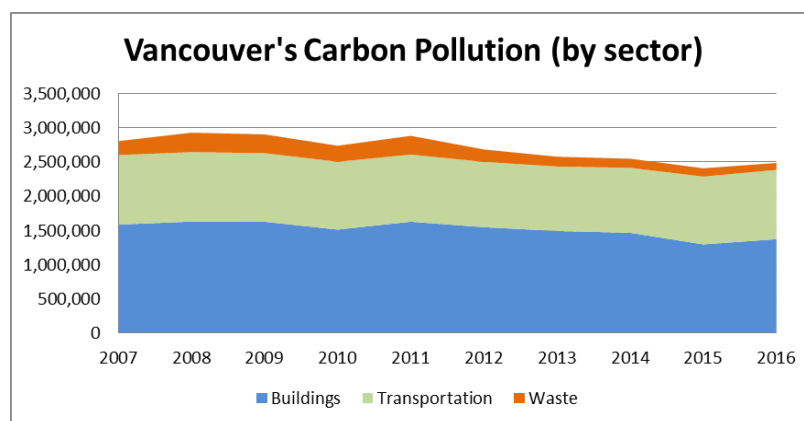
We also know that energy efficiency alone isn't enough, and a transition to renewable energy is needed to achieve our targets. Thankfully, our efforts to conserve energy make it easier to switch to renewable energy by reducing the amount of energy needed. While we're confident that the cost and quality of renewable energy will continue to improve, we will adjust course if a step in the transition to renewable energy isn't cost-effective or viable.

To complement the actions the City is taking, we'll continue to build strong partnerships with the federal and provincial governments, First Nations, and utilities as we work towards our shared objectives.

Section 4 - Vancouver's Progress

The City has a long history of taking action on climate change. These actions coupled with provincial and federal policy, and utility demand side management programs have helped cut carbon pollution, while allowing the population and the economy to grow.

In 2016, Vancouver's carbon pollution was 11% below the 2007 baseline. The increase from 2015 to 2016 was the result of the cold end to 2016. Within the overall trend, the sectors changes relative to 2007 differ considerably with buildings down by 13%, transportation equal, and solid waste down by 50% (see figure below). On a per capita basis, the drop is 18% below 2007 levels, which brings Vancouver down from 4.8 to 3.9 tonnes per person.



Underpinning those reductions is an improvement in energy efficiency, which contributed to significant financial savings. Between 2007 and 2016, Vancouver residents and businesses are spending \$29 million less on energy for buildings and \$9 million less on energy for transportation. The progress to date has also been accompanied by a growing number of

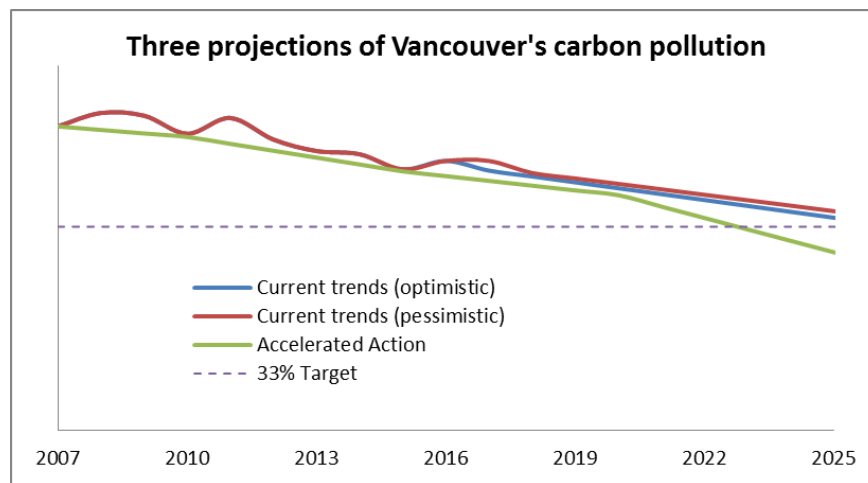
green jobs. Between 2010 and 2016, 8,100 new green jobs have been created in Vancouver - a 49% increase.

Building on past progress, the City has moved forward with numerous new actions since the Renewable City Strategy was approved in 2015. These include:

<p>Buildings</p> <ul style="list-style-type: none"> • The Zero Emissions Buildings Plan sets out a roadmap for new building construction in Vancouver with a strong focus on ongoing improvements in energy efficiency. • For new construction, the updated Green Buildings Policy for Rezoning and Vancouver Building Bylaw will result in buildings that are more energy efficient and produce less carbon pollution. • Ongoing expansion of the City's Neighborhood Energy Utility to new developments in Southeast False Creek and the Great Northern Way Campus Lands. • A commitment to build the new Fire Hall 17, and other new City buildings, to the Passive House standard. • Support for BCIT training to offer a Passive House trades training course. • Involvement in the development of the BC Energy Step code (approved by the BC government in May 2017), which establishes a series of steps from current building practices to much higher levels of energy efficiency.
<p>Transportation</p> <ul style="list-style-type: none"> • Mobi by Shaw Go (Vancouver's public bike share program) has installed 120 stations and 1,200 bikes since launching in July 2016. • All three levels of government have committed to advance the first phase of the Metro Vancouver Mayors' 10-Year Transportation Vision. • The Congestion Management Strategy and Complete Streets Framework were developed and approved by Council. • The Arbutus Greenway was purchased and an average of 700 pedestrians and 2,000 riders are using the temporary path daily. • The Electric Vehicle Ecosystem Strategy lays out a five year plan to ensure Vancouver residents and businesses can access charging stations when and where they need them. • EV drivers can currently access approximately 300 Level 2 charging points across Vancouver, of which the City manages approximately one third, along with one "DC Fast Charger" in partnership with BC Hydro. • The City launched pilot programs for curbside charging for homeowners without access to off street parking, and separately for businesses interested in providing publicly accessible charging stations. • The City continues to expand its fleet of lower emissions vehicles with 33 electric vehicles, the largest municipal electric fleet in Canada, and 29 compressed natural gas vehicles.
<p>Solid Waste</p> <ul style="list-style-type: none"> • The City continues to supply gas from the Vancouver Landfill to generate electricity and provide heat to the Village Farms greenhouses. • The City continues to work with FortisBC to develop a project that would upgrade a portion of the gas produced by the Vancouver Landfill to be sold as renewable natural gas.

Despite the progress that has been made in the last decade, the City is not on track for the 2020 carbon pollution target. This is based on three different projections, as shown in the figure below:

1. *Current trends (optimistic)*: If the trend between 2007 and 2016 is extrapolated forward, we would achieve a 20% reduction by 2020 (a gap of 355 thousand tonnes from the target) and the targeted 33% reduction by 2027.
2. *Current trends (pessimistic)*: If the increase in carbon pollution from buildings in 2016 is due to more than the cold winter and progress is slower in 2017 and beyond as a result, we would achieve a 19% reduction by 2020 (a gap of 396 thousand tonnes from the target) and the targeted 33% reduction by 2028.
3. *Accelerated action*: A third projection is drawn from economic modelling completed by Navius Research to explore viable pathways for Vancouver to achieve the 2050 Renewable City Strategy objectives (see Section 9 for more detail on the modelling). This projection points to a 23% reduction in 2020 (a gap of 201 thousand tonnes). This is a smaller gap than either of the current trend scenarios and the curve begins to bend down faster after 2020, enabling us to achieve the 33% reduction by 2023.



Unfortunately, we do not see a realistic pathway to meeting Vancouver's climate target for 2020. While residents and businesses can choose solutions like transit or active transportation at any time, they are much more likely to do so if safe, convenient and affordable options are available. Making transit and active transportation more attractive and viable for more people depends on good land-use decisions and investments, which takes time. Similarly, technology changes (e.g. upgrading a furnace to a heat-pump or switching to an electric vehicle) typically happen when a resident or business is ready to replace the existing technology, and there are a limited number of those windows of opportunity between now and 2020.

That said, we are confident we can accelerate the pace of progress to put ourselves on target for our mid-century goals, minimize the gap in 2020, and achieve the 33% reduction target by 2023. The RCAP aims to achieve this outcome through a mix of City actions, partnerships with other levels of government and utilities, and increased engagement with Vancouver residents and businesses to help them use energy more efficiently and transition to renewable energy.

As we move forward, there are three areas where we've had excellent success that we intend to continue:

1. *We need to continue to make land use and transportation decisions that encourage transit and active transportation.* The percentage of trips Vancouverites take by walking, cycling and transit rose to 50% in 2016 from 47% in 2013. Those shifts help to reduce carbon pollution, save people money, improve air quality and reduce congestion. Through the ongoing implementation of Transportation 2040, we will continue to integrate land use and transportation planning, and invest in sustainable transportation infrastructure. We are aiming for at least two-thirds of trips to be taken by walking, cycling and transit by 2040.
2. *We need to follow through on the Zero Emissions Buildings Plan:* Approved in 2016, the Zero Emissions Building Plan provides a roadmap for new construction in the City that will lead to buildings that progressively use energy more efficiently and are responsible for less carbon pollution between now and 2030. The 2017 update to the Green Building Policy for Rezoning and the 2018 update to the Vancouver Building Bylaw for 3-6 story buildings are the first approved steps in that roadmap. Subsequent steps combined with supporting actions like the Zero Emissions Building and Construction Innovation Centre of Excellence will enable the City to achieve its objectives for new buildings.
3. *We need to continue reducing carbon pollution from solid waste:* Between 2007 and 2016, the carbon pollution from solid waste has dropped by 50%. The ongoing development of Vancouver's Zero Waste Strategy and efforts with FortisBC to upgrade methane gas from the Vancouver Landfill to renewable natural gas are key opportunities to build on these successes.

In addition to building on these successes, we will also need to address several areas where progress to date has not been adequate:

1. *We need to do more to increase the uptake of zero emissions vehicles and low carbon fuels.* Vancouver's carbon pollution from transportation is a major reason for the gap forecast for 2020 because they are equal to 2007 levels, and have been rising slowly since 2014. This is in spite of the encouraging results from the City's efforts to increase the number of trips Vancouverites take by walking, cycling and transit. Potential explanations for the rising carbon pollution from transportation are an increase in larger, less efficient personal vehicles, more commercial transportation, or more trips within Vancouver and into the City from the surrounding region.
2. *We need to expand the reach of building retrofit programs and deepen their impact.* Despite a 7% increase in the total floor area of buildings in the City from 2007 to 2016, carbon pollution from buildings has decreased 13% over the same time period. This is due to the success of previous provincial government initiatives, such as LiveSmart BC, utility company rebates and City policy. Additional focus on existing buildings is needed to assist owners in making upgrades to windows, walls and super-efficient heating and cooling equipment that increase comfort and health, conserve energy and reduce carbon pollution. These efforts will need to account for challenges such as the relatively low cost of natural gas, which makes it more difficult to increase investment in technologies that use natural gas more efficiently and/or switch to renewable sources of energy.

3. *We need to do more to work with the federal and provincial governments to encourage them to adopt new actions.* While Vancouver has an important role to play in the transition to renewable energy, we need the federal and provincial governments to be taking complementary actions if we're going to achieve our objectives. Good examples include the clean energy requirements, low carbon fuel standard, and carbon tax from BC's 2007 Climate Action Plan. From 2012 through 2016, we didn't have significant advances in provincial or federal climate change policies that could have helped us make more progress reducing carbon pollution. The pan-Canadian Framework on Clean Growth and Climate Change and the renewed interest in accelerating action provincially should both help, and we will increase our efforts to partner and engage with other levels of government to encourage ongoing progress.

Section 5 - Principles

Our actions will be designed in accordance with the following principles:

1. **Ensure equitable access to solutions:** In designing our actions, we'll work to identify and resolve barriers to ensure all Vancouver residents and businesses are able to reduce their reliance on fossil fuels.
2. **Reduce costs:** Our actions will be designed to make it more affordable for Vancouver residents and businesses to use energy more efficiently and switch to renewable energy solutions. Many of these solutions are already cost-effective, but the more we can do to reduce costs and other barriers, the faster they can be adopted.
3. **Increase choice:** Our actions will be designed to give Vancouver residents and businesses more options to reduce their reliance on fossil fuels. Many of these options already exist, and we will do more to make them more widely available and grow the range of choices and provide better access to service.
4. **Take advantage of natural stock turn over:** Our actions will focus on opportunities to reduce fossil fuel use when residents and businesses already need or want to make improvements or replacements. Those are the most convenient and cost-effective times to make changes.
5. **Seek partnerships:** Vancouver's climate change objectives are closely aligned with Metro Vancouver's, BC's and Canada's, and we will design our actions in collaboration with those governments to maximize our impact. Similarly, we will seek partnership opportunities with local utilities, researchers, trainers, organizations, businesses, and residents.
6. **Engage each step of the way:** As new actions are developed, we will engage with Vancouver residents and businesses to ensure we answer questions, understand concerns, and embrace new ideas. We will also engage with other governments to share our successes and challenges, and learn from their experience.
7. **Ensure a just transition:** Some business models will be challenged by the transition to renewable energy. We'll work with those businesses and employees to help them find new opportunities.

8. **Adapt to changing circumstances:** The challenges and opportunities we face today, and the available solutions will both shift over time. We will design our actions to be adaptive to these shifting contexts.
9. **Lead by example:** We will take action in our own operations to demonstrate that investments in energy efficiency and renewable energy are achievable and beneficial.
10. **Reduce carbon pollution:** Our actions will help us to achieve our targets and support carbon pollution reductions regionally.

Section 6 - Interim Targets

The City's 2030 interim targets will be:

- Reduce carbon pollution by 50% below 2007 levels.
- Derive 55% of the energy used in Vancouver from renewable sources.

These interim targets were selected for the following reasons:

1. They are achievable with strong actions from the City and other levels of government based on economic modelling of the Renewable City Strategy completed by Navius Research (see Section 9). They represent an acceleration of current trends from an average 1.9% decrease in carbon pollution per year to a 2.7% decrease per year.
2. They are resilient across multiple scenarios from the same modelling with different assumptions about the competitiveness of bio-fuels and the effectiveness of energy efficiency efforts.
3. Meeting them would put Vancouver on a path from where we are today to achieving the 80% cut in carbon pollution around 2040, and the 100% renewable energy target by 2050. That path is consistent with the scenario described in Section 4, in which the 2020 target is achieved by 2023. It is also consistent with the level of reductions C40's Deadline 2020 project has estimated Vancouver will need to achieve to contribute a fair share to 1.5 degree climate goal in the Paris agreement.
4. They are achievable without needing to accelerate natural stock turnover. In other words, the targets can be achieved by transitioning to lower carbon vehicles and buildings when residents and businesses want or need to make upgrades or replacements.

Achieving the 2030 targets will require ambitious and ongoing action that builds on actions taken to date in a way that is coordinated across different levels of government and with utilities. It will also require actions and investments from residents and businesses. The City of Vancouver cannot do this alone - we will need complementary actions from the province and federal government. Some of the key federal and provincial actions include policies that increase the supply of zero emissions vehicles, policies that increase the availability of renewable fuels, and policies that increase the incentives to improve energy efficiency and switch to renewable energy.

While the interim and long-term targets are achievable, there are risks to achieving them. Two in particular are material and outside of the City's control:

1. Federal/provincial actions: For the City to achieve its targets, climate change policies and investments from all levels of government will need to continue getting stronger over time. If that progress doesn't occur, or stalls for an extended period, carbon pollution levels will not drop as quickly as targeted. This is particularly true for policies that improve the efficiency of new vehicles, increase the availability of zero emissions vehicles, and increase the availability of low carbon fuels, where the City has the least jurisdiction.
2. Technology improvement: While the pathways we have modelled to achieving the RCS objectives don't depend on new technologies, there is some dependence on existing technologies improving in quality and/or price over time. For example: the variety of electric vehicles is expected to drop to the point of being \$3,000 more than conventional vehicles and the amount of renewable natural gas utilized implies that we will be producing from wood wastes in addition to agricultural and municipal wastes. If these sorts of advancements don't materialize, residents and businesses will be less likely to adopt them. Conversely, if they materialize faster than anticipated and/or new technologies emerge, achieving the targets will become easier.

Comparing Vancouver's interim targets with other cities is difficult because there isn't a consistent base year or target year, and cities differ in their economic structures, design, and electricity supply (e.g. coal versus hydro). That said, the recommended interim climate target is comparable with the targets in other leading cities such as:

- New York = 35% below 2006 levels by 2025
- San Francisco = 40% below 1990* levels by 2025
- Los Angeles = 45% below 1990 levels by 2025
- Toronto = 60% below 1990 levels by 2030
- Oslo = 50% below 1991 levels by 2030
- Portland = 40% below 1990 levels by 2030
- Yokohama = 24% below 2005 levels by 2030

*Vancouver's 1990 and 2007 levels are similar.

The federal government has an interim 2030 target of a 30% reduction below 2005 levels. While BC doesn't currently have a 2030 target, the provincial government has committed to adopting one.

By the end of 2018, staff from Engineering and Planning, Urban Design and Sustainability will bring forward sector-specific 2030 and 2050 carbon pollution targets for buildings, transportation and waste that will add up to the community-wide 2030 and 2050 targets. These will help provide further clarity on the types of actions that will need to happen within those sectors. In setting these sector-specific targets, we'll work with the province because they have committed to adopting sector specific targets as well.

Section 7 - Monitoring, reporting and review

The following table lays out the various components of monitoring and reporting for the RCAP, along with their frequencies.

Component	Interim milestone	Ongoing Frequency
<p><i>High-level indicators:</i></p> <ul style="list-style-type: none"> - Community-wide carbon pollution separated into buildings, transportation and waste. - Percentage of community-wide energy derived from renewable sources. 	None. The high-level indicators are already tracked on an annual basis as part of the City's Greenest City reporting.	As part of Greenest City Action Plan updates, currently annually.
<p><i>Explanatory indicators:</i></p> <ul style="list-style-type: none"> - The secondary indicators will serve to help to understand the reasons underpinning the trends in high-level indicators (e.g. number of electric vehicles, walk scores, number of Passive House developments, percentage of trips by active transportation, access to frequent transit, local renewable energy generation, level of engagement/awareness, etc.). - A full set of explanatory indicators still needs to be determined. 	By the end of 2018, staff will develop a set of explanatory indicators and plan for populating them. The indicators will be selected in consultation with other agencies undertaking similar work (e.g. the BC Climate Action Secretariat).	At least every four years, as part the RCAP review. Some explanatory indicators are already tracked more frequently (e.g. annual transportation survey for T2040 reporting) and that will continue.
<p><i>Quality of life indicators:</i></p> <ul style="list-style-type: none"> - The output indicators would be additional high-level indicators beyond community-wide carbon pollution and percentage renewable energy. - They will serve to understand the broader set of impacts of the RCAP from economic/employment, health, affordability, and equity perspectives. 	By the end of 2018, staff will develop a set of output indicators and plan for populating them.	At least every four years, as part of the RCAP review.
<p><i>CMO steering committee:</i></p> <ul style="list-style-type: none"> - City Manager, PDS General Manager and City Council designate to discuss progress and challenges regarding RCAP implementation. 	None	Quarterly
<p><i>Staff information sharing:</i></p> <ul style="list-style-type: none"> - A cross-department team to share information on progress and challenges regarding RCAP implementation. 	None	As part of Greenest City Action Plan staff committee, currently quarterly.
<p><i>Near-term actions update:</i></p> <ul style="list-style-type: none"> - A schedule of City of Vancouver's planned policy developments, action items and investments in the coming two years. 	None	Every two years

<p><i>Economic modelling review:</i></p> <ul style="list-style-type: none"> - An assessment of different policy and technology pathways to achieving the Renewable City Strategy objectives. 	<p>Forming a multi-disciplinary advisory committee that is representative of diverse perspectives in advance of the next modelling review. The committee will serve through the course of the review.</p>	<p>Every four years</p>
<p><i>Overall plan review:</i></p> <ul style="list-style-type: none"> - Working with the indicators, economic modelling, and refreshed understanding of external context, an evaluation and update of the RCAP. 	<p>Forming a multi-disciplinary advisory team that is representative of diverse perspectives in advance of the next review and update. The team will serve through the course of the review.</p>	<p>Every four years</p>

Section 8 - Schedule for actions

This section explains the actions within the three priority sectors: buildings, transportation, and waste. A fourth category includes actions that apply across more than one sector. Implementation timeframes are classified as short-term (less than 2 years), medium-term (2-4 years), long-term (5 years), or ongoing. Departmental responsibility is also identified according to the following abbreviations: DBL = Development, Buildings and Licensing; ENG = Engineering; FRS = Finance, Risk and Supply Chain Management; PDS = Planning, Urban Design, and Sustainability; and REFM = Real Estate and Facilities Management. The level of detail in the tables varies depending on the number of priorities and different approaches to work-planning across City departments.

Buildings

		Responsibility	Short-term (<2 years)	Medium-term (2-4 years)	Long-term (>4 years)	Ongoing
Improving energy efficiency and transitioning to renewable energy in new buildings						
B.1	Periodic improvements to heat loss, energy efficiency and carbon pollution requirements in the Green Buildings Policy for Rezoning, with improvements aligned with the steps in the Zero Emissions Buildings Plan. Next update anticipated in 2022.	PDS			X	
B.2	Implement changes to the Vancouver Building Bylaw that will improve energy efficiency and reduce carbon pollution in 3-6 story buildings. The changes were approved in March 2017 and will come into force in March 2018.	PDS	X			
B.3	Future periodic improvements to the Vancouver Building Bylaw that will be aligned with the heat loss, energy efficiency and carbon pollution targets in the Zero Emissions Building Plan. The next update will be in early 2018 (coming in to force in early 2019) for buildings seven stories and above to codify the improvements achieved through the previous version of the Green Building Policy for Rezoning.	PDS	X		X	
B.4	Add compliance pathways to the Vancouver Building Bylaw and Green Building Policy for Rezoning to recognize the BC Energy Step Code where it achieves equivalent outcomes.	PDS	X			
B.5	Changes to permitting guidelines to remove barriers to Passive House developments.	DBL	X			
B.6	Evaluate effectiveness of new program to procure case studies in Passive House development and plan next steps based on results.	PDS	X			
B.7	Work with provincial and federal governments and utilities to establish robust support for Passive House developments and/or the final step of the BC Energy Step Code through incentives and public sector leadership.	PDS	X			
Improving energy efficiency and transitioning to renewable energy in existing buildings						
B.8	Work with other governments, utilities and building owners and managers to develop targeted incentives to encourage deep energy and emissions retrofit projects (i.e. cuts in carbon pollution in the range of 50-80%), particularly in building types with the most encouraging economics for such projects.	PDS	X			
B.9	Work with Metro Vancouver and other partners on multi-year energy advisor program to support deep energy and emission retrofits in stratas.	PDS				X
B.10	Continue to research barriers to deep energy and emission retrofits and work with other governments and utilities to address these through new programs and changes to City policy.	PDS				X
B.11	Streamline and prioritize the permitting process for renovations so as to encourage deep energy and emissions retrofit projects.	DBL	X			
B.12	Work with provincial and federal governments, and utilities to finance improvements to energy efficiency and reductions in carbon pollution in public housing	PDS		X		

Buildings

		Responsibility	Short-term (<2 years)	Medium-term (2-4 years)	Long-term (>4 years)	Ongoing
	projects.					
B.13	Work with the provincial government to establish province-wide energy performance benchmarking and reporting requirements for large commercial and residential buildings to help identify opportunities to improve energy efficiency, reduce carbon pollution, and to monitor the effectiveness of policy changes.	PDS	X			
B.14	Continue to regularly update the Vancouver Building Bylaw so that at the time of equipment replacement and renewal, energy efficient and low carbon options are required. These requirements will increase over time, in step with technology availability and cost-effectiveness.	PDS				X
B.15	Launch and evaluate thermal imaging program as a tool to increase retrofit activity in single family homes.	PDS	X			
B.16	Evaluate the Heritage Energy Retrofit Grant program as a tool to increase retrofit activity in pre-1940's homes and plan next steps based on results.	PDS	X			
Increasing low carbon neighbourhood energy systems						
B.17	Continuing to expand the City-owned Neighbourhood Energy Utility to provide more new buildings with zero emissions heat and hot water.	ENG				X
B.18	Remove mandatory neighbourhood energy connection requirements for developments in areas not served by a City-owned energy system, to enable low carbon thermal energy systems by other parties.	PDS	X			
B.19	Update the Policy for Secured Low Carbon Energy Systems to minimize the risk that new buildings connected to district energy systems won't be connected to a low carbon energy source.	PDS	X			
B.20	Continue work enabling the conversion of the Creative Energy's downtown district energy system to a low carbon source of energy.	ENG				X
B.21	Continue work enabling the implementation of a low carbon energy supply for the River District neighbourhood.	ENG				X
B.22	Evaluate the business case for expansion of the City-Owned Neighbourhood Energy Utility to the False Creek Flats, Lower Main Street, NE False Creek, and potentially other areas of the Downtown and Cambie corridor.	ENG	X			
B.23	Using the City-Owned Neighbourhood Energy Utility and other low carbon energy systems, maximize recovery of waste heat from sources such as sewers, commercial cooling and data centres	ENG				X
Other actions						
B.24	Develop a Green Building Strategy with a 2050 time horizon that includes new and existing buildings and incorporates high performance envelopes, building scale renewable energy and district scale renewable energy.	PDS	X			
B.25	Explore a program that would allow residents and businesses to purchase the renewable natural gas needed for the typical lifetime operation of relatively low use appliances like decorative fireplaces when those appliances are purchased.	PDS	X			
B.26	Launch the Zero Emissions Building and Construction Innovation Centre of Excellence and continue to work with the federal and provincial government to share knowledge and expertise, and secure additional endowment or operating funding.	PDS	X			X
B.27	Re-assess the opportunities for the City to support solar and other distributed generation technologies in light of ongoing improvements in their cost and performance, and an increase in our projections for new electricity demand.	PDS	X			

Transportation

		Responsibility	Short-term (<2 years)	Medium-term (2-4 years)	Long-term (>4 years)	Ongoing
Use land-use and zoning policies to develop complete compact communities and complete streets that encourage active transportation and transit						
T.1	Foster land use as a tool to improve transportation consistent with the direction established in Transportation 2040.	PDS				X
T.2	Enhance and accelerate the development of complete streets and green infrastructure.	ENG/ PDS				X
T.3	Enhance the pedestrian network according to the direction established in Transportation 2040.	ENG				X
T.4	Enhance cycling infrastructure and encourage more bike trips according to the direction set in Transportation 2040.	ENG				X
T.5	Use parking policies to support sustainable transportation choices and efficient use of our street network.	ENG/ PDS				X
T.6	Optimize the road network to manage congestion, improve safety, and prioritize sustainable transportation.	ENG				X
Improve transit services as set out in Transportation 2040						
T.7	Extend the Millennium Line SkyTrain in a tunnel under Broadway.	ENG			X	
T.8	Improve frequency, reliability, and capacity across the transit network.	ENG				X
T.9	Develop a transit supportive public realm with improved multimodal integration and comfortable waiting areas.	ENG				X
T.10	Work with TransLink to draft a plan to transition fossil fuel powered transit vehicles to renewable energy.	ENG/ PDS	X			
Transition light-duty vehicles (cars and light trucks) to be predominantly electric, plug-in hybrid or sustainable biofuel powered						
T.11	Continue to build out the 'level 2' public charging network. By the end of 2021, we anticipate adding 40 new charge points throughout Vancouver. Focus areas include community centres and Business Improvement Associations.	PDS		X		
T.12	Expand the 'fast charging' public network from one station (Empire Field) to between 20 and 24 by end of 2021. This will put a 'fast charger' within a 10 minute drive of everywhere in Vancouver.	PDS		X		
T.13	Work with the federal and provincial governments, and BC Hydro to enhance investment into the City's charging network.	PDS	X			
T.14	Develop a preferential parking policy to encourage the use of zero emissions vehicles relative to conventional vehicles.	ENG/ PDS	X			
T.15	Lead an initiative with various stakeholders and the BC Utilities Commission to streamline regulation in respect of electric vehicle charging to encourage more private investment in charging stations and reduce the need for public sector investment.	PDS	X			
T.16	Review and update the requirements for electric vehicle charging infrastructure in new buildings in coordination with other governments working on the issue (e.g. Richmond).	PDS	X			
T.17	Implement an incentive program to help residents in existing multi-unit residential buildings install electric vehicle charging infrastructure. We will work closely with the provincial government to complement the program committed to in the Climate Leadership Plan.	PDS	X			
T.18	Monitor response to the implementation of fees at City charging stations to ensure they encourage turnover, while continuing to be competitive relative to gasoline and diesel.	ENG				X
T.19	Develop and implement a standardized look and customer interface for the City's electric vehicle charging infrastructure so that it also serves as an opportunity to promote the network to existing and potential users.	PDS	X			

T.20	Work with local light-duty fleets (e.g. taxis, carshares, couriers, etc.) to help them transition to zero emissions vehicles and fuels.	PDS				X
T.21	Transition the planning, operations and maintenance of the charging network to Engineering Services.	ENG/ PDS		X		
T.22	Work with the provincial and federal governments to encourage them to adopt a zero emissions vehicle mandate that would ensure an increasing availability of zero emissions vehicles for Vancouver residents and businesses to choose from.	PDS				X
T.23	Work with the provincial government to encourage them to adopt a stronger Low Carbon Fuel Standard that reduces carbon pollution by 20% by 2030.	PDS				X
T.24	Work with the provincial government to explore opportunities through the Low Carbon Fuel Standard to increase investment in infrastructure that improves access to low carbon fuels.	ENG/ PDS	X			
Develop car-sharing and regional mobility pricing						
T.25	Support increased car-sharing and the uptake of renewably powered vehicles in car-sharing fleets.	ENG/ PDS				X
T.26	Advocate for comprehensive regional mobility pricing.	ENG				X
Better manage commercial vehicle journeys and transition heavy-duty (commercial) vehicles to sustainable biofuels, biomethane, hydrogen and electricity						
T.27	Improve the delivery of commercial freight, goods, and services according the direction set in Transportation 2040	ENG				X
T.28	Work with fleet operators (e.g. tour companies) and contractors to transition to renewably powered vehicles.	ENG/ PDS				X
T.29	Support efforts from the Port of Vancouver to reduce carbon pollution from the trucks and ships needed for goods movement. These are significant sources of carbon pollution that are associated with Vancouver, but fall outside of our inventory.	ENG/ PDS				X
T.30	Assess opportunities to provide private fleets with limited access to the Manitoba and/or National Works Yards as supply sites for low carbon fuels.	ENG/ PDS	X			

Waste

		Responsibility	Short-term (<2 years)	Medium-term (2-4 years)	Long-term (>4 years)	Ongoing
General						
W.1	Complete the development of a comprehensive Zero Waste Strategy for Vancouver.	ENG	X			
W.2	Continue to work with FortisBC to advance the project to upgrade methane gas from the Vancouver Landfill to renewable natural gas.	ENG	X			
W.3	Evaluate additional opportunities to develop renewable natural gas from Vancouver wastes, and work with FortisBC and other partners to increase the supply of renewable natural gas throughout the region.	ENG	X			
W.4	Evaluate other opportunities to produce biofuels from Vancouver wood waste and other potential waste streams	ENG	X			

Cross-Sectoral Actions

		Responsibility	Short-term (<2 years)	Medium-term (2-4 years)	Long-term (>4 years)	Ongoing
General						
C.1	Continue to expand our public and stakeholder engagement around the Renewable City Strategy in order to grow public understanding and support and create an understandable roadmap on how residents and businesses can participate, share experiences and concerns, and help the City succeed.	PDS				X
C.2	Evaluate sources of carbon pollution that Vancouver bears some responsibility for, but are not currently reflected in our reporting framework (e.g. Scope 3 emissions from the production and transport of food and consumer goods used in Vancouver).	PDS		X		
C.3	Continue to refine how we track and report on energy use and carbon pollution to ensure our data is as accurate as possible and useful in informing future City actions.	PDS				X
C.4	Undertake an assessment of how business permitting and licensing could be used to support improvements in energy efficiency and the adoption of renewable energy.	DBL/ PDS	X			
C.5	Establish a taskforce to evaluate the Renewable City Strategy through our principles of Equitable access and Just Transition and make recommendations on how to improve the strategy to better account for these principles.	CS/ PDS	X			
C.6	Support the BC government in following through on their commitment to increase the carbon tax and expand its coverage.	PDS	X			
C.7	Support local businesses in their efforts to reduce their carbon pollution.	VEC				X
C.8	Update the Large Sites Policy so that is consistent with the direction established in Transportation 2040 and the Zero Emissions Buildings Plan.	PDS	X			
Lead by example in corporate operations						
C.9	Develop new City buildings to Passive House and zero emissions standards (as part of the City's plan to achieve 100% renewable energy in City buildings by 2040).	REFM				X
C.10	Continue relying on a mix of strategies to retrofit existing City buildings to make them more energy efficient with energy increasingly from renewable sources (e.g. connecting to neighborhood energy systems, converting to high-efficiency electric heating, installing on-site renewables, and purchasing renewable natural gas).	REFM				X
C.11	Lead and finalize the new regional fuel purchasing consortium agreement with an objective of decreasing the carbon intensity of fuels. (if this is an outgrowth of our own fuel purchasers then could be moved here.)	ENG	X			
C.12	Increase utilization of zero emissions vehicles in the City fleet through replacement of existing units that need to be replaced.	ENG				X
C.13	Continue to require contractors for major facilities demolition projects to divert 85 per cent of non-hazardous wastes from landfill where feasible; and explore opportunities to expand this requirement to other City construction projects.	REFM /ENG				
C.14	Undertake an assessment of the carbon pollution emitted by the City's suppliers and how the City can use its purchasing power to support suppliers in adopting renewable energy and energy efficiency.	FRS/ PDS	X			
C.15	Develop and implement a corporate carbon pricing policy building on the leadership shown by Metro Vancouver through the development of a similar policy in July 2017.	FRS/ PDS	X			
C.16	Bring forward a Report to Council as appropriate on all fossil fuel burning vehicles and non-stationary equipment used in the City, their role in City operations, their status with respect to transitioning to renewable energy alternatives, and recommended approaches to help fast-track the transition toward renewable energy uses and products.	ENG/ PDS				X

Section 9 - Modelling results

The economic modelling to inform the RCAP was conducted by Navius Research through a project commissioned in partnership with BC Hydro. Navius Research used a Vancouver-specific version of their CIMS model, which is the same model used to inform the initial development of the Renewable City Strategy.

The model is a detailed representation of the energy used in Vancouver for buildings and transportation. It simulates a large number of resident and business decision-points (e.g. purchasing a new vehicle, deciding between different transportation modes, replacing a furnace, building a new home, etc.) with the decisions having implications for energy use, carbon pollution, and costs.

In this project, extensive work was done with BC Hydro to calibrate the model using Vancouver-specific historical data (e.g. Vancouver's mode share data) and forecast data (e.g. BC Hydro load forecasts).

Scenarios

The modelling project simulates Vancouver's energy demand out to 2050 with four scenarios explored - each of which was designed to achieve the Renewable City 2050 objectives.

1. A policy package primarily focused on reducing carbon pollution with more optimistic assumptions about how competitive different sources of bio-energy will be. This scenario is labeled 'P1_opt_bio' in the charts below.
2. A policy package primarily focused on reducing carbon pollution with less optimistic assumptions about how competitive different sources of bio-energy will be. This scenario is labeled 'P1_pess_bio' in the charts below.
3. A policy package focused on reducing carbon pollution plus an extra emphasis on energy efficiency, and more optimistic assumptions about how competitive different sources of bio-energy will be. This scenario is labeled 'P2_opt_bio' in the charts below.
4. A policy package focused on reducing carbon pollution plus an extra emphasis on energy efficiency, and less optimistic assumptions about how competitive different sources of bio-energy will be. This scenario is labeled 'P2_pess_bio' in the charts below.

All four scenarios use BC Hydro's anticipated population growth rate of 1.6% per year.

Policies

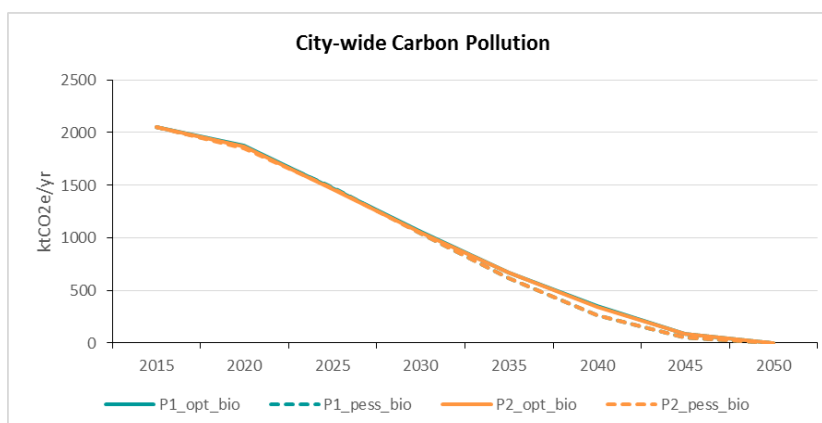
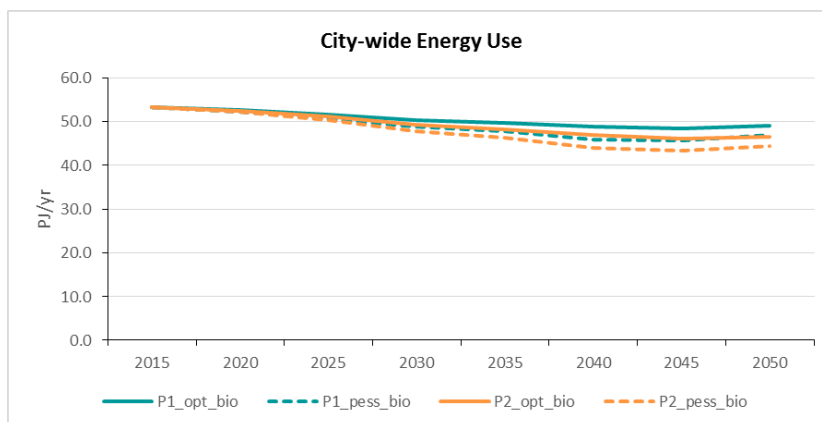
The full package of policies is available in the Navius report, but at a high-level it is consistent with the actions in Section 8 (including the federal and provincial actions that Vancouver is working to support). Examples include:

- A representation of Vancouver's Zero Emissions Building Plan for new construction.

- Requirements to upgrade to more energy efficient and lower carbon heating systems when existing systems need to be replaced.
- Policy that requires ongoing reductions in the carbon-intensity of transportation fuels and a complementary requirement to reduce the carbon-intensity of the fuels in the natural gas grid.
- A representation of Vancouver's Transportation 2040 plan to continue increasing the share of trips taken by active transportation and transit.
- Increases in the carbon tax that aligns with the BC government's commitments and then rising at the rate of inflation after reaching the promised \$50/tonne.

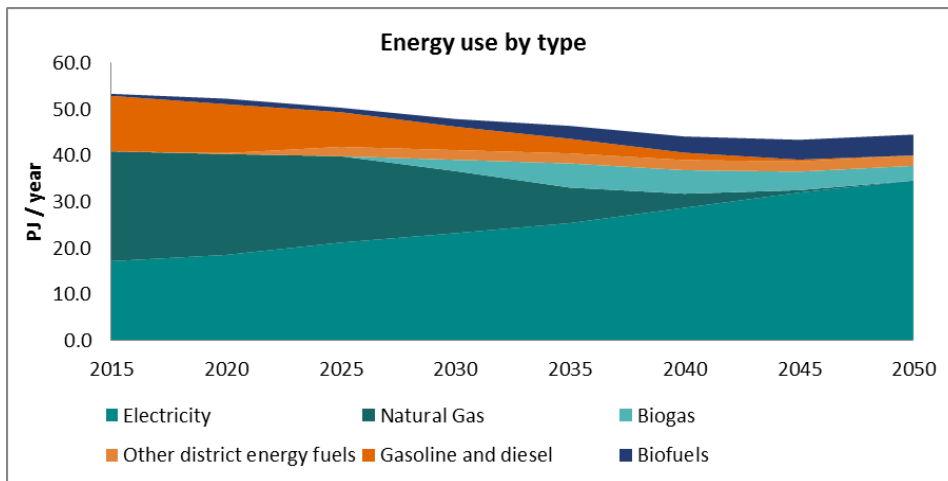
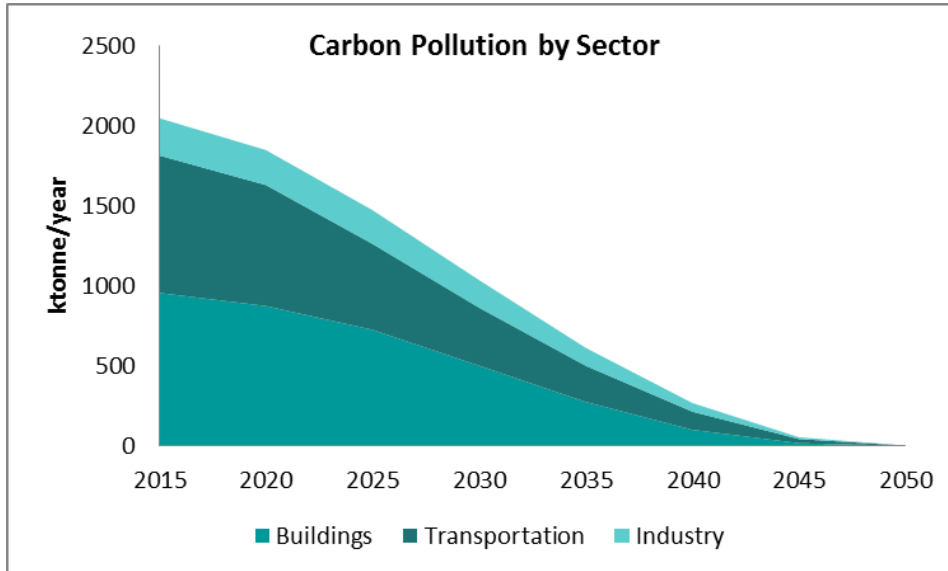
Results: Total Energy Use and Carbon Pollution

The first two charts show Vancouver's energy use and carbon pollution for the four different scenarios. As expected, the scenarios that place a higher priority on energy efficiency result in less energy consumption, although the difference is relatively small because the scenarios focused primarily on carbon pollution still achieve improvements in energy efficiency. In all of the scenarios, city-wide energy use declines because of improvements in energy efficiency. There is minimal difference in carbon pollution between the scenarios.



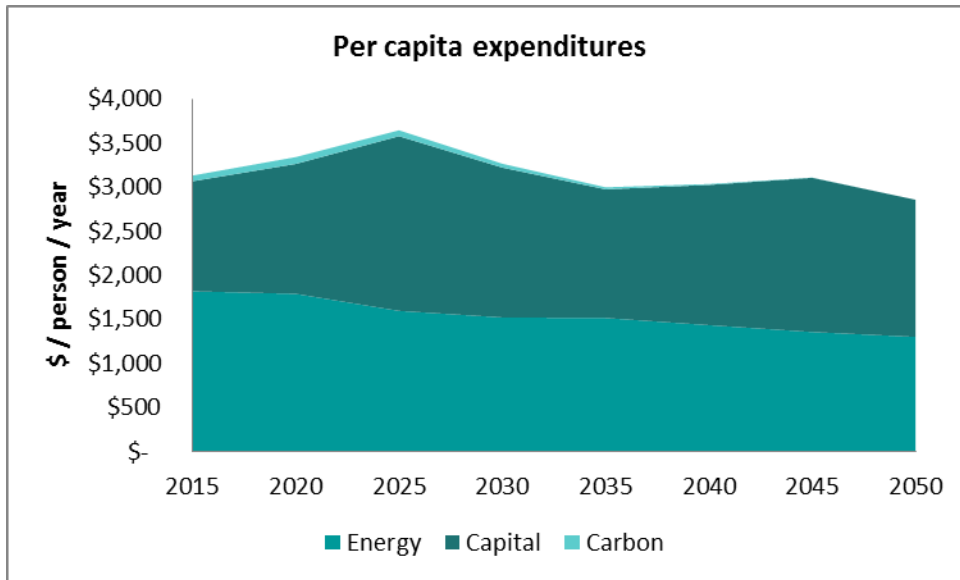
The next two charts show carbon pollution by sector and energy use by type of energy. In both cases, the results presented are from scenario 4 (P2_pess_bio). As shown in the first figure, carbon pollution drops in all sectors, with the declines happening fastest in

transportation, followed by buildings, and then industry. The energy use by type figure shows a transition from electricity meeting about one third of Vancouver's total needs to three quarters in 2050. The remaining quarter is primarily different types of bio-energy.



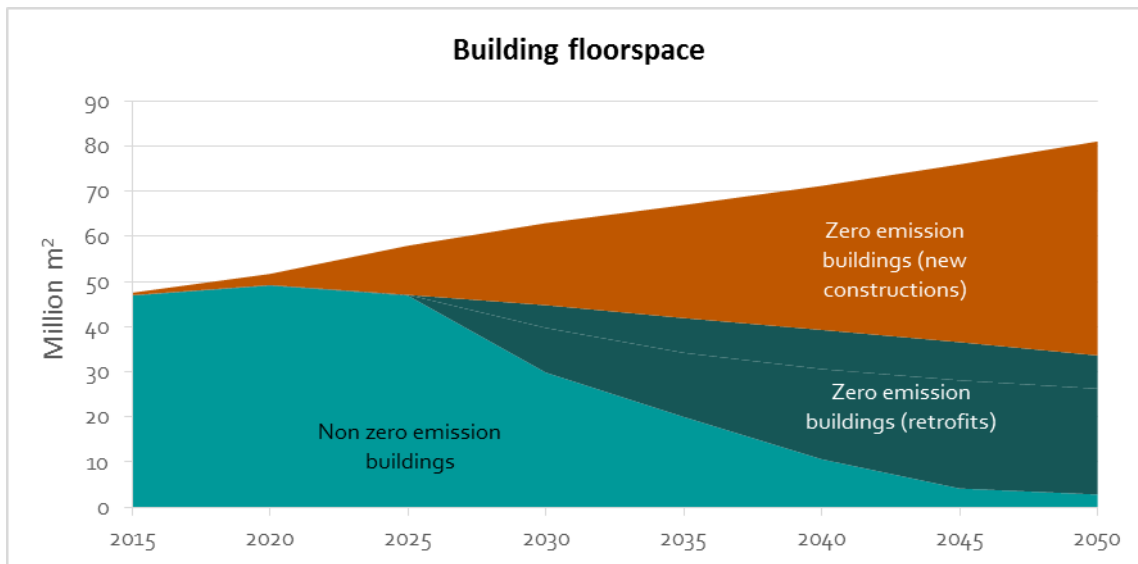
Results: Costs

The next figure shows per capita energy, capital and carbon tax expenditures (2015 \$'s) from scenario 4 (P2_pess_bio). While energy and carbon expenditures decline and capital expenditures increase, the net change is a 9% reduction in expenditures on a per capita basis.

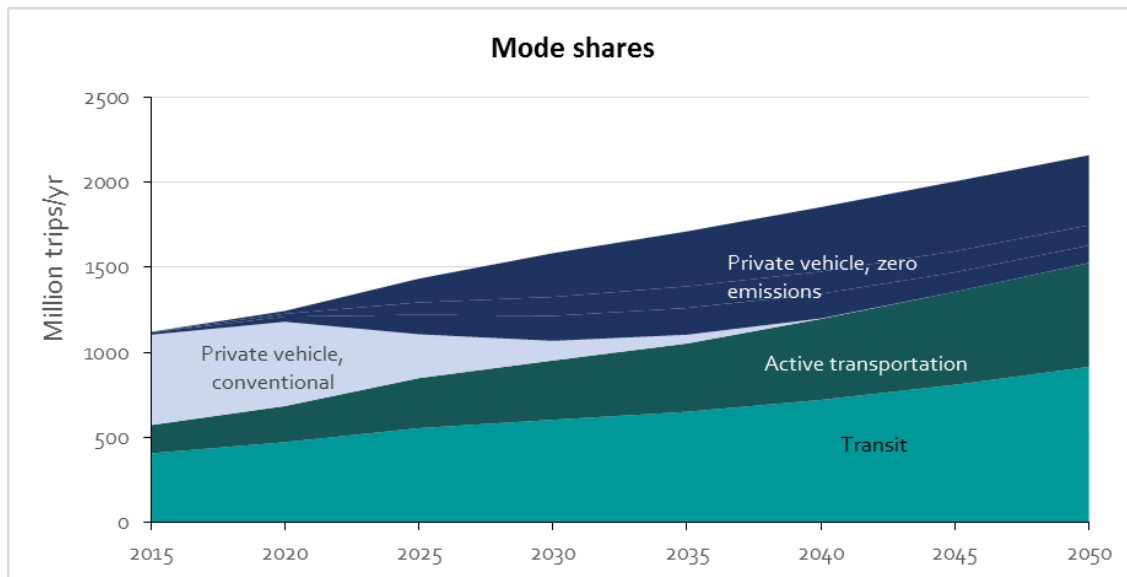


Results: Buildings and Transportation

The next two figures illustrate how buildings and personal transportation evolve from their current state to 100% renewable energy. In both cases, the results presented here are from scenario 4. For the buildings figure, the growing orange wedge shows new (and redeveloped) buildings built to a zero emissions standard. The transition from light to dark turquoise shows the declining number of existing buildings that transition to a zero emission standard through retrofits and fuel-switching.



For the personal transportation figure, the growing light and dark turquoise wedges show the increasing importance of transit and active transportation in the City. The transition from light blue to dark blue shows the relatively steady number of private vehicle trips transitioning from conventional vehicles to zero emissions vehicles.



Limitations

There are two important limitations to the model worth highlighting:

- The CIMS model does not include carbon pollution from the Vancouver Landfill, which is included in our inventory and targets. City of Vancouver estimates of waste emissions were added to the Navius results to produce the information in Section 4 and 6.
- The CIMS model is limited in its ability to simulate city-level policies aimed at mode-shifting (e.g. investments in walking and cycling infrastructure). To ensure the energy and carbon pollution estimates reflect these important actions, the outcomes targeted by Transportation 2040 are built into the scenarios as assumptions.

RCS Draft Action Plan - List of Organizations Consulted With (May to August, 2017)

Note: Inclusion of the organization in the list of consulted groups does not indicate endorsement of the RCAP. These organizations were provided the opportunity to respond to the RCAP through in-person meetings with staff and/or by providing written comments.

Governments and Utilities

BC Ministry of Energy, Mines & Petroleum Resources
BC Ministry of Environment & Climate Change Strategy - Climate Action Secretariat
Natural Resources Canada
MetroVancouver
Translink
City of Richmond
City of Surrey
City of Victoria
Vancouver Economic Commission
BC Hydro
FortisBC

Business and Business Associations

Alterra Power Corporation
BC Advanced Conservation & Efficiency Association
BC Chamber of Commerce
BC Cleantech CEOs Alliance
BC Restaurant Association
BIA - Downtown
BIA - Strathcona
Building Owners and Managers Association (BOMA)
Chrysalix Venture Capital
Climate Access (Cara Pike)
Condominium Home Owner's Association (CHOA)
eco-Options Energy Cooperative
Energy Forum
Golden Properties
Greater Vancouver Home Builder's Association
Green Jobs BC
Hearth, Patio and Barbecue Association
Innergex Renewable Energy
Landsea Tours and Adventures
Modo Carshare Co-op
New Car Dealers Association of BC
Novex Couriers
Port MetroVancouver
Quality Urban Energy Systems of Tomorrow (QUEST)
SAP Software Solutions

TD Canada Trust
Urban Development Institute
Vancouver Board of Trade
Yellow Cab

Academic

David Boyd, SFU School of Resource and Env Management
James Tansey, UBC Sustainability Initiative
Jennie Moore and Alexandre Hebert, BCIT
Mark Jaccard, SFU School of Resource and Env Management
Pacific Institute for Climate Solutions (UBC, UVic, SFU) - Transportation Project and Building Project
Stephen Sheppard, UBC Centre for Advanced Landscape Planning

Non-Governmental Organizations

BC Sustainable Energy Association
Better Environmentally Sound Transportation (BEST)
Broadbent Institute
Canadian Centre for Policy Alternatives
Carbon Neutral Cities Alliance (CNCA)
Clean Energy BC
Clean Energy Canada
Community Energy Association
David Suzuki Foundation
Federation of Canadian Municipalities
Fraser Basin Council
Georgia Strait Alliance
One Earth Alliance
Passive House Canada
Pembina Institute
Tourism Vancouver
Union of BC Municipalities