City of Colwood

Climate Planning Foundations Report

Updated July 2023

Colwood

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Glossary

Adaptation	Any initiative or action in response to actual or projected climate change impacts that reduces the effects of climate change on built, natural, and social systems.
Climate Change	Significant changes in global temperature, precipitation, wind patterns and other measures of climate that occur over several decades or longer. Not to be confused with weather, climate is the overall trend or average of weather, whereas weather is a day-to-day occurrence.
Co-benefits	The beneficial social, cultural, economic, and/or environmental effects of a policy or action that aims to reduce climate change risks and greenhouse gas emissions. Effective climate action advances sustainable community priorities.
Greenhouse Gas (GHG)	A gas that contributes to the greenhouse effect by absorbing infrared radiation. The main GHG's include water vapour, carbon dioxide, methane, and nitrous oxide. GHGs are released into the atmosphere both naturally and from human activity and amplify earth's warming.
Hazard	A biophysical event (e.g., drought, rain, or wind) that could cause potential impacts.0F0F0F0F0F[1]
Impact	The effects of existing or forecast changes in climate on built, natural and human systems, i.e., the effects of climate change on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure. One can distinguish between potential impacts (impacts that may occur given a projected change in climate, without considering adaptation) and residual impacts (impacts of climate change that would occur after adaptation).[1]
Low Carbon Resilience	A step change in climate action that coordinates and mainstreams adaptation, mitigation, and co-benefits in municipal planning and decision-making processes.
Mitigation	Efforts to reduce or prevent emission of greenhouse gases.
Net Zero Emissions	Emitting no greenhouse gas emissions or offsetting emissions, for example, through actions such as tree planting or employing technologies that can capture carbon before it is released into the air.[2]
Resilience	The capacity of a system, community or society exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.[1]
Risk	The combination of the likelihood of an event occurring and its negative consequences. Risk can be expressed as a function where risk = likelihood × consequence. In this case, likelihood refers to the probability of a projected impact occurring, and consequence refers to the known or estimated outcomes of a particular climate change impact.[1]
Vulnerability	The degree to which a system or jurisdiction is susceptible to harm arising from climate change impacts. It is a function of a community's sensitivity to climate change and its capacity to adapt to climate change impacts.[1]

[1] Canadian Council of Ministers of the Environment. (2021). Guidance on Good Practices in Climate Change Risk Assessment. Retrieved from: https://ccme.ca/en/res/riskassessmentguidancesecured.pdf
[2] Government of Canada. (n.d.). Net Zero by 2050. Retrieved from: https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html

Acronyms

AAA	All Ages and Abilities
AFOLU	Agriculture, Forestry, and Other Land Use
AQI	Air Quality Index
BAU	Business as Usual
CAP	Climate Action Plan
CAT	Climate Action Team
CDD	Cooling Degree Days
CLIC	Community Lifecycle Infrastructure Costing
CO_2	Carbon Dioxide
CRD	Capital Regional District
EV	Electric Vehicle
GHG	Greenhouse Gas
HDD	Heating Degree Days
MACC	Marginal Abatement Cost Curve
MURB	Multi-Unit Residential Building
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Process and Product Use
LCR	Low Carbon Resilience
OCP	Official Community Plan
RCP	Representative Concentration Pathway
SD62	School District 62
SLR	Sea Level Rise
SOV	Single Occupancy Vehicle
tCO_2e	Tonnes of Carbon Dioxide Equivalent

Land/Territory Acknowledgement

We are honoured to have the opportunity to build strong working relationships with local Nations based on learning, openness, humility, and respect. We endeavour to walk softly on these ancestral lands of the Xwsepsum and Lekwungen families.

Acknowledgements

This Foundations Report towards a Climate Action Plan was developed by the Community Energy Association and FlipSide Sustainability on behalf of the City of Colwood. We would like to acknowledge the many individuals and organizations who participated in the development process, we appreciate your time and commitment. Together we are building a climate ready Colwood!

Residents

The residents of Colwood are strongly committed to climate action and have shown how much they value practical solutions to reducing our emissions and preparing for climate change. The dedication of residents and youth has already built the momentum for climate action in the community, from engaging with neighbours to become more resilient, to growing their own food or buying locally grown food, to shifting their mode of transportation to low carbon options like walking and cycling. Without this strong community support and commitment, it would be impossible to reach our goals.

Mayor and Council

This project was made possible through the support of Mayor and Council. Their guidance, including the allocation of funding and staff resources, illustrates their commitment to taking strong action on climate change.

Climate Action Team

The Climate Action Team advising on this foundational work was composed of both internal staff and stakeholders and external stakeholders, such as members of the Development Community, Royal Roads University, Island Health, the Capital Regional District, City Green, Capital Bike, Westshore Chamber of Commerce, and BC Transit. Their collective expertise, perspective, and creativity informs a climate plan for the community that is practical and impactful. The dedication of this team to reflect on the impact of their work on climate change, and vice versa is inspiring. We look forward to their continued support to move the plan into implementation.

Executive Summary

The City of Colwood is a rapidly growing seaside community in southern Vancouver Island. Like all other local governments in Canada, Colwood is at the forefront of increasingly frequent and severe climate change impacts. The need to proactively plan for climate impacts (adaptation) and also reduce emissions that contribute to Earth's warming (mitigation) is now urgent. The City has developed this Climate Planning Foundation Report and adjoining Climate Action Plan to respond to this crisis and undertake adaptation and mitigation planning in a streamlined manner. This report proposes five cross-cutting pathways and 13 strategies to:

- Help our residents, assets, and ecosystems adapt to the projected, future impacts of climate change, and manage those already underway.
- Help us meet our goal of becoming a zero-emissions community with targets of 30% emissions reductions below 2007 levels by 2030 and net zero by 2050 (per capita 50% by 2030 and 100% by 2050).

What is Low Carbon Resilience?

Low Carbon Resilience, or LCR, is a step change in climate action planning that streamlines and integrates 1) risk and vulnerability reduction (adaptation), 2) emissions reduction (mitigation), and 3) co-benefits in municipal planning and decision-making processes. Applying an LCR approach, or LCR lens (Figure 1), mainstreams these three criteria alongside other factors like cost and feasibility.

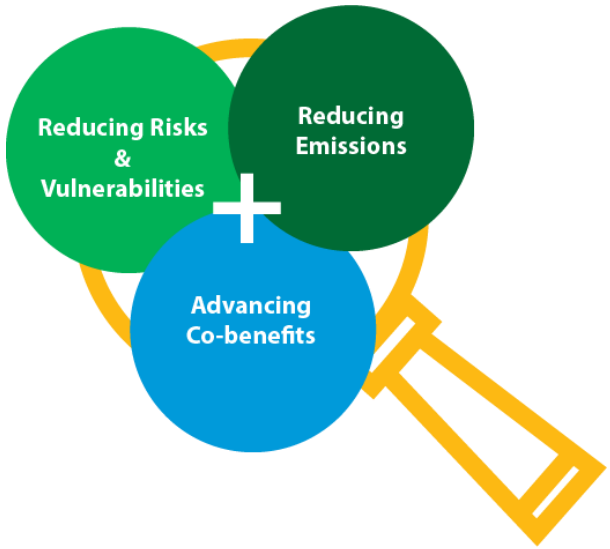


Figure 1: The LCR lens (ACT, 2020).

Colwood's Climate Vision

In 2050, the City of Colwood is a leader in integrated climate action. We consider climate risk, emissions, and co-benefits in organization-wide decision making. We take resilience seriously in our built environment, among vulnerable residents, and in surrounding natural areas that support and provide services to our communities in multiple ways. We aim to be a zero-emissions community with targets of 30% emissions reductions by 2030 (per capita 50%) and net zero by 2050.

Emissions Reduction (Climate Mitigation)

Target Criteria	Target Year	
	2030	**2050**
Per capita GHG emissions reductions from 2007 levels ($5.3\ tCO_2e$)	50% (~$2.6\ tCO_2e$)	100% (net 0 tCO_2e)
Total GHG emissions reduction from 2007 levels (82,500 tCO_2e)	30% (57,800 tCO_2e)	100% (net 0 tCO_2e)

These per capita targets have been set to be consistent with the recommended targets in the IPCC's report *Global Warming of 1.5°C* of reducing global emissions by 45% from 2010 levels by 2030 and reaching net zero emissions by 2050. The Federal Government has also committed Canada to reducing emissions by 40-45% from 2005 levels by 2030 and committed to net zero emissions by 2050. The Province of BC has committed to net-zero emissions by 2050 and legislated targets for reducing emissions 40% below 2007 levels by 2030, 60% by 2040, and 80% by 2050. Given Colwood's growth, per capita targets must be set in addition to absolute targets.

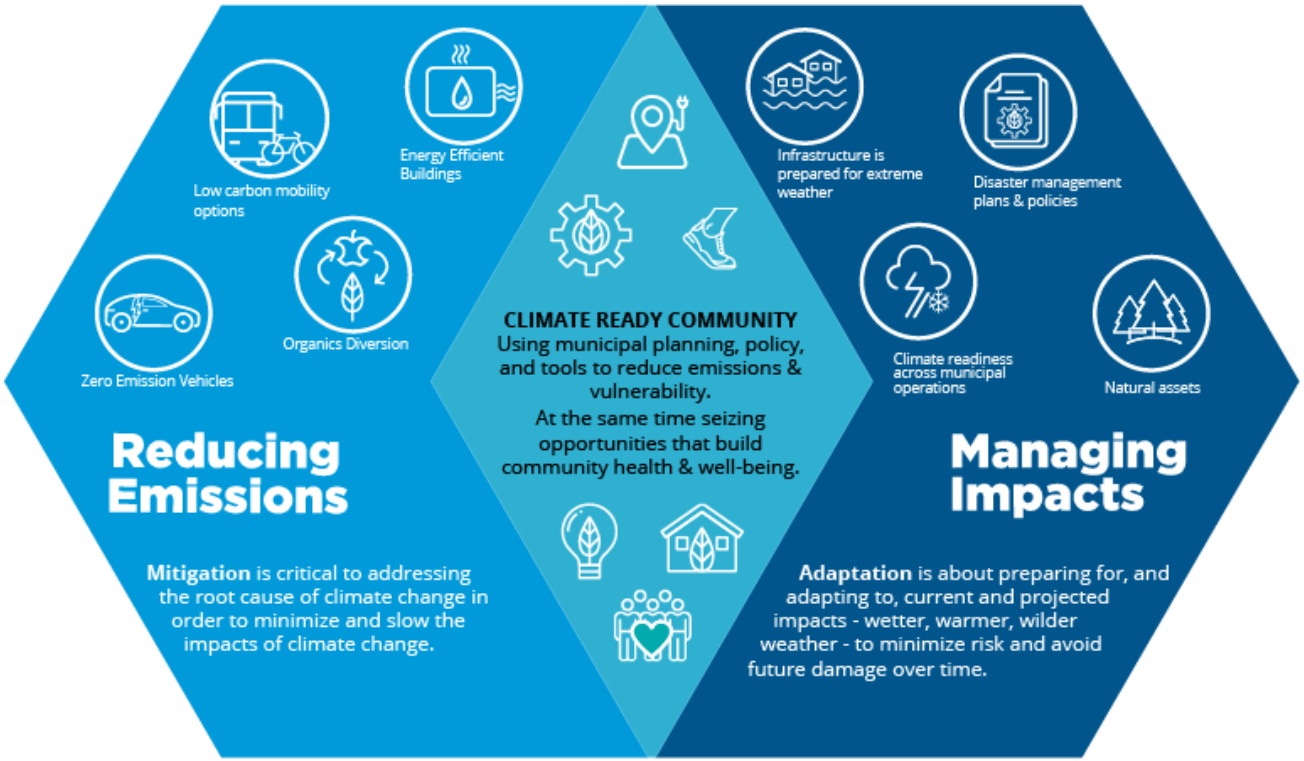
Addressing Climate Risks

Recent events in the City of Colwood including heat waves, water shortages, winter storms, and other occurrences of extreme weather have highlighted the need to reduce our vulnerabilities and prepare for ongoing challenges. This report identifies actions for reducing risks and vulnerability for climate adaptation, integrated with mitigation planning and providing additional co-benefits.

Co-benefits

This report factors in co-benefits of climate action, including the beneficial social, cultural, economic and/or environmental benefits towards sustainable community development. Co-benefits can be maximized through integrated planning.

Figure 2: Snapshot of integrated actions that reduce emissions while preparing for climate change impacts.



Examples of actions that reduce emissions while preparing for climate change impacts:

Walking/biking paths: reduces emissions, increases access for vulnerable populations, reduces congestion, reduces pollution, and increases air quality and health.

Building retrofits: use less energy, reduce emissions, save costs, increase thermal comfort and air quality during extreme heat and wildfire events.

Green infrastructure: increases rainfall absorption, reduces flood risk, sequesters carbon, recharges aquifers, increases green space.

Climate Planning Foundations Report

This report as been adapted from an original draft plan, providing the foundation for an updated Climate Action Plan. The report and climate planning is the result of engagement and planning with Colwood residents, stakeholders, and staff.

This foundational work is detailed in this report including:

- Modeling of greenhouse gas (GHG) emissions in Colwood
- Cost/benefit analysis of actions for GHG emissions reductions, including a Marginal Abatement Cost Curve
- Climate projections and hazards summary (risks and vulnerabilities)
- An exploration of 3 different climate futures for Colwood

Also included are descriptions of 5 pathways with strategies and actions towards a climate action plan. The proposed pathways are:

Pathway 1: Strong Municipal Leadership on Low Carbon Resilient Solutions

Pathway 2: Low Carbon Transportation and Connected, Complete Communities

Pathway 3: Low Carbon and Resilient Buildings and Infrastructure

Pathway 4: Connected Urban and Natural Systems

Pathway 5: Thriving Circular Economy and Eco-Innovation Hub

Climate Action Plan

This foundational report informs and supports Colwood's final 2023 Climate Action Plan, developed through further public and staff feedback. The actions described in this report were reviewed by the Climate Action Team members for relevance, feasibility, impact, and alignment with ongoing work. It should be noted that the level of effort to reduce emissions by the targets in this plan should not be underestimated. In addition, there are emissions that Colwood can control or influence, while there are other sectors that the City has little or no influence over (such as commercial vehicles and off-road transportation). Successful climate action will require partnerships and engagement throughout and beyond the City of Colwood.

1. Introduction

The City of Colwood is a rapidly growing seaside community in southern Vancouver Island. Like all other local governments in Canada, Colwood is at the forefront of increasingly frequent and severe climate change impacts. The need to proactively plan for climatic impacts (adaptation) and also to reduce emissions that contribute to earth's warming (mitigation) is now urgent. The City has developed this foundational climate planning report that considers **Low Carbon Resilience**[3] approaches (LCR)-to undertake adaptation and mitigation planning in a streamlined manner (see top right Quadrant, Figure 3).

This report is a comprehensive and strategic guide to reducing our **greenhouse gas (GHG) emissions**, strengthen our **resilience** to the impacts of **climate change**, and enhancing the long-term livability and prosperity of our community. Recent flooding, extreme heat, and wildfire events have increased a sense of urgency to proactively adapt our built, natural and social systems to the impacts of climate change – while simultaneously reducing our emissions.

This climate planning aligns with existing City and regional plans and initiatives, setting the path for long-term climate action targets. The overall objective is to build a resilient, low carbon, connected, healthy, and prosperous city.

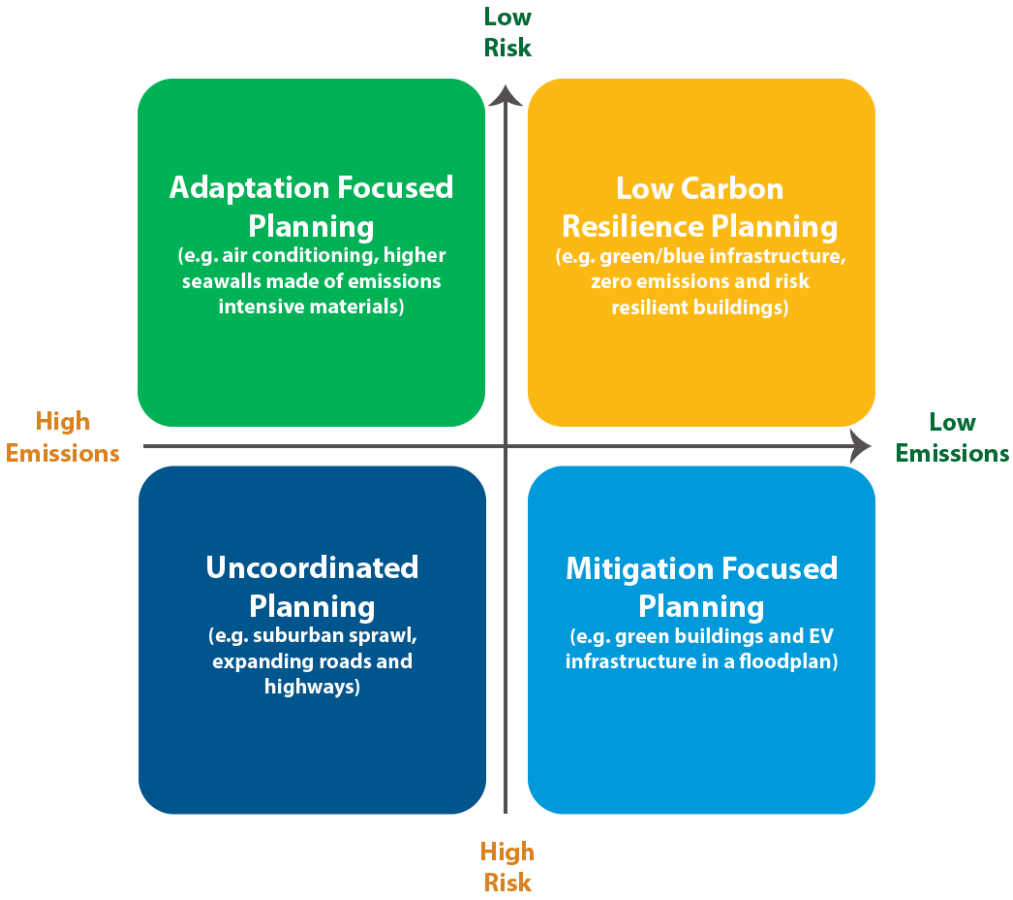


Figure 3: The LCR diagram illustrates the benefits of integrating adaptation and mitigation (upper right quadrant), rather than pursuing adaptation or mitigation in siloes (top left, bottom right). (ACT, 2020, adapted from Cohen & Wadell, 2009).

[3] **Low Carbon Resilience**: A step change in climate action that coordinates and mainstreams adaptation, mitigation, and co-benefits in municipal planning and decision-making processes. The use of this term for integrated climate action was coined by ACT (Action on Climate Team) at Simon Fraser University.

*See the Glossary (page 5) for term definitions.

Colwood's Climate Vision

In 2050, the City of Colwood is a leader in integrated climate action. We consider climate risk, emissions, and co-benefits in organization-wide decision making. We take resilience seriously in our built environment, among vulnerable residents, and in surrounding natural areas that support and provide services to our communities in multiple ways. We aim to be a zero-emissions community with targets of 30% emissions reductions by 2030 and net zero by 2050.

To achieve this vision, we must understand the challenge we are facing and work together to accelerate coherence and momentum in key areas. Five integrated pathways, co-developed with public and stakeholder engagement, outline opportunities to catalyze and accelerate momentum toward Colwood's 2050 Vision and align with policies from Colwood's 2018 Official Community Plan (OCP) and Strategic Plan (Figure 4).

Figure 4: Five interconnected pathways work together to implement Colwood's vision for the future.

Climate Action Pathways

The following pathways are summarized from the climate planning process and have been further updated and refined in the Climate Action Plan. Further details about the action pathways are in section 7.

	**Pathway 1: Strong Municipal Leadership on Low Carbon Resilient Solutions**
Vision	Colwood is a well-managed city that showcases leadership in low carbon resilience (LCR) by considering climate risk, emissions, and co-benefit opportunities in all planning, procurement, and investment decisions. Strategic policy alignment optimizes collaboration and introduces cost saving and co-benefit opportunities. Integrated planning builds climate literacy, strengthens emergency planning and response, and helps Colwood deliver services and manage assets in a financially and environmentally responsible manner.
Aligned Plans	• OCP Objective 8.2.1: To achieve Colwood's mode share targets, which support greenhouse gas emissions reduction targets and other community goals for accessibility, health, and quality of life. • OCP Objective 10.3.5: To adapt to the impacts of climate change. • OCP Objective: 12.2.1 To deliver services and manage public assets in a financially and environmentally responsible manner. • Colwood Strategic Plan Priority Area: Governance
Goals	• Showcase climate leadership by considering climate risk, emissions, and co-benefit opportunities in all planning, procurement, and investment decisions. • Build staff and public climate understanding and knowledge - climate literacy. • Adopt climate change impacts, hazards, and risks projections into emergency management planning. Identify low carbon solutions (e.g., designated cooling stations).
Targets	• Per capita GHG emissions reduction levels from 2007 levels (5.3 tCO_2e), 50% by 2030 (~2.6 tCO_2e) and 100% by 2050 (net 0 tCO_2e). • Total GHG emissions reduction from 2007 levels (82,500 tCO_2e), 30% by 2030 (57,800 tCO_2e), 100% by 2050 (net 0 tCO_2e).
Strategies	• Strategy 1.1 Ensure Capacity and Resources for Ongoing Climate Action • Strategy 1.2 Update Emergency Planning and Responses to Prepare for Climate Change

	**Pathway 2: Low Carbon Transportation and Connected, Complete Communities**
Vision	Colwood optimizes transit oriented, mixed density communities and connected transportation networks to achieve its mode share targets, support greenhouse gas emissions reductions targets and advance community goals for accessibility, health, and quality of life. Electrified public transit networks are connected, timely, and direct, and provide an improved rider experience. Connected active transportation networks help people of all ages and abilities move safely and conveniently through the City. Electric vehicle (EV) charging is affordable and accessible, and the community hums with the sound of electric vehicles and transit.
Aligned Plans	• OCP Objective 8.2.1: To achieve Colwood's mode share targets, which support greenhouse gas emissions reduction targets and other community goals for accessibility, health, and quality of life. • OCP Objective 8.2.2: To improve the safety, comfort, convenience, and enjoyment of walking for residents of all ages and abilities, making it the first choice for short trips, and treating sidewalks as public places for gathering, shopping, resting, playing and other activities in addition to walking. • OCP Objective 8.2.3: To improve the safety, comfort, convenience, and enjoyment of cycling for both recreational and destination-oriented trips. • OCP Objective 8.2.4: To support more attractive transit services – including speed, frequency, and directness of transit – and an enhanced rider experience overall. • OCP Objective: 8.2.6: To enable the safe movement of vehicles, effectively manage parking, encourage greener solutions for personal vehicle use, and anticipate changing trends in vehicular use. • OCP Objective 10.3.1: To achieve Colwood's GHG emission reduction targets through complete communities, a low-carbon multimodal transportation system, and a focus on site adaptive planning • Colwood Strategic Plan Priority Area: Mobility
Goals	• Focus mixed density growth around low carbon, multi-modal transportation systems such as the Galloping Goose, transit exchange, arterial road served by transit and along other roads included in BC Transit's future transit network. • Expand public transit and active transportation infrastructure so that they become the primary ways Colwoodians get around.
Targets	• OCP Mode share targets by 2038: Drive (70%), public transit (12%), walk (10%), bicycle (8%). • Target to reduce emissions from passenger vehicles by 17% over 20 years, through transit, active transportation, and smart land use. • Over 50% of Colwoodians live within a 15-minute walk of services and amenities by 2040.
Strategies	• Strategy 2.1 Growth Management and Smart Land Use • Strategy 2.2 Prioritize Connected Active Transportation Networks • Strategy 2.3 Support Enhanced Transit Services • Strategy 2.4 Promote Affordable and Accessible Zero Emissions Mobility

 **Pathway 3: Low Carbon and Resilient Buildings and Infrastructure**	
Vision	Colwood uses LCR criteria (climate risk, emissions, and co-benefits) in permitting processes to ensure that investments in buildings and infrastructure are situated in low-risk areas and designed to withstand projected climate impacts over the next 50-80 years. New builds and retrofits both feature green building design and account for zero-emissions energy and resilience solutions over time. Clean and secure energy transitions build local resilience.
Aligned Plans	• OCP Objective: 9.2.1 To increase housing choices for existing and future residents – recognizing that Colwood is a family-oriented community that is also aging – and enhance diversity of housing types for a variety of household sizes, incomes, tenures, needs and preferences. • OCP Objective: 10.3.2 To achieve Colwood's GHG emission reduction targets with high performing and low carbon buildings and infrastructure. • Colwood Strategic Plan Priority Area: Vibrancy
Goals	• Achieve Colwood's GHG emission reduction targets through new low carbon homes, building retrofits, and renewable energy. • Build and retrofit homes to be resilient to the many impacts of climate change and reduce costs for homeowners and tenants. • Ensure that clean, renewable energy is readily accessible and secure, and where possible that supplemental energy sources are zero-emission.
Targets	• Retrofit 2% (~140) of existing residences per year with air source heat pumps. • Retrofit 3% (~200) of existing residences per year with energy efficiency measures. • All new developments are solar photovoltaic ready.
Strategies	• Strategy 3.1 Build Zero Emissions and Resilient New Buildings • Strategy 3.2 Promote Low Carbon and Resilient Building Retrofits • Strategy 3.3 Ensure Local Energy Accessibility and Security

Pathway 4: Connected Urban and Natural Systems

Vision	Connected networks of urban and natural infrastructure coexist together in harmony. Biodiversity and the ecosystem services provided by nature are valued and protected to help Colwood achieve its GHG emission reduction targets. Residents have equitable access to diverse green spaces that moderate temperatures, minimize heat impacts, and support mental health and overall well-being. Indigenous plant species in Colwood are protected and valued in terrestrial, aquatic, coastal, and urban areas to foster biodiversity.
Aligned Plans	• OCP Objective: 10.3.3: To achieve Colwood's GHG emission reduction targets by valuing natural assets as sinks and contributors to climate change mitigation. • OCP Objective: 12.2.2: To protect and conserve water resources. • OCP Objective: 12.2.3: To manage rainwater in a manner that optimizes conservation, protects ecosystems, and maintains quality. • OCP Objective: 12.2.6: To reduce the heat island effect. • OCP Objective: 11.2.3: To strengthen Colwood's forested areas and overall tree canopy. • OCP Objective: 11.2.5: To maintain and regenerate the ecological functions of Colwood's diverse shorelines. • OCP Objective: 11.2.6 To protect and restore widespread presence of Indigenous plant species. • Colwood Strategic Plan Priority Area: Vibrancy
Goals	• Value natural assets for their contributions to asset management, resilience, and as sinks and contributors to emissions reductions. • Expand connected terrestrial and marine ecological networks to support indigenous species, habitat, and biodiversity.
Targets	• Increase in tree canopy by 18% (325 hectares).
Strategies	• Strategy 4.1 Develop a Natural Asset Management Plan and Implement Policy • Strategy 4.2: Prioritize Connected Ecological Networks to Protect Habitat and Biodiversity

 **Pathway 5: Thriving Circular Economy and Eco-Innovation Hub**	
Vision	Colwood has a reimagined circular waste system, reduces and repurposes waste, encouraging local modes of production and innovative, and secure supply chains. Waste is viewed as a resource and waste diversion helps the City meet GHG emission reduction targets. Colwood understands projected climate impacts to protect the prosperity of residents and businesses, encourage resilient local business opportunities, bolster quality of life, and attract residents and investment.
Aligned Plans	• OCP Objective: 10.3.4 To achieve Colwood's GHG emission reduction targets by optimizing waste diversion and by treating waste as a resource. • OCP Objective: 12.2.5 To apply a zero-waste approach to solid waste management. • OCP Objective: 15.2.1 To find synergies between growth and the community's unique cultural, heritage, and environmental values. • OCP Objective: 15.2.2 To attract future residents, visitors, jobs, and investment. • Colwood Strategic Plan Priority Area: Prosperity
Goals	• Transition to a zero-waste community. • Become a thriving eco-innovation hub with local training and employment opportunities.
Targets	• Develop a Zero Waste Strategy to divert 100% of divertible waste from Colwood's waste stream.
Strategies	• Strategy 5.1 Promote Zero-Waste & Local Food Production for a Thriving Circular Economy • Strategy 5.2 Incentivize Eco-Innovation Networks & Programming

Understanding the Urgency of Climate Change in Colwood

In May of 2019, the City of Colwood declared a Climate Emergency. This signifies Council's understanding that rapid and impactful shifts are needed now to minimize and wherever possible, avoid the impacts of climate change.

What Causes Climate Change?

Climate change is caused by greenhouse gases (GHGs) that are trapped in the earth's atmosphere (Figure 5). Currently, we are releasing GHGs into the atmosphere faster than we are removing them. Releasing carbon dioxide (CO_2) into the atmosphere, for example by burning fossil fuels, is the main cause of human-induced climate change, but other GHGs like methane and nitrous oxide also contribute to climate change. However, methane and nitrous oxide do not stay in our atmosphere as long as CO_2. Releasing these gases creates a greenhouse effect that makes the earth warmer, much like a greenhouse keeps plants warm on a sunny day. This warming leads to climate impacts such as extreme heat, or flooding that disrupt our infrastructure and transportation systems, social systems, and ecosystems. For example, the heat dome in summer of 2021 caused impacts ranging from buckling sidewalks to the increased hospitalization of the elderly, and the mass die-off of mussels in coastal ecosystems.

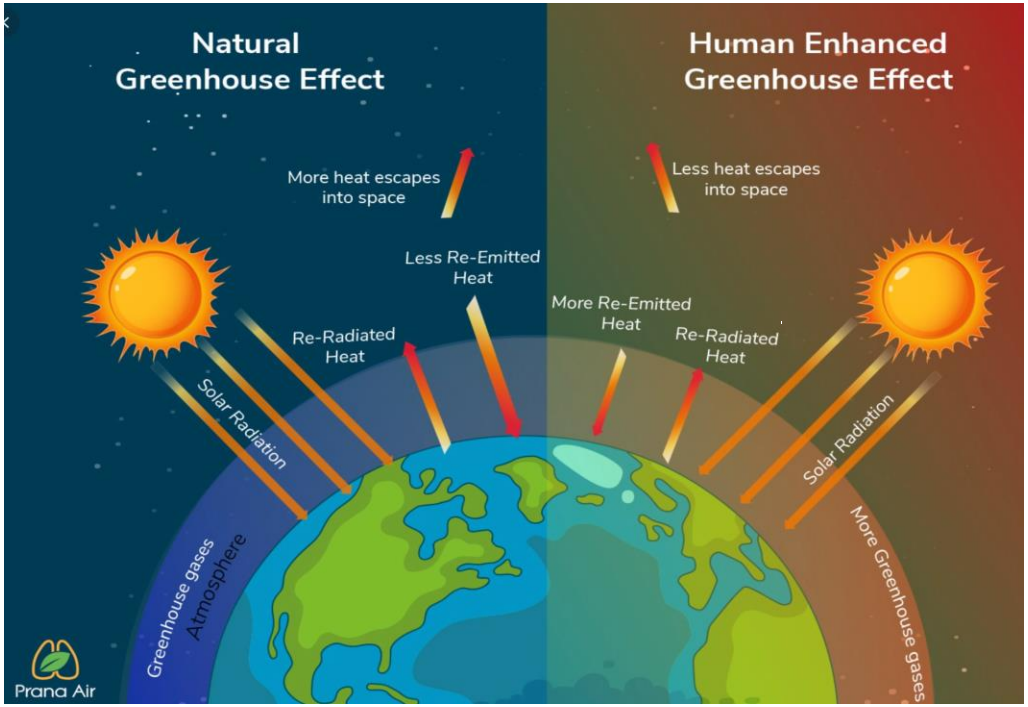


Figure 5: The human enhanced greenhouse effect is trapping GHGs in our atmosphere, warming our planet. Image from: https://www.pranaair.com/blog/what-is-greenhouse-effect-its-gases-causes-solution/

Why Act Now?

To reduce the projected losses and damages from climate change of which we are already seeing, we are aiming to minimize global warming beyond 1.5°C (Figure 6). Currently however, it is estimated that we are on track to limit global warming to 2.4°C at best, even if all current targets are met. Urgent action is required now to substantially reduce our emissions in the short term and minimize climate impacts in the long term.[4]

1. **Colwood is a growing city and the land use decisions we make now**, for instance about new developments, transportation systems, and natural spaces **can either increase our emissions profiles and vulnerability or contribute to emissions and risk reduction.** Since 1986, Colwood's population has grown by 64.2%, higher than the growth within the broader Capital Regional District (CRD). Colwood's current population is 18,961 and is expected to grow to roughly 22,000 people by 2031 and 27,000 by 2041. This growth will largely be driven by an abundance of residential development, with 4,500 planned or confirmed residentials units to be completed between 2016 and 2031[5].

2. **Canada is warming at twice the global average.**[6] This disproportionate warming will likely cause unavoidable increases in climate hazards and present multiple risks to infrastructure, humans, and ecosystems. However, we also know that in the near-term, climate risks to human and natural populations are more influenced by vulnerability and exposure than emissions.[4]

   In other words, although reducing our emissions must remain a priority, we can build rapid resilience by developing a greater understanding of population vulnerabilities and inequities in our community.

3. Climate change impacts and risks are becoming increasingly complex and difficult to manage. **Multiple climate hazards are likely to occur simultaneously**, such as a heat dome and wildfire. Further, it is likely that multiple climatic and non-climatic risks will interact, such as wildfire smoke, COVID-19, and a lack of family doctors, resulting in compounding overall risk and risks cascading across sectors and regions.[13]

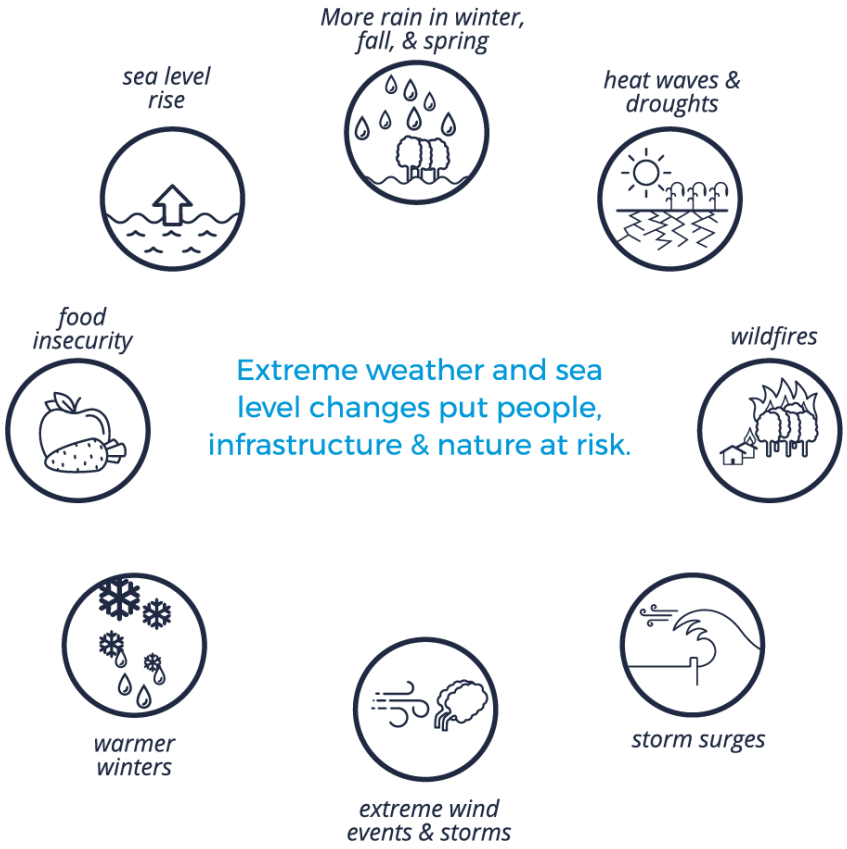


Figure 6: Extreme Weather Effects Caused by Climate Change

[4] IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.

[5] Colliers Strategy and Consulting Group. (2022). City of Colwood Assessment of Updated Real Estate Dynamics and Population Projections.

[6] Natural Resources Canada. (2021). Canada in a Changing Climate: Advancing our Knowledge for Action. Retrieved from: https://changingclimate.ca/national-issues/

4. **GHGs stay in the atmosphere for varying amounts of time.** This means that even as we reduce the amount of GHGs we release in the City, emissions from previous years, decades, and even centuries remain locked in and continue to contribute to warming (Figure 7). This is a process called **climate inertia**[7]. This means that it is extremely important to reduce and limit our emissions as much as possible in the short term *while also* adapting our City to locked in climate impacts.

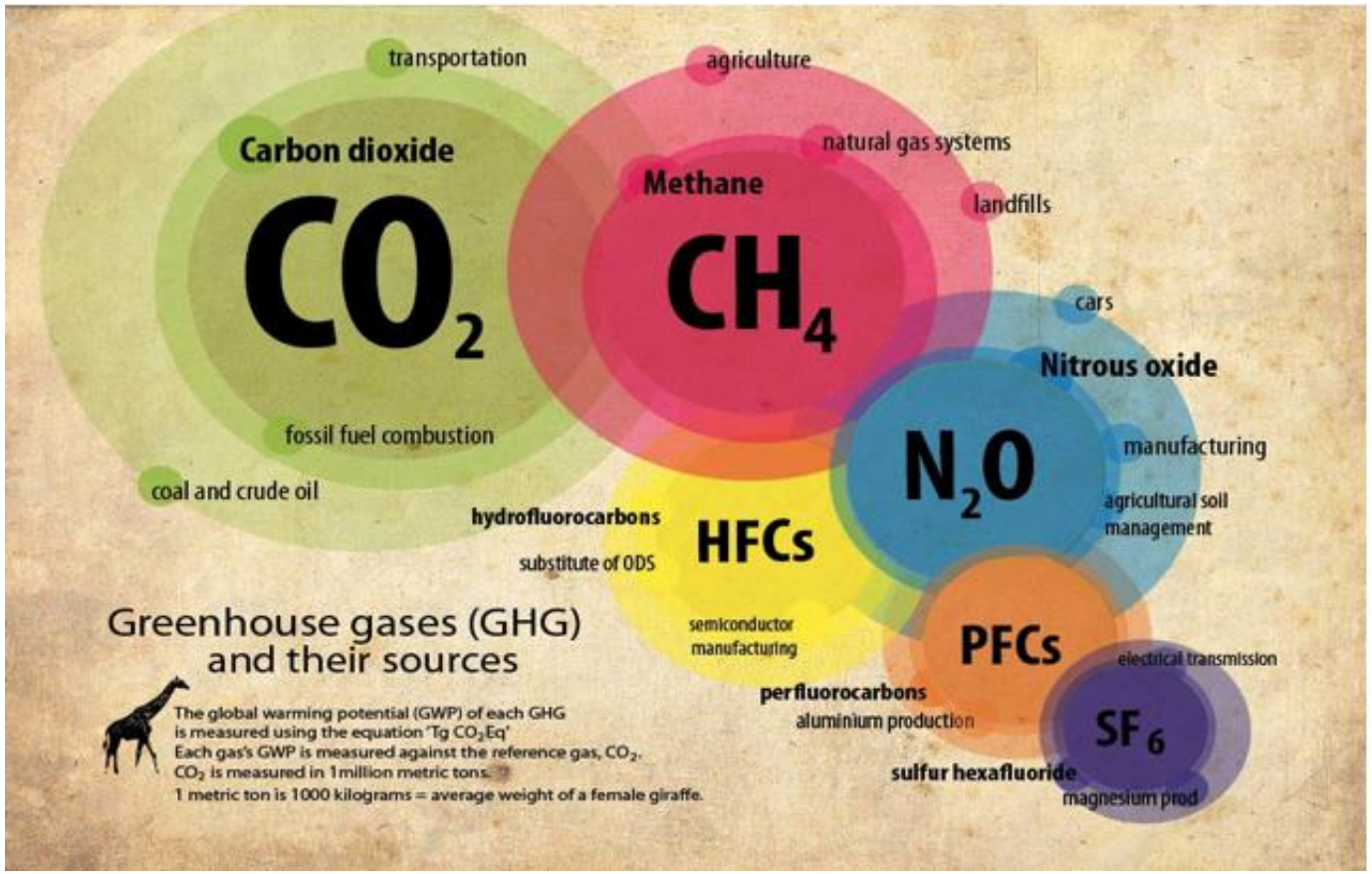


Figure 7: The global warming potential of different greenhouse gases shows how long they will stay in the atmosphere and their main sources. Image from: https://worldat1c.org/top-diagrams-to-explain-climate-change-10c5a016b6e9

[7] **Climate Inertia:** The long-term lifespan of certain GHGs means they'll remain in the atmosphere long after they're released, locking in a certain amount of warming.

Making the Connection between Risks and Emissions

How Do We Respond?

The reasons above clarify the strong relationship between risk and emissions and highlight the importance of acting on both in a coordinated manner. This is an approach referred to as low carbon resilience (LCR).

Although responding to climate challenges may seem daunting, the LCR approach is a strategic best practice approach that the City is applying to take into consideration the many different complexities of climate change while making progress on a host of different community priorities. Climate action in Colwood is planned to:

- Minimize climate change risks (**adaptation**[8]) while concurrently minimizing GHG emissions released (**mitigation**[9]);
- Build on the work already being done in Colwood to avoid duplicity of time, efforts, and resources;
- Identify opportunities to build in additional co-benefits so that all members of the community can benefit from climate action in one way or another and to advance other community priorities.

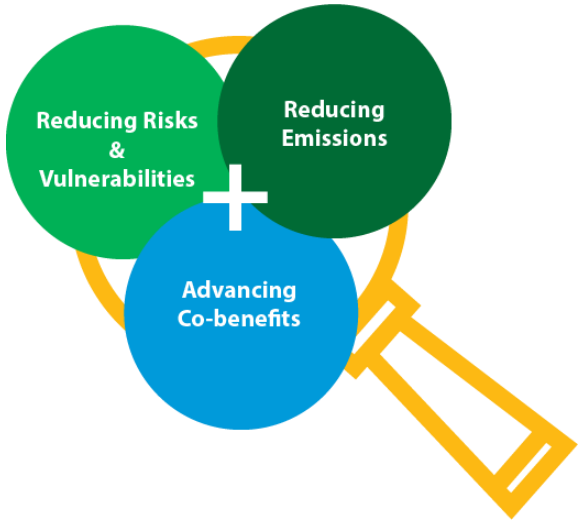


Figure 8: The LCR approach considers climate risk and vulnerability, emissions, and co-benefits alongside cost, feasibility, and other decision-making criteria. (ACT, 2020).

[8] **Adaptation:** Those actions undertaken to adjust to actual or expected climate change and its impact and minimize or reduce harm.
[9] **Mitigation:** The process of reducing the amount of greenhouse gases (GHG) in our atmosphere.

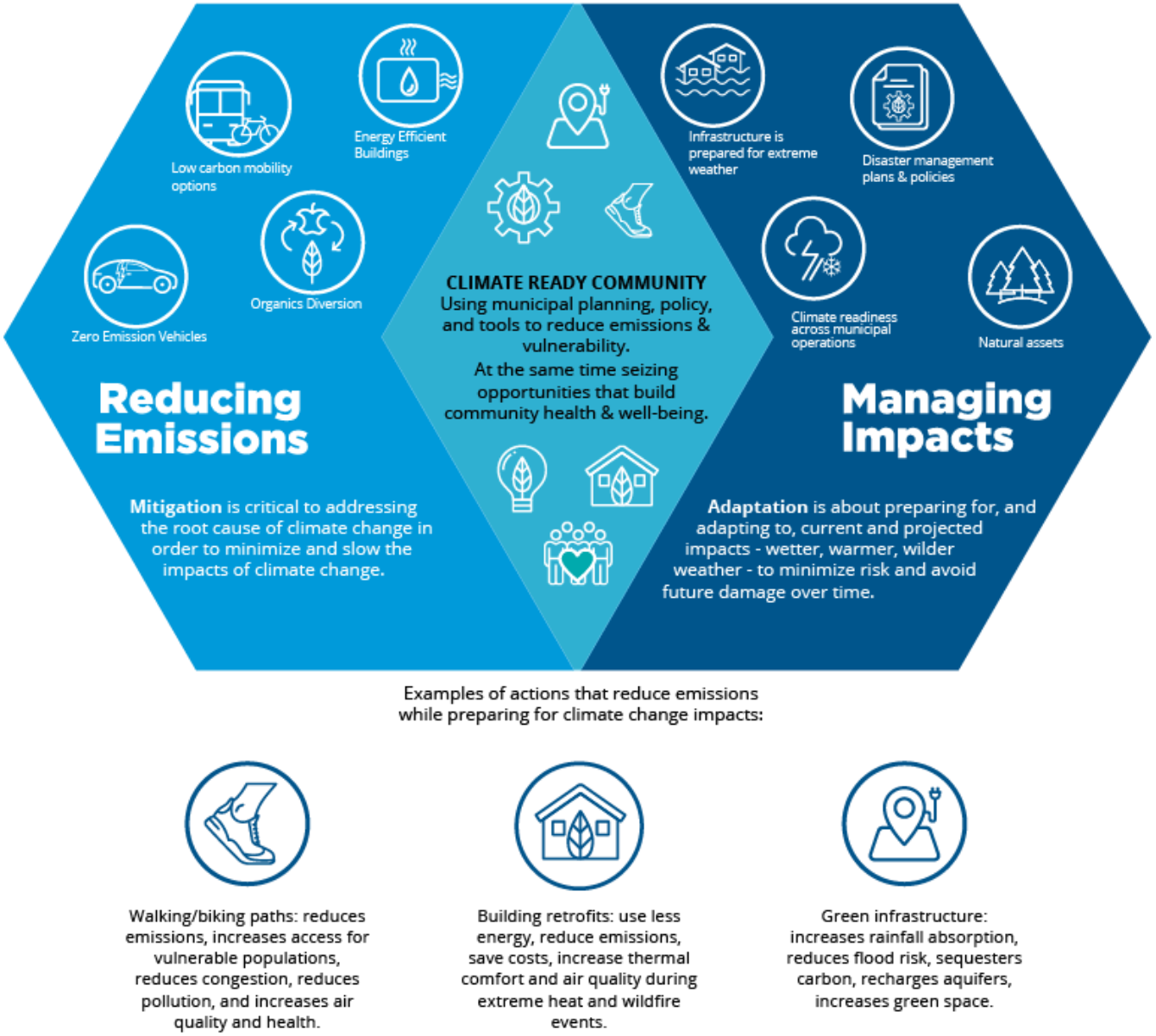


Figure 9: Snapshot of integrated, LCR actions that reduce emissions while preparing for climate change impacts.

The Co-benefits of Integrated Climate Planning in Colwood

Co-benefits are the positive social, economic, and ecosystem results of a policy or measure aimed at reducing climate risks and emissions. These link climate action to overall sustainable community development. Integrated climate action aligns with broader community safety, resilience, and sustainability goals. These "additional" benefits that can occur from taking integrated climate action are showcased below and are highlighted throughout to inspire systems thinking.

Table 2: Colwood's Climate Action Co-benefits

Green economic growth and innovation

- Transition industries foster green economic growth.
- Training opportunities build a green job environment.
- An LCR lens in procurement can foster opportunities for innovation.

Improved air and/or water quality

- Natural assets and green infrastructure are strategically protected/placed to minimize air and water pollution.
- Reductions in gas SOVs improve air quality and reduce road pollutants that get into water systems.

Public mental and physical health

- Improved connectivity between neighbors improves community resilience.
- Active transportation improves physical health.
- Access to naturalized green spaces help mental health.

Community cohesion and livability

- Mixed use density offers hubs of increased services, amenities, and green spaces that connect people to one another.
- Active and public transportation allows for the reprioritization of space from single occupancy cars.
- Opportunities for collaboration and connections between one another reduce social isolation.

Carbon storage and/or sequestration

- Advanced by preserving our natural assets and advancing our urban forest.
- Promoting appropriate green and blue infrastructure where possible.

Awareness and education

- Communications increase public knowledge about climate change and clarify how to take action on climate change.
- Youth climate leadership is fostered.
- Enhanced staff climate literacy to ensure decisions are made with climate change considerations.

Habitat and biodiversity

- Key habitats are protected by preserving and restoring natural areas.
- Habitats contribute to healthy ecosystems.
- Providing recreational access and cultural value.

Regional collaboration and connectivity

- Amenities, services, and natural areas attract people to Colwood
- Connected public and active transportation networks make it easy to get to Colwood.
- Supporting regional initiatives like the EV Roadmap.

Ecosystem preservation

- Reducing fragmentation and conversion of natural areas allows for the continual provision of ecosystems services, reducing costs to taxpayers and providing numerous other services like reduced extreme heat and water absorption.

Cost savings to the City and/or taxpayers

- Designing new infrastructure with climate projections for increased lifecycle.
- Using natural assets for enhanced service provision and to limit the need for new costly infrastructure.
- Reductions in costly damages.

Governments set the stage, but it is residents and businesses who make daily decisions to reduce their emissions and carbon footprint.

The Foundation of Climate Action in Colwood

Where are We Starting From?

The City of Colwood has a strong commitment to and foundation for climate action and has worked to integrate climate considerations into numerous City plans and documents such as the 2018 Official Community Plan (OCP) and Colwood Strategic Plan. Integrated climate planning ensures that the ongoing work that is happening in the City and community is streamlined and coherent to accelerate climate action. A cross-sectoral Climate Action Team was developed during this planning process, helping to build climate change literacy that can be mobilized into various areas of the City. The City of Colwood also has an active community who are passionate about climate change action.

The City of Colwood is a municipality within the Capital Regional District (CRD), both of which are situated within the large climate policy landscape (Figure 20). The CRD provides regional decision-making on issues that transcend municipal boundaries and help deliver effective service to residents. The CRD plays a role in providing services through region-wide or shared service delivery models, for instance, regional water supply, solid waste, wastewater treatment, regional parks, housing, 911 calls, and recreational facilities. The interconnectivity between the CRD and Colwood for service provision requires ongoing communication and collaboration.

Figure 10: The larger climate policy landscape influences policies at the regional and local level.

This illustration (2022) shows climate and related plans and initiatives in Colwood and the CRD:

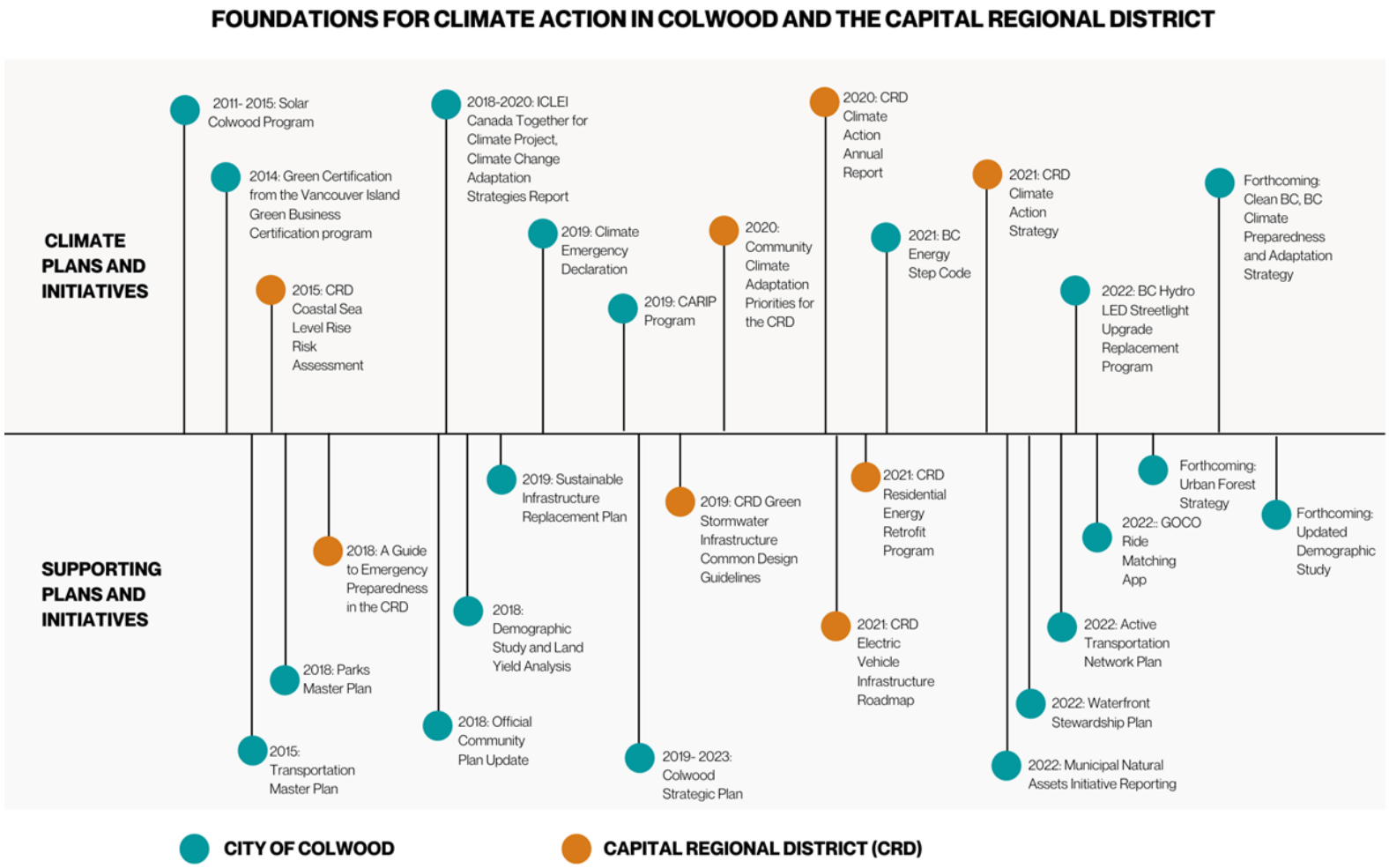


Figure 11: Climate action and related work in Colwood and CRD (2022)

2. Climate Planning and Engagement

Climate Planning Process

The process for Colwood's climate planning consisted of five key phases. These phases lead to phase 6: Monitor and Iterate (Figure 14):

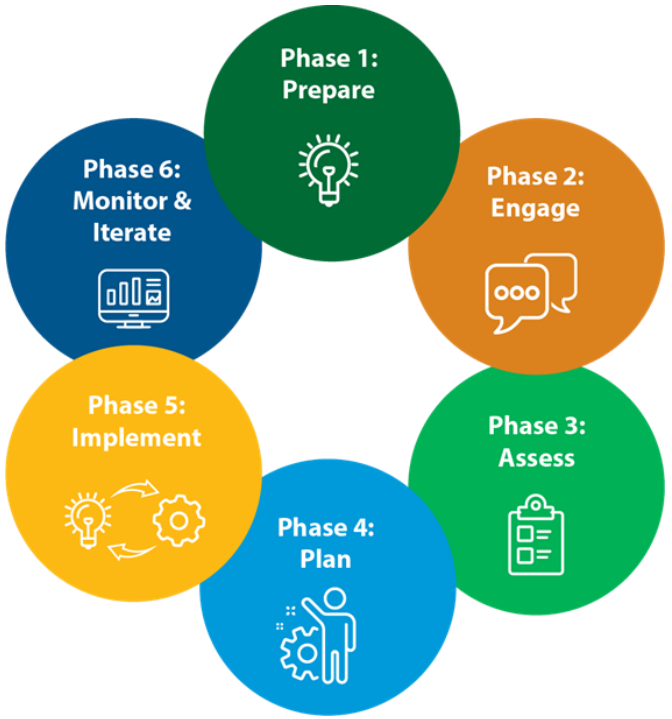


Figure 14: The phases of the LCR process (ACT, 2021).

- **Prepare:** Climate Action Team (staff only) attended a kick-off meeting to begin building LCR awareness and understanding. Concurrently, the climate action landscape was mapped to document ongoing and aligned work already-in-progress and synthesize previous mitigation and adaptation work.
- **Engage:** The City conducted two initial public surveys and one youth survey to learn about residents' understanding of climate change and get feedback on the draft pathways. During this period, Climate Action Team participants (staff and external stakeholders) attended three workshops to collectively identify synergies, build LCR understanding, and co-develop the foundation for the plan.
- **Assess:** In the Climate Action Team workshops, participants collaborated to update the baseline risk and vulnerability assessment and identify priority risk areas, identify key emissions reduction areas and set reduction targets, and identify co-benefit opportunities. The team worked to co-evaluate risk and emissions opportunities and identified key areas for action.
- **Plan:** Climate Action Team participants explored barriers to action to prioritize strategies. Where possible, the momentum of the cross-departmental process was built upon to move actions and indicators toward implementation, identifying department leads, timelines, and budgets. A draft plan was presented to staff and Council, then moved forward for public engagement (review), including a final public survey. Based on the reviews and feedback, the original draft plan document was revised for updates and to form this Climate Planning Foundation Report with an updated accompanying Climate Action Plan.
- **Implement & Review:** The updated draft plan will go to Council, followed by implementation planning pending Council endorsement or direction on the draft plan.

Climate Planning Engagement

Colwood conducted public engagement and climate planning from February to May 2022 and November 2022 to February 2023. Information and feedback were gathered through public and stakeholder engagement, especially through 4 surveys and 3 stakeholder workshops.

The following summarizes what we heard through this engagement process.

Engagement: Climate Action Team

Climate change will have broad, far-reaching impacts across Colwood, from power surges/outages, to supply chain issues, and habitat loss. Planning and engagement with diverse departments and disciplines, staff, and stakeholders from across Colwood was important to collaborate on how to effectively respond. Cross-departmental representatives included participants from Community Planning, Development Services, Building Services, Fire Rescue, Public Works, Engineering, and Communications. Cross-sectoral stakeholders from Colwood and the surrounding region included School District 62, BC Transit, the Capital Regional District, Royal Roads University, Capital Bike, the Westshore Chamber of Commerce, CENiC, Island Health, Victoria Residential Builders Association, and various other representatives from the development community. Climate Action Team members participated in three LCR workshops in March 2022 (Figure 15).

Figure 15: The climate planning engagement process in Colwood, including the important role of the Climate Action Team.

Climate Planning Workshops

In March 2022, the following workshops were conducted with stakeholders and staff, led by a team of consultants.

Workshop 1: Understanding the Climate Landscape and Key Risks

In Workshop 1, participants came together to learn about the low carbon resilience process, envision what a low carbon and resilient future could look like for Colwood, and undertake a gap analysis and prioritization of climate impacts across four hazard areas. Building off the work already completed by ICLEI Canada in the Together for Climate Project (2020), participants worked collaboratively to review and prioritize different impacts spanning the four hazard areas from above (temperature, precipitation, extreme weather, and sea level rise) across three impact areas: built infrastructure, natural systems and human systems (e.g., health, economies, societies, cultures).

Workshop 2: Co-evaluating Adaptation and Mitigation Options
In Workshop 2, participants came together again to learn about emissions sources in Colwood and began discussing opportunities to reduce risks and emissions in a coordinated manner. Participants undertook a systemic thinking exercise to consider aligned risk and emissions reduction opportunities, along with the co-benefits that could be provided to build the foundation for integrated climate action tactics.

Workshop 3: Refining Low Carbon Resilience Strategies
In Workshop 3, participants had the opportunity to review and revise a draft list of strategies to support the Pathways. Participants were asked to discuss the barriers to advance these strategies and brainstorm solutions using different tools and tactics such as community engagement, policy, additional data and research, and partnerships. The results of these discussions form the backbone of the strategies in this document.

Public Engagement Surveys

Engagement surveys included:

1. The first online survey focused on learning about residents' values and understanding of climate change.
2. The second focused on obtaining feedback on the direction of the draft key shifts and learning more about residents' current level of action and appetite for change.
3. A third online survey was developed for Grade 8 -12 students of Royal Bay Secondary School. Reaching out to students was a novel form of engagement pursued by the City, but it was an important tool to learn about how youths are considering climate change and to build youth climate leadership in the City.
4. A final review/ survey followed Council endorsement to engage public feedback on a draft plan.

Survey quotes are highlighted below. The complete public consultation summary can be found in Appendix 2.

Quotes from the Survey:

"Land Use decisions made by council are key to conservation of natural assets that already exist, and already provide 'ecosystem services' to people."

"More focus on new development requirements to preserve as much natural environment as possible, thus benefit the community and contribute to climate stability."

"Transit and active transport space on our roadways must be reclaimed at the expense and inconvenience to private vehicles."

(re: draft plan) "Pathway approach comprehensive, but possibly overly complicates, even obscures 'issues' with confusing graphics and excessive data (at least for the non-technical people, like myself!)"

"Provide more/higher rebates or interest free loans to residents."

3. Priority Climate Risks in Colwood

Colwood Risks & Vulnerabilities Assessments

Recent events in the City of Colwood including heat waves, water shortages, winter storms, and other occurrences of extreme weather have highlighted the need to reduce our vulnerabilities and prepare for ongoing challenges. In 2020, the City of Colwood participated in the ICLEI Canada Together for Climate Project and conducted a risk and vulnerability assessment to develop the 2020 Adaptation Strategies Stakeholder Report. Building off the work already completed by ICLEI Canada in the Together for Climate Project (2020), the City of Colwood Climate Action Team completed a gap analysis and prioritization of **climate impact statements**,[10] which had pre-assigned risks levels from the ICLEI Canada **risk and vulnerability assessment**[11] (see Appendix 4). Certain climate data and impact statements from the 2020 report informed the climate planning process. Additional data, including temperatures under low, medium, and high scenarios were retrieved from ClimateData.ca.

Colwood Climate Projections and Hazards

Temperature and precipitation are key aspects of climate. Temperature and precipitation changes are drivers of social and environmental impacts. Other hazards such as extreme weather and sea level rise will be influenced by temperature and precipitation.

1. **Temperature**
   - **Increases:** The average annual temperature is expected to increase by 1.7°C by the 2050s under a **high emissions scenario**.[12] Colwoodians will notice more frequent and intense heat events, especially during the summer months.
   - **Increased summer days:** the number of days when temperatures are over 25°C is referred to as "summer days". Previously (1976-2005) Colwood experienced 11 summer days per year. It is expected that this will increase (under a high emissions scenario) to an average of 26 days between 2021-2050 and an average of 54 days between 2051-2080
   - **Increased hot days:** the number of days when temperatures exceed 30°C is referred to as "hot days". Previously (1976-2005) Colwood experienced 0.5 hot days per year. It is expected that this will increase (under a high emissions scenario) to an average of 2 days between 2021-2050 and an average of 7 days between 2051-2080.
   - **Decreased freeze-thaw cycles:** any day where the minimum temperature is below 0˚C and the maximum temperature is above 0˚C is a "freeze-thaw cycle". Under a high emissions scenario, it is projected that freeze-thaw cycles will decrease from an average of 10.3 days (1976-2005) to an average of 3.2 days (2021-2050) and then 0.6 days (2051-2080) due to overall warmer temperatures.
   - **Ocean and stream temperatures:** are also expected to rise.

[10] **Climate Change Impact Statement**: A concise statement that outlines locally relevant projected threats and how those changes are expected to affect the built, natural, social and economic systems of the municipality.
[11] **Risk and Vulnerability Assessment:** Assess the vulnerabilities, exposure and climate change hazards and their likelihoods and consequences. One of the key stages of risk management.
[12] **High Emissions Scenario:** RCP 8.5, a high emissions scenario, or 'Business-as-Usual', refers to a world in which limited climate policy and action is taken to decrease emissions.

2. **Precipitation**
   - **Increased seasonal variability:** residents can expect more extreme seasonal variability, including:
     - drier summers and extended periods of drought
     - wetter winters, including more frequent and intense rainfall events (more rainfall in a shorter period of time).
   - **Increased precipitation:** average annual precipitation is expected to increase (under a high emissions scenario) from 922mm (1976-2005) to 953mm (2021-2050), and then 999mm (2051-2080).

3. **Extreme Weather Events**
   - **Increased extreme weather:** residents can expect more frequent and intense extreme weather, including wind events and storm surges. The impacts of this extreme weather will include damage to infrastructure, disruptions to transportation networks, and loss of habitat (contribute to). This will impact all residents, especially vulnerable residents.
   - **Wind gusts:** data from the CRD suggests that the region will experience more frequent and intense wind gusts. It is projected that the number of days with 40km/hr winds are likely to increase by about 5%, and days with winds above 70 km/hr will increase by about 15%.-This increase is likely to be concentrated in existing wind events, rather than more windy days overall.[13]

   ***Layered Impacts:** Residents will likely experience layered impacts like a heat dome that occurs in conjunction with wildfires, leading to exacerbated impacts like extremely poor air quality events.

4. **Sea Level Rise**
   - **Changing sea levels:** climate changes that impact sea levels include melting glaciers, warmer temperatures (thermal expansion), and change in salinity. Other climate variabilities (ranges over many time and space), such as El Niño/La Niña Southern Oscillation, contribute to extreme water levels, temperatures and storm surge flooding.
   - **Coastal Flooding Inundation Mapping** in the region supports adaptation planning and related decision-making. The City of Colwood further refined mapping based on the CRD's Capital Region Coastal Flooding Inundation Mapping Project (2019). This mapping informs Coastal Storm Flood Construction Level (FCL) for policy development and provides mapping for Tsunami Inundation (Figure 16).

Figure 16: Coastal flooding and tsunami inundation mapping for the City of Colwood to support adaptation planning.

[13] ICLEI Canada. (2020). Climate Change Adaptation Strategies for the City of Colwood. Retrieved from: https://icleicanada.org/wp-content/uploads/2020/10/Colwood-Adaptation-Strategies_ICLEI-FINAL.pdf

Case Study: Linking Shoreline Protection to Emissions

Colwood is a unique community with over 7.5 km of waterfront. Considering climate change impacts such as sea level rise and storm surge, shoreline planning is important. This case study links approaches to shoreline protection with GHG emissions (different approaches and under different future emissions scenarios). As described, naturalized shoreline/ nature-based solution approaches offer zero emissions solutions that address both climate mitigation and adaptation. These approaches are very cost effective and provide many co-benefits.

High to low emissions: International modelling describes different future scenarios based on global GHG levels in the atmosphere. These scenarios (Representative Concentration Pathways or RCPs*) are simplified below as high, medium to lower concentrations of emissions, which depend on global GHG emissions reductions.

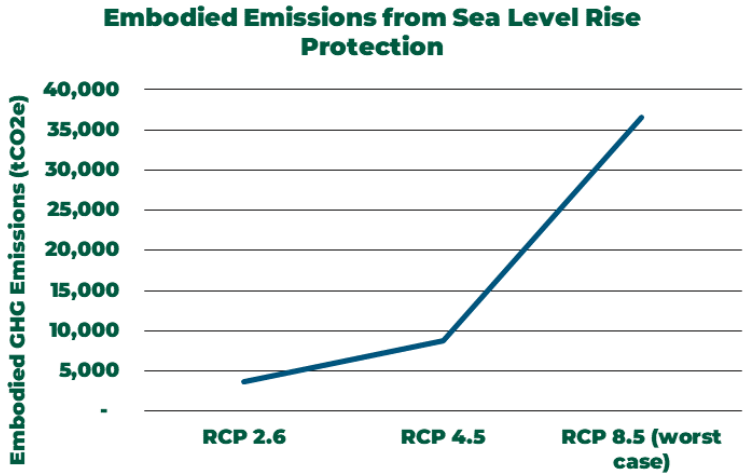


Figure 17: Embodied emissions from sea level rise protection based on emissions.

High Emissions & Hardscape protection

BAU/business as usual scenario with high emissions: sea level rise by 2100 expected at 0.5 – 1 metres (or worst case of 1.39 m with significant Antarctic ice loss). Shoreline barrier needed: up to 1.7 m high barrier and freeboard. **Shoreline hardscape:** using Portland cement would result in 37,000 tCO2e (embodied emissions)

Medium Emissions & Hardscape protection

Medium emissions scenario: sea level rise by 2100 expected at 0.35 – 0.7 m Shoreline barrier needed: 0.9 m high barrier **Shoreline hardscape:** using CEM I cement (0-5% gypsum) would result in 9,000 tCO2e (embodied emissions)

Low Emissions & Hardscape Protection

Low emissions scenario: sea level rise by 2100 expected at 0.3 – 0.6 m. Shoreline barrier needed: 0.7 m high barrier **Shoreline hardscape:** using CEM III cement (40-90% ground granulated blast slag) = 3,600 tCO2e (embodied emissions)

Naturalized Approach & Co-benefits

Restoring and naturalizing the shoreline over time avoids emissions and the negative impacts of hardened shoreline infrastructure on shoreline ecosystems and biodiversity. Nature-based solution approaches increase the absorption capacity of the shoreline. The benefits include:

- ✓ low emissions solution
- ✓ carbon storage & sequestration
- ✓ biodiversity & ecosystem co-benefits
- ✓ community co-benefits such as recreation, health & well-being & shoreline access
- ✓ cost effective, increasingly effective over time vs needing maintenance/ replacement

This is an example of a low carbon resilience approach, using strategies that reduce climate risk and emissions while also advancing other sustainability priorities and co-benefits. Anticipating and responding to worst case projections and identifying solutions that multitask helps build community resilience and sustainability over time.

*For more information about climate impacts and climate variables in Colwood for RCP scenarios (2.6, 4.5, and 8.5). Please see Appendices 7 and 8.

5. Priority Emissions Sources in Colwood

Local governments have varying degrees of influence over different sources of emissions within their boundaries. Our emissions come from both 'local' sources (emissions that are created here) and 'global' sources from local consumption (emissions that include everything from the extraction of raw materials / production of food through to processing and transport as well as emissions that may be counted elsewhere but are still ultimately our emissions).

Colwood's GHG inventory and reduction target references local (territorial) emissions, but also includes some emissions from beyond Colwood's municipal boundary (Figure 18). These emissions are measured in the Stantec inventory created for Colwood, commissioned by the CRD, and using the GPC Basic+ methodology. The major categories of emissions included in this inventory are: stationary energy (including residential and commercial buildings), transportation (including on-road passenger and commercial vehicles, aviation and marine vehicles), IPPU (Industrial Processes and Product Use), AFOLU (Agriculture, Forestry, and Other Land Use), and waste. For more information see Appendix 5.

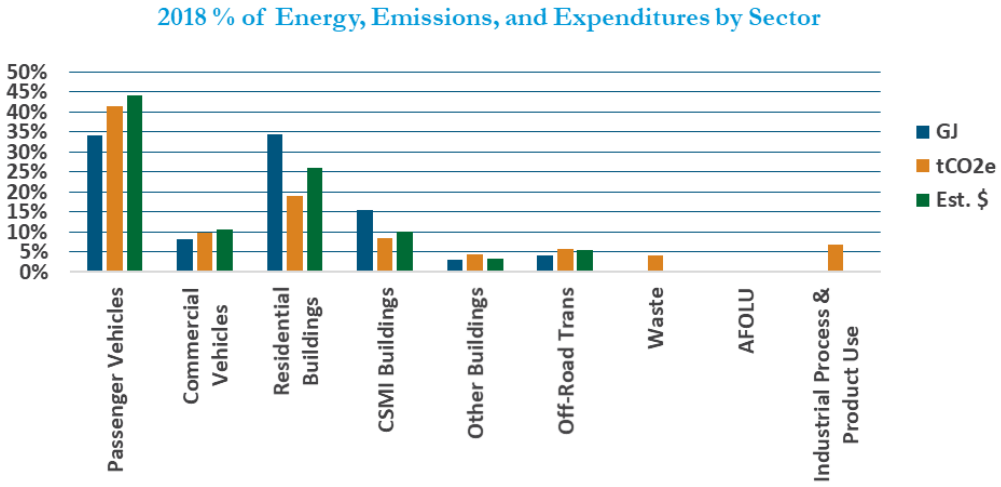


Figure 18: From 2018, percent of energy, emissions, and expenditures by sector.

Colwood's GHG Emission Reduction

Through this process, Colwood's GHG emission reduction targets were updated. The targets in the 2018 OCP were a relic from the 2010 Community Energy & Emissions Plan, with the expectation that they would be revised in this LCR process.

Table 3: Colwood's Emissions Reduction Targets

Target Criteria	Target Year	
	2030	**2050**
Per capita GHG emissions reductions from 2007 levels (2007 levels: 5.3 tCO_2e)	50% (~2.6 tCO_2e)	100% (net 0 tCO_2e)
Total GHG emissions reduction from 2007 levels (2007 levels: 82,500 tCO_2e)	30% (57,800 tCO_2e)	100% (net 0 tCO_2e)

These per capita (average per person) targets have been set to be consistent with the recommended targets in the IPCC's report *Global Warming of 1.5°C* of reducing global emissions by 45% from 2010 levels by 2030 and reaching net zero emissions by 2050. The Federal Government has also committed Canada to reducing emissions by 40-45% from 2005 levels by 2030 and committed to net zero emissions by 2050. The Province of BC has legislated targets for reducing emissions 40% below 2007 levels by 2030, 60% by 2040, and 80% by 2050. Given Colwood's growth, per capita targets must be set in addition to absolute targets.

Colwood's Energy, Emissions, and Costs

Three inventory years have been made available by the CRD for Colwood, 2007, 2018, and 2020. The year we have primarily used is 2018 because it is the most recent year that has not been affected by the pandemic. For example, during the Covid-19 pandemic, transportation emissions were reduced because less people travelled to work.

Figures and graphs below are based on Colwood's 2018 inventory with updates from the 2020 methodology report (with 2020 numbers included in narrative descriptions for comparison). See Appendix 6 for a full description of the inventory and modeling methodology.

In 2018, for the whole community of Colwood:

- Total energy consumption was 1,604,000 GJ
- Total GHG emissions were 85,000 tonnes of CO2e
- Total energy expenditure was $62,200,000

Colwood's Energy, Emissions, and Costs by Sector

GHG emissions by sector are shown in Figure 19. Passenger vehicles are the largest source of emissions, followed by residential buildings. Commercial vehicles and Commercial and Small-Medium Industrial Buildings (CSMI) are also very important.

The rest of Colwood's emissions are composed of other sources. Waste is responsible for comparatively fewer emissions. Further information is in Appendix 6.

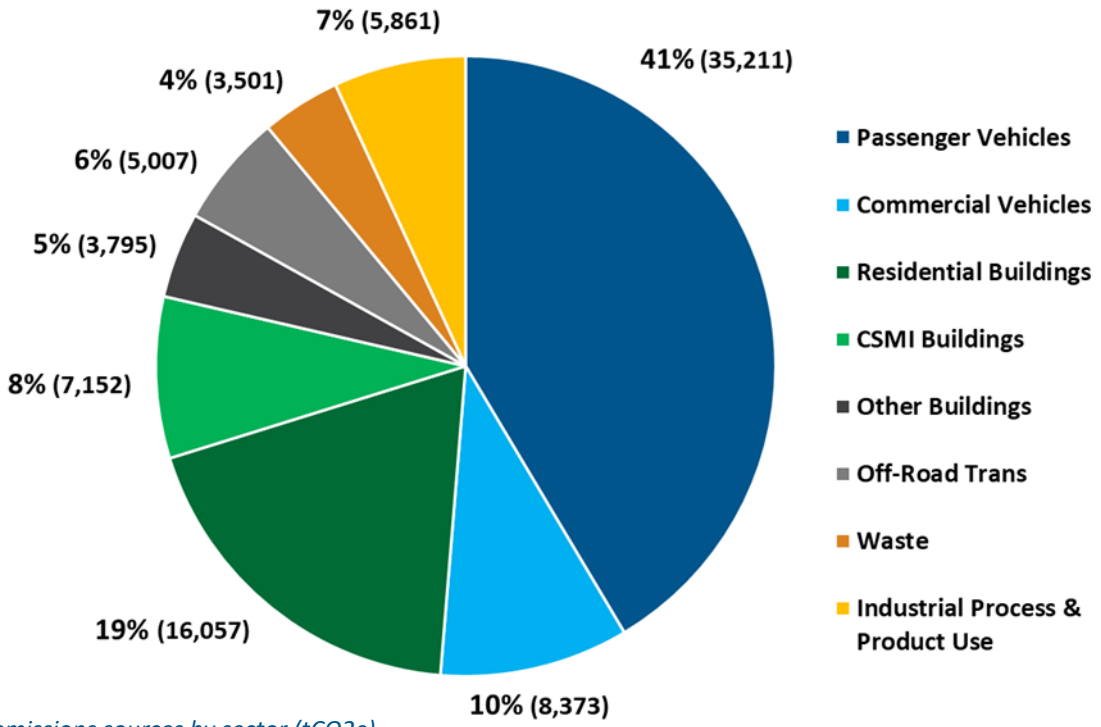


Figure 19: Colwood's emissions sources by sector (tCO2e)

Colwood's Emissions and Costs by Fuel Type

The following charts show energy emissions and cost by fuel type for 2018. Mobility fuels are responsible for most of Colwood's energy expenditures and GHGs (Figures 20 and 21). Electricity is responsible for a large proportion of costs but only a small percentage of GHGs because most BC electricity is generated from renewable energy. Conversely, natural gas is responsible for a small percentage of costs but a high proportion of GHGs due to its low cost and higher emissions. Other fuels and emissions sources complete the picture. Further information is in Appendix 6.

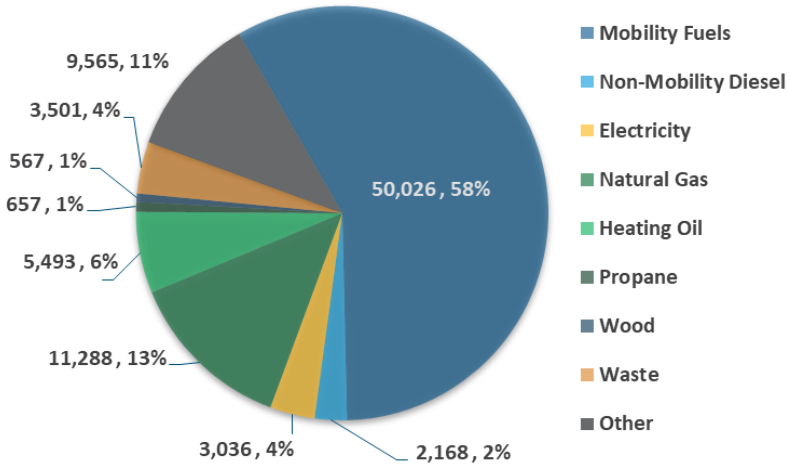


Figure 20: Colwood's emissions by source (tCO2e).

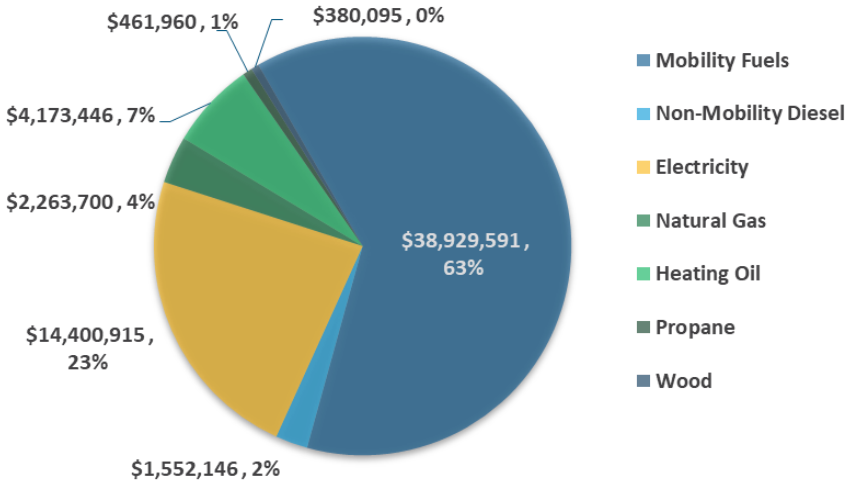


Figure 21: Cost of Colwood's energy by type.

Emission Projection Analysis for Multiple Scenarios

GHG emission projections have been made to 2050 based on the level of action in each of the RCPs or future GHG concentration scenarios (Figure 22). RCPs (Representative Concentration Pathways) are different future scenarios based on concentrations of global GHG levels in the atmosphere. RCP 2.6 would be the outcome of lower concentrations of GHG due to quick and effective GHG emissions reduction, while RCP 8.5 would be the outcome of a lack of emissions reductions or BAU (business as usual).

Colwood projections for GHG emissions in each RCP by 2030 are 55,700 tCO_2e (2.6), 68,500 tCO_2e (4.5), and 93,600 tCO_2e (8.5). This translates to reductions of 33%, 17%, and an increase of 13% vs. 2007 levels, respectively. By 2050, GHG emissions in each RCP are 37,700 tCO_2e (2.6), 53,200 tCO_2e (4.5), and 132,000 tCO_2e (8.5), translating to reductions of 54%, 36%, and an increase of 60% vs. 2007 levels, respectively.

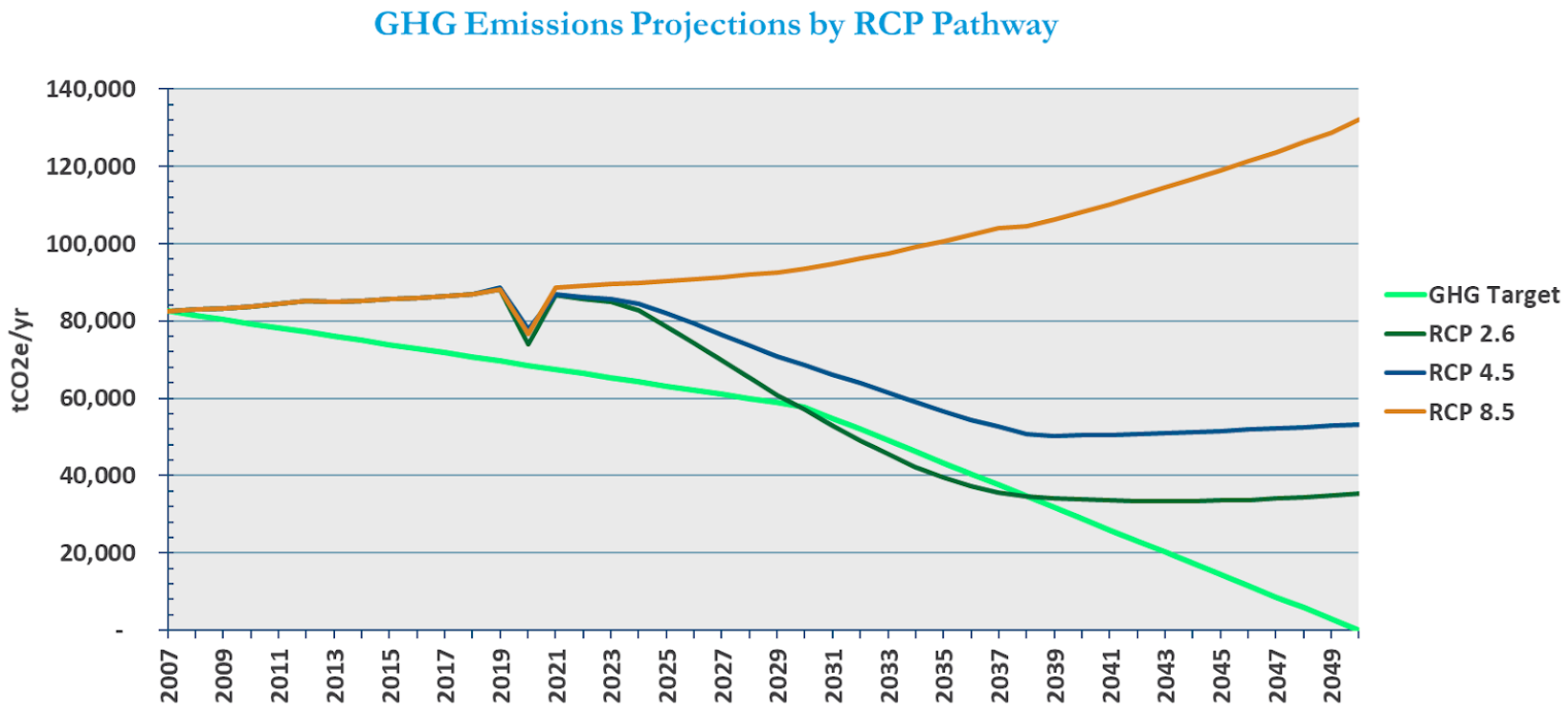


Figure 22: GHG emissions projections by RCP pathway in 2030, 2040, and 2050.

Emission Projection Analysis for RCP 2.6 Scenario

Colwood's business as usual (BAU) greenhouse gas emissions projections under an RCP 2.6 scenario, both total and per capita (average per person), are briefly summarised in the Figures 21 and 22.

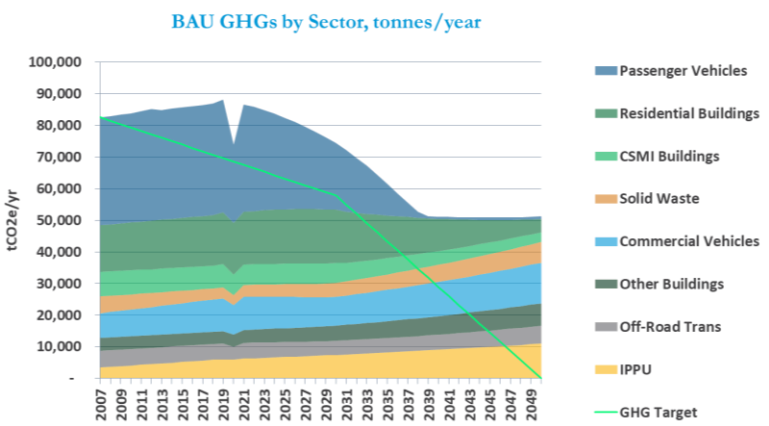


Figure 21: BAU Emissions Projections

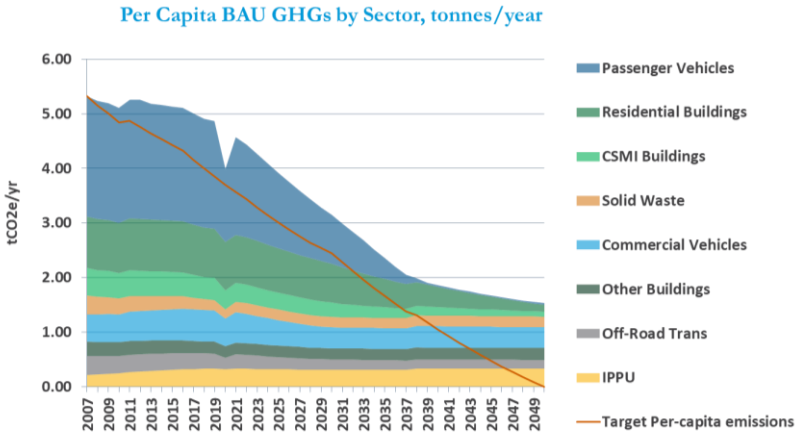


Figure 22: Per Capita BAU Emissions Projections

These figures show how most of Colwood's current emissions are due to passenger vehicles and buildings. The BAU emission projections show how emissions from many of these sectors, especially passenger vehicles, are forecast to decrease. These projections include measures that the Provincial and Federal governments have committed to, as well as other trends, modeled with no action from the City.

The figures also show the GHG emission reduction targets. The City has unique local actions that it can implement in order to help close the gap between the BAU trajectory and the target lines.

6. Future Scenarios: Understanding the Implications

Exploring Different Futures for Colwood

As we plan for climate action in Colwood by reducing climate impacts and adapting to climate change, it is helpful to consider what different futures we might face depending on how we act.

The Intergovernmental Panel on Climate Change (IPCC) provides models of future scenarios that predict how greenhouse gas (GHG) concentrations in the atmosphere will change as a result of our actions (and the effects of different concentrations). These scenarios are called Representative Concentration Pathways or "RCPs". RCPs consider trends in international and national policy, the acceleration of new technologies, more efficient land-uses, and changes in societal and individual behaviours Current international trends point to dire climate change impacts. However, taking global action now can minimize the magnitude and severity of climate impacts we can expect over time. This provides hope that our efforts in Colwood can play a role in lowering emissions and minimizing climate impacts into the future.

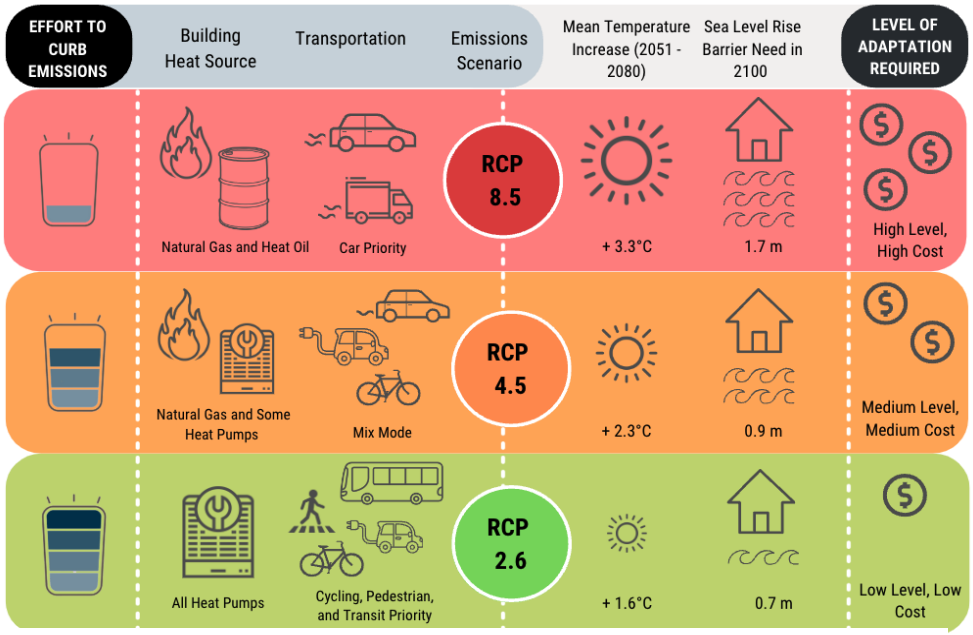


Figure 23: Reducing our emissions to follow an RCP 2.6 scenario will require a higher effort, but result in fewer impacts and lead to fewer damages and costs to governments, insurers, businesses, and households over time. Image adapted from CoastalAdapt (n.d.)

Figure 23 applies the RCP scenarios to Colwood. This shows how different emissions sources in Colwood, primarily building energy use and transportation, influence the climate impacts we can expect. Efforts now to follow an RCP 2.6 scenario will result in fewer climate impacts, leading to avoided damages and lower costs to governments, insurers, businesses, and households over time. Integrating actions that reduce emissions and increase climate resilience can advance other community sustainability goals, such as equity, biodiversity, and smart development, to name a few. **This approach is important because it clarifies that no matter what the rest of the world is doing, the actions we are taking will improve community resilience and help us meet our community sustainability goals over time.**

Climate action in Colwood can provide many co-benefits, such as:

- Increase opportunities for social connection and responsive emergency management
- Reduce congestion, vehicle emissions, and local air pollution
- Build the business case for alternative transportation options
- Support compact urban form and walkable communities
- Focus growth in intended growth areas
- Provide a diversity of housing options in different price ranges
- Improve community health and well-being
- Protect natural assets like parks and shade trees, which help to manage flood and heat risks
- Reduce household heating/cooling and water costs

Exploring Three Futures for the City of Colwood

In the scenarios that follow, we explore how advancing climate action can create solutions that provide many co-benefits.

To increase understanding of the implications of climate change in Colwood, the RCP 2.6 scenario below explores what our city can look like through strong climate action. This scenario was modeled based on research and looking considering governance, transportation, infrastructure, land cover and waste in Colwood. This is followed by an exploration of three different RCP scenarios to compare how different pathways may change under different emissions profiles. Together, these scenarios help us consider three realistic, yet very different futures for our city. (Detailed scenarios for RCP 8.5 and RCP 4.5 can be found in Appendix 7.)

Table 4: RCP 2.6 Scenario of Systemic Climate Action in Colwood

Pathway	2.6 World Narrative
Governance: How is our city governed in an RCP 2.6 world? 	• The City of Colwood understands the importance of taking action now to protect its residents from projected climate impacts over time, while simultaneously reducing its carbon footprint. • The City embeds climate risk and emissions data into all decisions, ranging from procurement, to land-use planning, asset management, capital expenditures, and development permitting and is nationally recognized as a leader in climate action. • Integrated climate action advances important community priorities such as improved air and water quality, greater connectivity and community cohesion, biodiversity, healthy and resilient neighbourhoods, and strong economic growth and innovation.
Transportation: How do residents move around in an RCP 2.6 world? 	• The City promotes vibrant mixed commercial-residential developments that provide amenities and services nearby. This keeps people and money in the City and increases opportunities for local businesses, social interaction, cultural development, and creates the density to justify public transportation options. These factors work together on a systems-level to reduce **vehicle kilometres travelled (VKTs) in single occupancy vehicles (SOVs) by 57% and air pollution by 39%.** • There is a large appetite for active transportation networks that are linked to electric rapid transit, both of which are fueled by high density demand. More active forms of transportation and lower times spent on the road improve the physical and mental health of residents. • EV infrastructure is bolstered in tandem with the CRD.
Land Use & Infrastructure: How are land and buildings in our community managed in an RCP 2.6 world? 	• The City works with developers to encourage different forms of density, ensuring that all new developments apply life cycle analysis and embed climate data into building design objectives. • Implementing the Community Lifecycle Infrastructure Costing (CLIC) tool allows the City, developers, and potential buyers to assess the long-term financial impacts of development proposals. This is used to justify decision-making about new developments and builds the appetite for increased density, transportation options, green design, energy efficient technologies and practices, and net-zero energy generation, which the City transitions into its development permitting. • The City works closely with BC Hydro to incorporate battery storage, demand side management and local generation for reduced transmissions and distribution needs, and increased grid resilience in the community. The return on investment for the project leads to local energy security over time.

	• Multiple forms of transportation options are considered for new developments, ranging from EV charging stations to proximity to public transit and/or active transportation routes. This builds momentum towards a systemic network of housing and transport options, connected green spaces, community gardens and local food-growing opportunities, accessible amenities, habitat connectivity, and more livable neighbourhoods. **Residents spend more time outside and feel less exposed to extreme heat and other climate risks, reducing heat-related hospitalizations by 30% compared to RCP 8.5**. • The City works across sectors to ensure that seniors' homes and low-income buildings and neighbourhoods are targeted first for climate-ready retrofits, to minimize the disproportionate impacts of climate change on already vulnerable community members.
Urban and Natural Systems: How are natural systems supported in urban areas an RCP 2.6 world? 	• The City understands the value of identifying and protecting natural assets to support residents and local flora and fauna, and for the ecosystem services they provide like stormwater absorption and heat regulation. As much as possible, the City limits conversion of natural areas for development. • The City partners with the Songhees and Esquimalt Nations to better understand how to manage, restore, and connect natural areas, and explore climate-adaptive trends in species to enhance biodiversity. • New built infrastructure aims to support and enhance ecosystem services, ranging from green building and roadway siting in low climate-exposed areas, to incorporating xeriscaping, shade trees, bioswales, and green roofs. • The City maximizes opportunities to increase permeability and vegetation to prepare for the absorption of more extreme precipitation and manage heat. **The urban tree canopy is expanded by an additional 327 ha, increasing ground permeability, and reducing stormwater runoff by 7.5%.** • The coastline and wetland ecosystems are valued and protected by the community, operating as education sites for the protection of biodiversity, and supporting habitat changes over time. Salt marshes and eelgrass beds are restored and expanded along shorelines to minimize the force of waves and sequester carbon. These early efforts avoid damages and costs into the future, avoid the cost and embodied emissions of hardened infrastructure, and save taxpayers money over time.
Waste and Innovation: How are opportunities for innovation expanded in an RCP 2.6 world? 	• Incentives are created for small businesses, farmers markets, and community gardens, creating opportunities to contribute to food production and security (e.g., on lawns and rooftops), including promoting businesses that reduce waste and developing a localized circular economy. **Between 80-100% of organics and compostables are diverted and landfill waste is significantly reduced by 2030.** • The City is a place to visit for innovative design features, artisan markets, and unique businesses. This builds local as well as international tourism and promotes Colwood's reputation as a leader in creating a livable, resilient, and sustainable community where people want to stay and contribute.

This visioning explores what Colwood might look like in an RCP 2.6 world. For a more detailed exploration, see Appendix 7, which also compares highlights from an RCP 4.5 and 8.5 world. This allows us to compare how the five different pathways included in this plan might change under different emissions profiles. Together, these scenarios help us consider three realistic, yet very different futures for Colwood.

Prioritizing Tactics to Move Towards a 2.6 World

Colwood's Marginal Abatement Cost Curve (MACC)

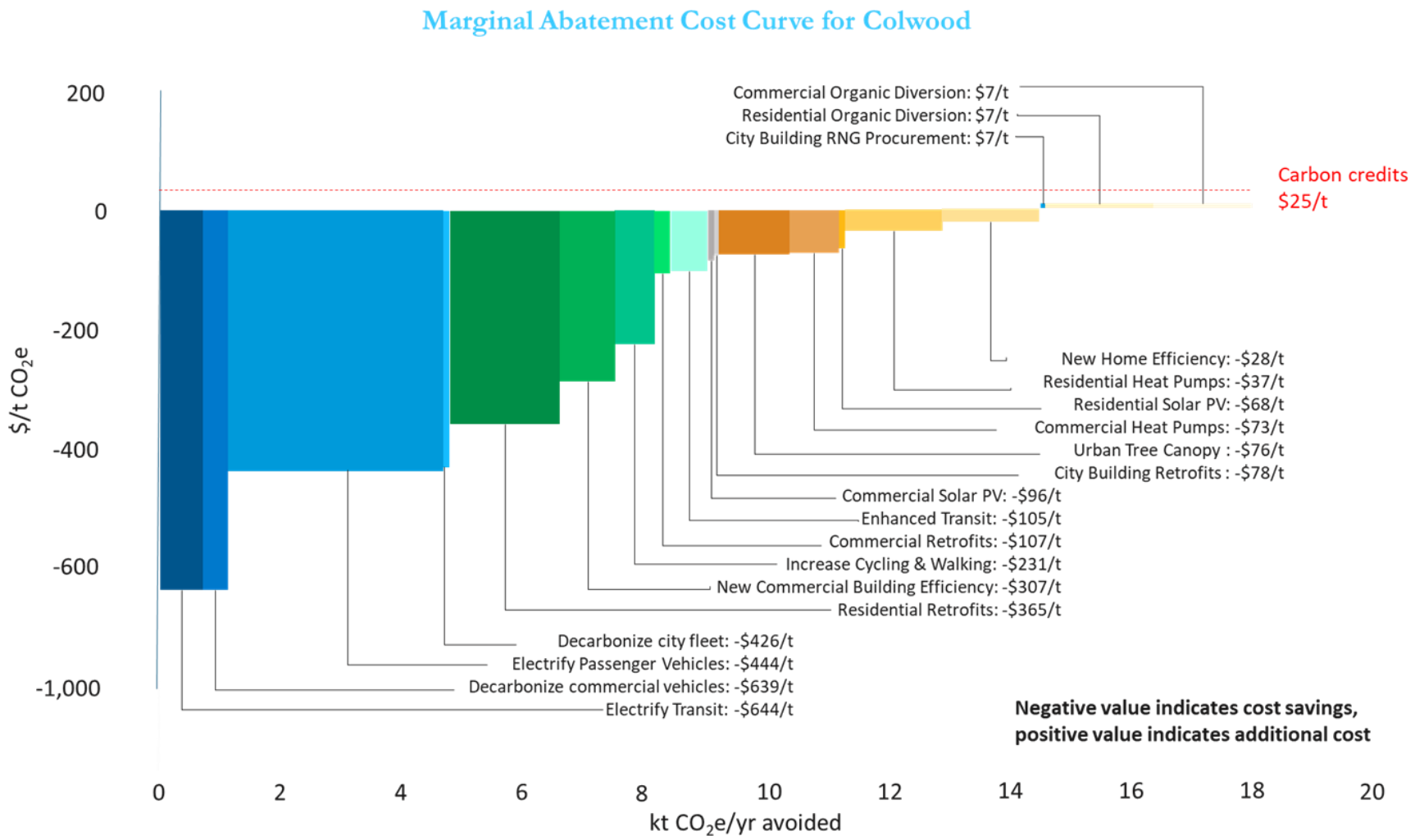


Figure 24: Colwood's Marginal Abatement Cost Curve (MACC) shows the cost or savings of reducing greenhouse gas emissions for a particular action. Of the 19 actions modelled for Colwood, 16 produce savings, and only three will cost the city money.

A marginal abatement cost curve (MACC) conducted for Colwood measures the cost or savings of reducing greenhouse gas emissions for particular actions. This is helpful to inform decision-making and set priorities.

As shown in figure 24, the MACC demonstrates an estimate of the savings (or cost) with of each action to help meet our GHG targets under an RCP 2.6 Scenario by 2030. The MACC divides the total costs or savings of the actions — represented by the net present value (NPV) — by the total emissions reductions associated with that action over its lifetime (in tonnes). The Y-Axis on the left-hand side of the MACC demonstrates the money saved by the community per tonne of carbon emissions avoided. The X-Axis on the MACC shows the amount of emissions avoided by each action in kilotons of carbon dioxide per year.

Most climate actions modeled result in cost savings. An action with a high positive cost/tonne is an expensive emissions reduction, whereas an action with a negative cost/tonne indicates that money is saved for every tonne of emissions reduced. Of the 19 actions modeled, 16 of them produced savings (as seen by a negative MACC), while only three emissions reduction opportunities will cost Colwood money over their project lifetimes. The calculations are shown for the year 2030 and are conservative. (Note that it has not been possible to quantify all possible sources of savings.) Emission reductions in the MACC (figure 24) are for the year 2030.

Some of the highlighted actions from the MACC curve include the following:

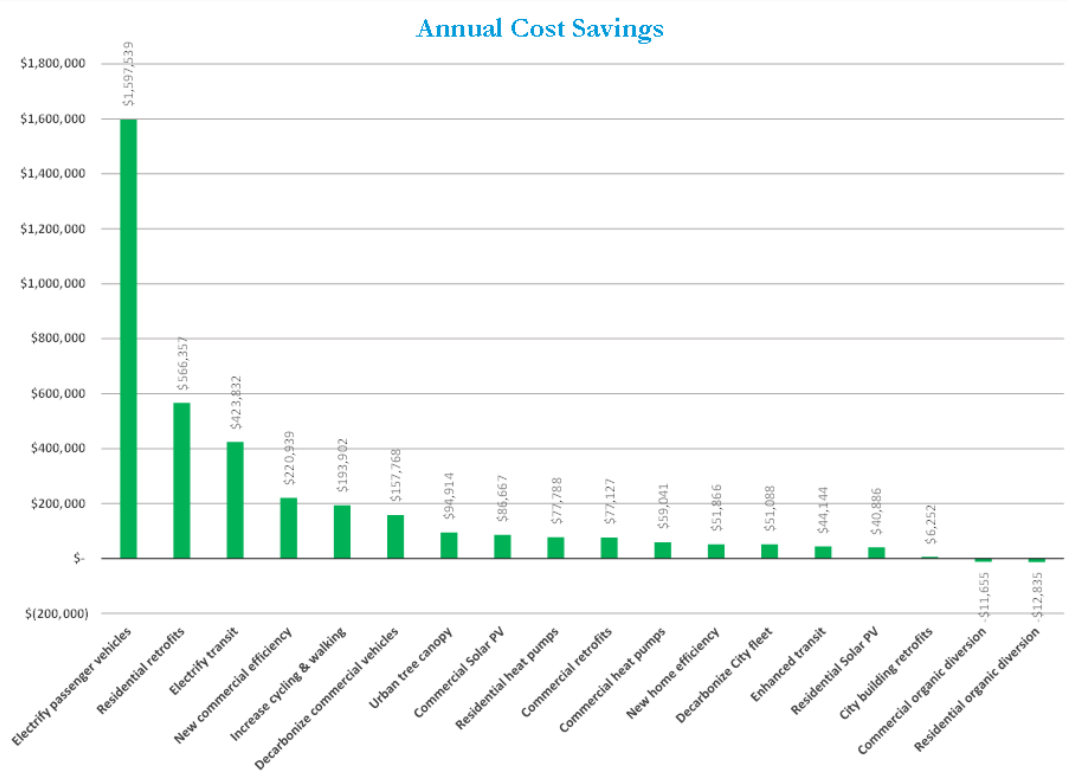
- **Decarbonization of transportation** resulting in high savings, including:
  - electrification of transit, commercial vehicles, passenger vehicles, and City fleet all producing between $426 - $644/t of savings
  - passenger vehicles producing the largest GHG savings at 3,600 tCO_2e/yr by 2030.
- **Residential retrofits** and **new commercial building efficiency** offer savings over $300/t.
  - Note: residential retrofits and commercial retrofits include conventional energy efficiency measures such as increasing insulation. Heat pump retrofits are separate actions.
- The **urban tree canopy**-provides only modest savings at $76/t in the scope of this analysis, but does not include the additional co-benefits from reduced infrastructure costs, reduced urban heat island, increased land value, or improvements to the community's connection to nature and mental health. These benefits would improve the net savings of urban tree canopy increases.
- **Organics diversion** has a positive cost in the MACC, but does not factor in considerable savings from the extension of the lifespan of the landfill through waste diversion.
- Carbon offsets have been illustrated in the MACC as a line, rather than a box, as the City could theoretically purchase unlimited credits. The current value of carbon offsets is $25/tonne and has been applied to the MACC, however this will likely increase towards 2030 as the carbon tax rate increases, and the City should consider this when deciding whether to pursue offsets or local carbon projects to reduce its net emissions.

Cost Savings and Considerations

Another way of prioritizing climate actions is to multiply the MACC and annual GHG savings to determine annual cost savings (Figure 25). This normalizes actions that have low MACC but higher emissions savings (e.g., residential heat pumps, new home efficiency). Figure 25 illustrates the annual emission-based cost savings of each action. Of note:

- Electrifying passenger vehicles, electrifying transit, and residential retrofits arise as the top three actions that will yield the most positive returns on investment, while also significantly reducing GHGs.
- Carbon offsets have been included to illustrate its relative impacts compared to other actions. Under an RCP 2.6 scenario, Colwood would meet its 2030 target and would not require additional offsets

To become carbon neutral, Colwood would need to reduce its emissions by an additional 38,600 tCO_2e if considering only influenceable emissions, or 57,000 tCO_2e if including non-influenceable emissions such as those from industrial processes, agriculture, and commercial vehicles. This translates to $0.96 million/yr and $1.43 million/yr in 2030, respectively.



Cost savings can also be analyzed by the incremental capital expenditure vs. the operational savings. Results were normalized by the annual emission savings for each action as opposed to lifetime, as different projects have different lifecycles and would skew results. Of all actions, electrifying passenger vehicles results in the largest net savings at nearly $1.6 million, followed by residential retrofits ($568,400) and electrifying transit ($423,800). Note that these dollar figures are meant for comparative analysis rather than absolute savings. See Appendix 8 for tables of the incremental capital costs and operational cost savings for each action.

Figure 25: Cost savings of different actions the City explored to reduce its GHG emissions.

7. Pathways to Climate Action

This report recommends pathways, strategies, and actions for Colwood's climate action planning. **Five pathways** build on the existing momentum in the City and identify broad areas for urgent action to shift from business-as-usual emissions and risk scenario to a low/zero emissions, and low risk scenario. Each pathway begins with a vision, narrative and a table that describes how the **strategies** in each pathway contribute to emissions and risk reduction, and the co-benefits they provide. The **actions** in each strategy are concrete steps towards reaching the goals and targets in each pathway. Each pathway finishes with example key performance indicators.

Table 6: Climate Action Pathway Goals and Targets

Pathway	Goals	Targets
Pathway 1: Municipal Leadership	• Showcase climate leadership by considering climate risk, emissions, and co-benefit opportunities in all planning, procurement, and investment decisions. • Build staff and public climate literacy. • Adopt climate change impacts, hazards, and risks projections into emergency management planning. Identify low carbon solutions (e.g., designated cooling stations).	• Per capita GHG emissions reduction levels from 2007 levels, 50% by 2030 and 100% by 2050. • Total GHG emissions reduction from 2007 levels, 30% by 2030, 100% by 2050.
Pathway 2: Transportation and Connected, Complete Communities	• Focus mixed density growth around low carbon, multi-modal transportation systems. • Expand public transit and active transportation infrastructure so that they become the primary ways for Colwoodians get around.	• OCP Mode share targets by 2038: Drive (70%), public transit (12%), walk (10%), bicycle (8%). • Target to reduce emissions from passenger vehicles by 17% over 20 years, through transit, active transportation, and smart land use. • Over 50% of Colwoodians live within a 15-minute walk of services and amenities by 2040.
Pathway 3: Buildings and Infrastructure	• Achieve Colwood's GHG emission reduction targets through new low carbon homes, building retrofits, and renewable energy. • Build and retrofit homes to be resilient to the many impacts of climate change and reduce costs for homeowners and tenants.	• Retrofit 3% (~210) of existing residences per year with air source heat pumps. • Retrofit 6% (~400) of existing residences per year with energy efficiency measures. • All new developments are solar photovoltaic ready.

	• Ensure that clean, renewable energy is readily accessible and secure, and where possible that supplemental energy sources are zero-emission.	
Pathway 4: Natural Systems	• Value natural assets for their contributions to asset management, resilience, and as sinks and contributors to emissions reductions. • Expand connected terrestrial and marine ecological networks to support indigenous species, habitat, and biodiversity.	• Increase in tree canopy by 18% (325 hectares).
Pathway 5: Local Eco-Innovation and Strong Circular Economy	• Transition to a zero-waste community. • Become a thriving eco-innovation hub with local training and employment opportunities.	• Develop a Zero Waste Strategy to divert 100% of divertible waste from Colwood's waste stream.

Table 7: Action Classifications

Action Classifications	• **City Operations:** Develop new ways of doing business and providing services and adapting existing practices to embed low carbon resilience approaches into current operations and decision-making processes. For example, addressing climate risk, emissions, and co-benefits in all procurement and investment sends a consistent signal that Colwood is serious about climate action and making the right decisions for tomorrow today. • **Policy:** Plans, decisions and regulations that provide direction and legal and financial means to advance climate action. • **Partnerships and Engagement:** Continue to convene the climate action team with internal and external stakeholders to streamline and piggyback on existing work, and create opportunities for shared budgeting, resourcing, and accountability. Continue to collaborate with other levels of government to advance local and regional climate action. • **Education:** Lead and/or participate in City and community-wide education and literacy-building on climate change. • **Data and Research:** Identify key gaps and areas needed to advance research that supports innovative climate action.
Risk Reduction Potential (RRP)	Actions were characterized as having low, medium, or high-risk reduction potential through qualitative assessment. We categorized risk reduction as the reduced impact of the hazard in conjunction with reductions in vulnerability. Although actions on their own are unlikely to reduce the chance that a climate hazard (e.g., flooding) will occur, they can reduce the impact of the hazard. For instance, a certain increase in sea level rise is likely, but actions can reduce the impact by updating flood construction levels for new buildings or by appropriate siting out of flood zones. These actions can also

	reduce our community's vulnerability. This means that our population will be less sensitive to climate impacts (e.g., fewer people living pay cheque to pay cheque), less exposed (e.g., no new developments built in flood zones), and have improved adaptive capacity (e.g., have the financial, human and/or technical resources to adapt to impacts). Certain approaches will be low, but have strong reciprocal emissions reduction potential, or provide additional benefits to the community. For this reason, a range of actions are included: low, medium, and high. • Low – Slight reduction in impacts from climate change, slight reductions in vulnerability. • Medium – Strong reduction in impacts from climate change, strong reductions in vulnerability. • High - Significant reductions in impacts from climate change, significant reductions in vulnerability.
Emission Reduction Potential (ERP)	In 2030: • Low: -5,500 tCO2e* • Medium: -20,000 tCO2e • High: -30,000 tCO2e+ (vs. 2018 baseline) In 2050: • Low: -44,000 tCO2e* • Medium: - 35,000 tCO2e • High: -50,000 tCO2e+ (vs. 2018 baseline) *Represents a net increase in emissions vs. 2018 baseline, and no climate actions taken.
Lead Department (LD) and Supporting Departments (SD)	Identifies the lead departments and the other critical supporting departments to advance integrated action across the organization and where relevant, community.
Timeline (T)	• Short 0-2 years (2023 -2025) • Medium 3-5 years (2026 – 2028) • Long 5+ years (2029+) • Ongoing (OG)
Budget ($)	• $ - Low (0 - $50,000) • $$ - Medium ($50,000 - $500,000) • $$$ - High ($500,000+)
Aligned Plans	Aligned plans or OCP objectives have been identified that align with the tactic.

Pathway 1: Municipal Leadership

Vision: The City of Colwood is well-managed and showcases leadership in low carbon resilience (LCR) by considering climate risk, emissions, and co-benefit opportunities in all planning, procurement, and investment decisions. Integrated planning helps Colwood deliver services and manage assets in a financially and environmentally responsible manner.

Overview: Building a low carbon and resilient Colwood requires cooperation and collaboration internally between staff and departments and externally between the city, region, sectoral stakeholders and community members. Cooperative and collaborative working saves time and resources and creates the enabling conditions for accelerating action. Integrated climate action is enabled when decision-making processes, finance, and strategies are integrated across governance levels, sectors, and timeframes. Decision-making tools will support the understanding of how decisions impact our emissions profiles and resilience in the long term. Creating a foundation for integrated action provides expanded community co-benefits like improved air and water quality, community cohesion, protection and enhancement of biodiversity, and strong economic growth and innovation. The City is advancing integrated climate action through partnerships, such as with the CRD and neighbouring municipalities for regional climate action.

Goals:

- Showcase climate leadership by considering climate risk, emissions, and co-benefit opportunities in all planning, procurement, and investment decisions.
- Build staff and public climate literacy.
- Adopt climate change impacts, hazards, and risks projections into emergency management planning. Identify low carbon solutions (e.g., designated cooling stations).

Targets:

- Per capita GHG emissions reduction levels from 2007 levels, 50% by 2030 and 100% by 2050.
- Total GHG emissions reduction from 2007 levels, 30% by 2030, 100% by 2050.

Pathway 1 Building Blocks

Existing Initiatives	Description
ICLEI Canada Together for Climate Project, Climate Change Adaptation Strategies Report (2020)	The City of Colwood was selected along with seven other partner communities to participate in an Island-wide collaborative project with ICLEI Canada to determine how climate change will affect the community's quality of life, and opportunities to reduce risks. The result of this work was a preliminary list of climate impacts.
2019 Climate Emergency Declaration	Colwood Council views this climate declaration as a continuation of the City's climate leadership, building upon initiatives like the Solar Colwood program, electric vehicle conversion, and climate change mitigation and adaptation strategies outlined in the Official Community Plan.
Colwood Strategic Plan (2019 - 2023)	Addresses priority areas for the City, including mobility, prosperity, governance, and vibrancy, where Council has identified a gap and wants to see meaningful progress.
Good Neighbour Project	This Colwood supported/ resident-led project is an effort to help neighbours connect and support one another and build resilient neighbourhoods. This is achieved by encouraging residents to get to know each other, such as through activities organized by a Good Neighbour Leader.
Westshore Alert	The Westshore Public Alert Notification System informs subscribers of major emergencies or disasters, such as tsunamis or wildfires.
Colwood-based Civil Society Organizations	Organizations like "Citizen's Environment Network in Colwood" (CENIC) showcases the commitment of Colwood residents' to advance community-wide education, climate action and environmental sustainability.
Capital Regional District Plans	The Guide to Emergency Preparedness in the CRD (2018) • Community Climate Adaptation Priorities for the CRD (2020) • CRD Climate Action Strategy (2021)

Pathway 1 Emissions and Risk Reduction Potentials and Co-benefits

Pathway 1 Strategies	Pathway 1 MACC Tactics	Emissions Reduction Potential (tCO_2e/yr, 2030)	Risk Reduction Potential
Ensure capacity and resources for ongoing climate action	Not modelled		• Improved training and workplace development to maintain momentum for integrated climate action. • Including the development of clear criteria for including a climate lens to assess development proposals, new policies, investment, procurement, and infrastructure decisions • Improved capacity for action via increased levels of social awareness of climate change risks and opportunities to reduce emissions. • Capacity and resources are identified in advance of emergencies to proactively respond to complex challenges.
Update emergency planning and responses to prepare for climate change	Not modelled		• Reductions to social isolation via Climate Ambassadors/Good Neighbour Program. • Improved emergency response time and outreach. • Adapting to extreme heat events with shade trees and cooling centres can reduce health cost increases. Without these measures, the City can expect 1.1 additional hospitalizations/yr in 2050, and 2.3 additional hospitalizations/yr by 2100[14].
Co-benefits			

[14]Canadian Institute for Climate Choices. (2021). Retrieved from: https://climatechoices.ca/wp-content/uploads/2021/06/ClimateChoices_Health-report_Final_June2021.pdf

The following tables outline recommended climate action for strategies within the Municipal Leadership pathway.

Strategy 1.1 Ensure Capacity and Resources for Ongoing Climate Action

Tactic Class	1.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Allocate a percentage of funds to a climate budget in the operational budget to support staff capacity and advance climate action work. Example: In 2022 Kamloops increased property taxes by 0.35% for climate action funding, and will increase them incrementally until they reach 3.5%. The District of West Vancouver uses an Environmental Levy allocating 1.5% of municipal budget to climate/natural asset initiatives. For Colwood 0.35% would be about $57,000, 1.5% would be about $245,000, and 3.5% about $570,000 (2022 numbers).	H	H	Corporate Office	Finance	0-2	$	Strategic Plan, OCP Update
City Operations	Build the capacity of the internal Climate Action Team to support implementation and track progress of the climate plan across departments.	M	L	Community Planning	Corporate Services, Community Development	0-2	$	
City Operations	Regularly use the city website and other communications tools to mainstream climate action in the community (e.g., long-term impacts and costs, short-term solutions-building, incentives, collaboration and partnership opportunities).	L	L	Communi-cations	Community Planning	0-2	$	
Policy	Implement Colwood's a climate lens tool for all planning, procurement, and capital investment decision processes to encourage resilient and sustainable decisions and investments over time.	H	H	Corporate Services	All	0-2	$	
Education	Collaborate with Royal Roads University to develop 1-2 hour online on-boarding and training programs for staff and stakeholders that build climate literacy and facilitate the uptake of climate action across all areas of work, e.g., include specific alignments with the climate lens tool to support staff application.	H	H	Human Resources	All	0-2 OG	$$	
Partnerships & Engagement	Expand the Good Neighbour Program to perform extreme weather checks on vulnerable people and educate residents about climate resilience. This may include emergency planning and response procedures, strategies on how to reduce household emissions, and promoting community co-benefits such as saving money, protecting pollinators/biodiversity, increasing community livability, etc.	M	L	Community Planning	Emerg. Services Comm. Champions, Communications Island Health	0-2	$$	Good Neighbourhood Program

Strategy 1.2 Update Emergency Planning and Responses to Prepare for Climate Change

Tactic Class	1.2 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Update the City's Hazard, Risk and Vulnerability Analysis and embed climate change projections, complying with renewed EmergencyBC requirements (2021), assessing climate vulnerabilities and risks across infrastructure and services, ecosystems, and vulnerable residents and groups. Identify streamlined actions and partnership opportunities (e.g., education, deployment capacity, facilities as shelters, evacuation routes, key partner roles).	H	L	Emergency Management	Engineering, Parks, View Royal (FSS Joint Team)	0-2	$$	OCP 10.3.5.1
Policy	Establish a city policy for an early warning alert system (e.g., Westshore app - Alertable). • Incorporate climate-related disaster planning and communications in public outreach efforts. Link with emergency protocols for key thresholds during events (e.g., social media alerts, extreme weather checks, evacuation, etc.).	H	L	Emergency Management	Communications	0-2	$	OCP 10.3.5.1

Example Key Performance Indicators for Pathway 1 to Track our Progress

- Number of annual Climate Action Team Meetings.
- Number of staff who have undergone climate literacy training.
- Number of community organizations aligned with the LCR CAP that promote climate awareness and literacy-building in their work.
- Increasing support for climate action and implementation identified through regular surveys, attendance at workshops / events, and website / social media traffic, etc.
- Number of municipal plans / policies / bylaws that link to the LCR CAP (relevant for all strategies).
- Number of projects that use Tier A / Tier B Terms of Reference.
- Expenditures by / performance of funding / financing for climate action.

Pathway 2: Transportation and Connected, Completed Communities

Vision: Colwood optimizes transit oriented, mixed density communities and connected transportation networks to achieve its mode share targets, support greenhouse gas emissions reductions targets and advance community goals for accessibility, health, and quality of life. Electrified public transit networks are connected, timely, and direct, and provide an enhanced rider experience. Connected active transportation networks help people of all ages and abilities move safely and conveniently through the City. Colwood encourages greener solutions for personal vehicle use by making electric vehicle (EV) charging affordable and accessible. The community hums with the sound of electric vehicles and transit.

Overview: Land use has significant implications for both emissions and resilience. Through land use planning, we influence the type of communities we live in, how we get around, our daily interactions with nature, the services that are provided by nature, and our health; especially in a growing community like Colwood. Colwood's current population of 18,961 has grown by 64.2%, higher than the growth within the broader CRD. By 2031 Colwood is expected to grow to roughly 22,000 residents and to 27,000 residents by 2041. The 2018 OCP states that just two percent of Colwood's population lives within a five-minute walk of a grocery store and 13% live within a 10-minute walk.[15]

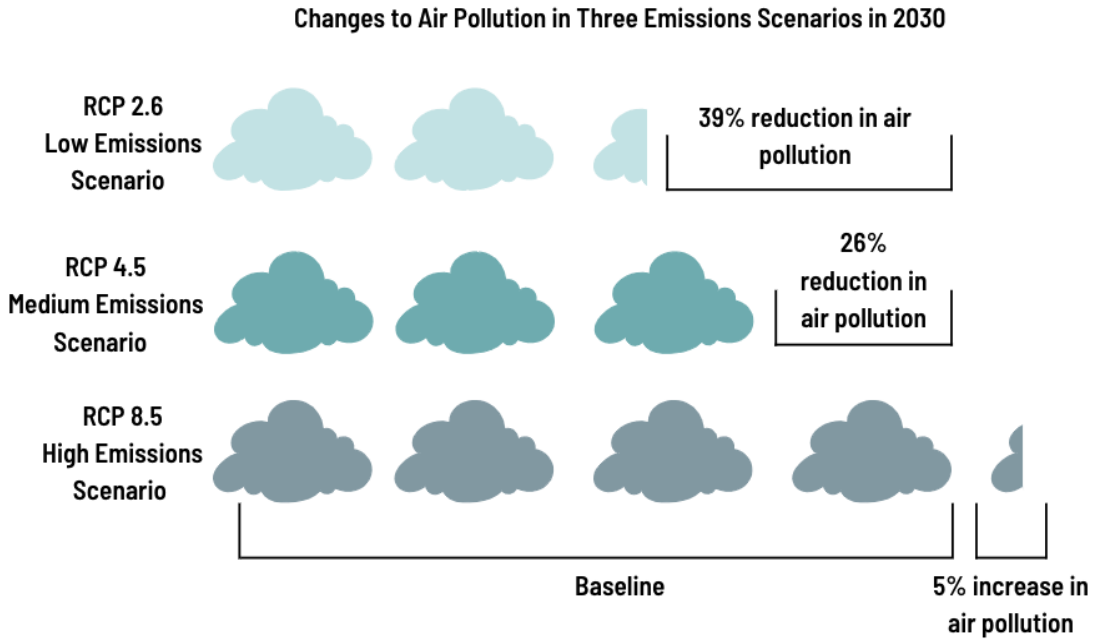


Figure 26: In a high emissions scenario (RCP 8.5) air pollution is likely to increase by 5%. With reductions in diesel and gas: 26% reduced air pollution (medium emissions scenario) or by 39% (low emissions scenario)

By focusing low impact density around public transportation and active transportation nodes we can significantly reduce transportation emissions and improve local air quality. Currently, **passenger vehicles account for about 40% of Colwood's emissions.** In a low emissions scenario (RCP 2.6), given reductions in diesel and gas consumption, air pollution is likely to decrease by 39%. Alternatively, in a high emissions scenario (RCP 8.5) air pollution could increase by 5% (Figure 26).

Intentional growth and mixed-use, transit-oriented density will also help residents save money – **Colwoodians currently spend $28.5 million annually at gas stations**. This type of growth builds the momentum locally and regionally for increased transit stops, active transportation pathways, and clustered services and amenities and supports cost saving opportunities like reduced household costs for water and energy and reduced municipal infrastructure expenditures.

[15] City of Colwood. (2018). Colwood Official Community Plan. Retrieved from: https://colwood.civicweb.net/document/131567/

Investing in and building active and public transportation networks is critical to lower our community emissions. Even if all vehicles are electric and all homes use renewable energy, more complete and compact communities will have lower embodied emissions and will convert less carbon-sequestering land to the urban environment. Decreasing sprawl can help protect urban green spaces and biodiversity, while also preserving ecosystem services being provided for free to the community such as shading and flood and heat protection. Finally, public health is improved by focusing on active ways to get around, reducing congestion and mental stress, and expanding green spaces that filter pollutants from the air and water.

Goals:

- Focus mixed density growth around low carbon, multi-modal transportation systems.
- Expand public transit and active transportation infrastructure so that they become the primary ways for Colwoodians get around.

Targets

- OCP Mode share targets by 2038: Drive (70%), public transit (12%), walk (10%), bicycle (8%).
- Target to reduce emissions from passenger vehicles by 17% over 20 years, through transit, active transportation, and smart land use.
- Over 50% of Colwoodians live within a 15-minute walk to services and amenities by 2040.

Pathway 2 Building Blocks

Existing Initiatives	Description
GOCO Ride Matching App (2022)	The GOCO app can aid in the transition from single occupancy vehicles towards more active transportation and ride sharing. The app will allow users to organize carpools and connect with other cyclists heading in the same direction to ride together.
Active Transportation Network Plan (ATNP) (coming 2023)	Maps out active transportation networks and priorities to make it easier for cyclists, pedestrians, and people with disabilities to travel in and through Colwood, improve road safety and meet our climate targets and modal shifts.
Demographic Study and Land Yield Analysis (2022)	Projects population increases by each neighbourhood within Colwood, as well as identifying the availability of commercial and industrial land in Colwood.
Age-Friendly Community Plan (2016)	Guides improvement to make the City more welcoming, comfortable and safe for people of all ages and all levels of mobility.

Master Transportation Plan (2015, 2023 update ongoing)	The traditional approach to transportation planning for a growing city is to build more and wider roads. Colwood's 2015 Transportation Master Plan intends to follow a different approach, opting instead to enhance accessibility options for residents and visitors of all ages and abilities to walk, bike, and take transit. This approach would ultimately cost less and bring more benefits to the City, including local economic development, health, and community building.
Traffic and Highways Bylaw (2010) - Neighbourhood Zero Emission Vehicles	Most highways within the City of Colwood are designated use highways for the purpose of permitting a Neighbourhood Zero Emission Vehicle to travel on them. This is defined as a four-wheeled electric vehicle with a top speed of 32-40 km/hr, and meeting the standards of the Canadian Motor Vehicle Safety Act.
Capital Regional District Plans	• Electric Vehicle Infrastructure Roadmap (2021) • Regional Transportation Plan (2014)

Pathway 2 Emissions and Risk Reduction Potential, Co-benefits

Pathway 2 Strategies	Pathway 2 MACC Tactics	Emissions Reduction Potential (tCO_2e/yr, 2030)	Risk Reduction Potential
Growth management and smart land use	Not modelled		• Improvements in road safety and reductions in fatalities. • Reductions in pollution (e.g., particulate matter, ground-level ozone, nitrous oxides, sulfurous oxides). Ground level ozone is especially toxic on hot days. • Improved physical and mental health. • Improvements to equity and access to education, employment, and recreational opportunities. • Reduced transportation cost burden; Colwoodians spend $28.5 million annually at gas stations. • Reduced road congestion improves transit times. • Improved ground permeability and reduced heat island effect due to reduced road infrastructure needs. • Increasing density reduces the percentage of land conversion to non-permeable surfaces. In an RCP 2.6 scenario increasing the urban tree canopy reduces stormwater runoff by 7.5%.
Prioritize connected active transportation networks	Increased Cycling & Walking	840	
Support enhanced transit services	Enhanced Transit	420	• Reductions in pollutants (e.g., particulate matter, ground-level ozone, nitrous oxides, sulfurous oxides). Ground level ozone is especially toxic on hot days. • Reduced transportation cost burden. • Improvements to equity through accessibility to school, work, and recreation. • Improved autonomy for elderly and disabled residents and reductions in social isolation. • Improved mental health from limiting time spent in congestion.
	Electrify Transit	660	
Promote affordable and accessible zero emissions mobility	Electrify Passenger Vehicles	3,600	• Reductions in pollution (e.g., particulate matter, nitrous oxides, sulfurous oxides). Air pollution is likely to decrease by 39% by 2030 in RCP 2.6 given reductions in diesel and gas consumption. (In an RCP 8.5 scenario, air pollution is likely to increase by 5%.)
	Decarbonize City Fleet	120	

	Decarbonize Commercial Vehicles	(actions begin in 2030)	
Co-benefits			

The following tables outline recommended climate action for strategies for the Transportation and Connected, Completed Communities pathway.

Strategy 2.1 Growth Management and Smart Land Use

Tactic Class	2.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
Policy	• Prevent new development in locations at high risk of flood, erosion, and sea level rise and identify existing development in high-risk areas. • Revise Figure 8 of the OCP land use map by reviewing the focused growth direction in the OCP to 1) develop mixed use and transit friendly density and 2) support pedestrian and cyclist infrastructure to drive down community emissions over time. • Use the CLIC (Community Lifecycle Infrastructure Costing) tool to assess long-term financial impacts of development proposals on the City, and use this to justify decision-making about new development proposals, and considerations around growth patterns for the community. • Develop a policy to discourage low carbon resilience unfriendly uses (e.g., gas stations, drive throughs, and surface car lots, areas with no permeability). • Consider the creation of incentives to encourage smart growth. Example: The City of Penticton created a	H	H	Community Planning	Development Services, UDI, CHBA BC, Local Developers, BC Transit, RRU	0-2	$$	Transportation Master Plan, OCP Policy 6.2.1.2, 8.2.1.3

	Development Cost Charge reduction of 50% for developments that achieved a certain score in a sustainability checklist, with points for features including brownfield redevelopment and access to alternative transportation options. • Adjust Parking Bylaw maximums and minimums, support increased EV use/charging and minimize on-street parking to support active and public right of ways. (3-5 years). Parking requirements could be reduced by sharing parking between different uses (e.g., an office, a church, and a restaurant may share as they will have different peak periods), improving walkability so that a parking area can serve multiple places, and reducing parking requirements for MURBs by partnering with a car share company to have shared vehicles nearby.							
Policy	• Review road requirements (e.g., around schools), and focus on Transportation Demand Management options to manage traffic. • Use multi-modal traffic data from the Transportation Master Plan (TMP) to manage traffic.	L	M	Community Planning	Development Services, BC Transit	0-2	$$	TMP

Strategy 2.2 Prioritize Connected Active Transportation Networks

Tactic Class	2.2 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Opera-tions	• Develop incentives to encourage City employees to use active transportation, take public transit, or carpool to work (e.g., discounted transit passes, e-Bike purchase program). • Continue to update End-of-Trip facility requirements in the Parking Bylaw to reflect increased ridership and improve user experience.	L	L	Human Resources, Finance	All dept's	0-2	$	

Policy	• Implement expansion of All Ages and Abilities routes and trails for walking, cycling and other forms of zero emission mobility called for in the Active Transportation Network Plan (ANTP) (2023). As necessary update OCP Figures 11 and 12 to align with the ANTP and BC Transit; • Expand cycling infrastructure along priority corridors by minimizing stop and start bike lanes, extending active transportation routes to key destinations in the City and enhancing connectivity along Sooke Road and Metchosin Road; • Prioritize active transportation over vehicle lanes when road widths are constrained; • Link active transportation and transit networks, and provide secure and weather resistant bike parking infrastructure at transit nodes; • Adopt 30 km/hr speed limits in more areas of the community (e.g., dense areas, major active transportation corridors); • Promote the GOCO Rideshare app; • Contact car sharing providers to develop car sharing / car coop infrastructure; • Improve the rider experience through wider/separate lanes, tree cover and shading, rest stops, water fountains, covered bike racks, secure bike locks at transit exchanges, and plug in stations for e-bikes / e-scooters) *(3-5 years);* • Create pedestrian and cycling first streets in Colwood (e.g., Dutch Woonerf living street concept) *(6-10 years).*	H	H	Engineering Services	Community Planning, Capital Bike, Local Residents and Neighbour-hood Associations, School District 62	0-2	$$$	Age Friendly Community Plan Active Transportation Network Plan OCP 8.2.2
Policy	• Update bylaws to allow zero emissions alternative transportation and micro mobility on roads, sidewalks, and bike lanes *(re: currently there are restrictions on riding scooters and skateboards on roads, and disconnections in the sidewalk infrastructure discourages micro mobility active transportation solutions);*	H	M	Community Planning	CRD, CHBA BC, UDI, local developers	3-5	$$	

	• Promote / encourage zero emissions alternative e-mobility, e.g., e-bikes, e-scooters via pilot projects, policy, and development.							
Partnerships and Engage-ment	• Continue partnering with the CRD and School District (and other partners) on the Ready Step Roll (RSR) program and implement the findings of the RSR reports. • Expand the RSR program in all Colwood schools (where possible) and repurpose parking lot areas.	M	M	Community Planning	School District, CRD, ICBC, RCMP, Comms	0-2	$$	
Partnerships and Engage-ment	• Build in opportunities in new developments (e.g., Royal Beach and Royal Bay) to convert street space into pedestrian only or pedestrian friendly land uses. • Establish car-free events to connect community members with each other (e.g., Bike to Work Week, bike to the weekly farmers market).	M	M	Community Planning, Engineering	Local residents, neighbourhood associations, farmers market	0-2	$$	OCP 8.2.2.1, 8.2.2.7, 11.2.2.3
Partnerships and Engage-ment	• Encourage a private company to establish a local E-Bike Share Program; (e.g., North Shore communities, Kelowna), and/or provide incentives for e-bike purchases (e.g., Banff's or Saanich's rebate programs)	M	M	Community Planning	Local bike shops, CRD	0-2	$	
Data & Research	• Conduct a study to determine where to add priority sensors for bikes and pedestrians to support continuous movement and how to calibrate them (e.g., to facilitate constant movement in heavy rain events/heat events, when a certain amount of people or bikes are stopped, during rush hour, etc.).	M	M	Engineering Services	Community Planning, Capital Bike	3-5	$$	ATNP

Strategy 2.3 Support Enhanced Transit Services

Tactic Class	2.3 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
Partnerships & Engagement	Work with BC Transit to continuously improve transit services: • Support implementation of the West Shore Local Area Transit Plan the Greater Victoria Rapid Bus Implementation Strategy (2021) and The Greater Victoria Transit Future Plan (2011) ; • Support the transition to a zero emissions transit network (e.g. electric); • Support a Bus Rapid Transit network, with a hub in Royal Bay / Royal Beach; and, • Promote transit ridership by offering free transit days (e.g. special events, or poor weather) and celebrating new routes. • Undertake reviews of key corridor (e.g. Island Highway and Sooke Road) to determine road cross section and land requirements for dedicated bus lanes. • Co-develop plans with BC Transit to provide rapid Transit to Colwood Corners and the Seaside Village Neighbourhoods • Request that developers make transit more attractive through e.g. shelters, benches, transit information, provision of garbage bins, bike parking, etc. as part of their frontage improvements	H	H	Community Planning,	Engineering Services, CRD, BC Transit, Local Municipalities	0-2	$	West Shore Local Area Transit Plan Greater Victoria Rapid Bus Strategy (2021) Transit Future Plan (2011)

Strategy 2.4 Promote Affordable and Accessible Zero Emissions Mobility

Tactic Class	2.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Adopt a ZEV prioritization component for the Fleet Policy so that ZEVs are considered first for every vehicle replacement, and work to adjust replacement timelines for ZEV introduction (i.e., availability of new products). Also work to phase in electric replacements for pieces of small equipment (e.g., blowers, line trimmers). Extend policy to contracted services. Target zero GHGs from the municipal fleet and contracted services by 2045.	M	H	Public Works	CEA	0-2	$	CRD Electric Vehicle Infrastructure Roadmap
Policy	Implement policy measures to support EVs: • Consider development of a City-wide EV strategy to support EV strategies, or approach CEA for best practices; • Adopt EV-ready building requirements for new buildings • Support EV charging in existing residential and commercial buildings. • Develop and deliver an EV outreach strategy (e.g., to builders and developers on EV charging requirements, supporting volunteer organizations with electric car shows, etc.); • Support the CRD's EV Infrastructure Roadmap to develop a regional EV charging system, identify sites for EV chargers (e.g., gas stations), ensure EV chargers will not be built in areas at high climate risk, and minimize travel related anxiety. Require fast chargers at key locations. • Install EV chargers at City-owned locations. • Gradually phase in electric requirements for gardening equipment in the community (e.g., Oak Bay)	M	H	Community Planning	Public Works, Engineering Services, Building Services, CRD, CEA, CHBA BC, UDI, local developers, local property management associations, stratas, other MURB owners	0-2	$$$	

Example Key Performance Indicators for Pathway 2 to Track our Progress

- Reduction in the number of buildings / infrastructure in areas at high risk of flooding, sea level rise, erosion, etc.
- Commuting / personal travel mode split, from Census.
- Length of infrastructure to promote active transportation, e.g., km of sidewalks, trails, and bike paths.
- Number of households in proximity to bus stops (e.g., at 500m, 800m, 1000m).
- Transit ridership data, including number of routes and frequency of service, from BC Transit.
- Number of public e-Bike chargers.
- Number of and per capita insurance policies in force for EVs, from ICBC's publicly available data.
- Number of and per capita public EV charging stations in the community, from PlugShare.
- kWh/year used for charging EVs at City-owned charging stations.
- Reduction in ground level ozone / improvements to air quality

Figure 27: Sparky is the City of Colwood's new Neighbourhood Zero Emissions Vehicle for Public Works & new all-electric Mustang for Bylaw Services

Pathway 3: Buildings and Infrastructure

Vision: Colwood uses LCR criteria (climate risk, emissions, and co-benefits) in permitting processes to ensure that investments in buildings and infrastructure are situated in low-risk areas and designed to withstand projected climate impacts over the next 50-80 years. New builds and retrofits both feature green building design and account for zero-emissions energy and resilience solutions over time. Clean and secure energy transitions build local resilience.

Overview: The vast majority of Colwood's residents live in low-density, single-family housing, just 11% live in apartments[16]. Currently, buildings account for 29% of Colwood's GHG emissions. As the population and housing demand grow, building low impact density through new buildings is an important opportunity to reduce emissions and build the resilience of residents from the ground up. For example, adopting heat pumps in new buildings and retrofits will minimize emissions and give residents access to heating and cooling features to manage all types of weather, while also providing them with energy cost savings. Sustaining and expanding incentives for heat pump retrofits in existing buildings is critical to see a cumulative impact on emissions reductions. Additional considerations should be taken to improve the resilience of buildings to more extreme temperatures, poor air quality events, heavy precipitation, and extreme weather events. Increasing density and options for infill housing provides a greater variety of building stock, such as Multi Unit Residential Buildings (MURBs), laneway houses, and suites at varying price points. New developments are built to be solar-ready to reduce energy cost burdens and increase energy security of residents.

Goals:

- Achieve Colwood's GHG emission reduction targets through new low carbon homes, building retrofits, and renewable energy.
- Build and retrofit homes to be resilient to the many impacts of climate change and reduce costs for homeowners and tenants.
- Ensure that clean, renewable energy is readily accessible and secure, and where possible that supplemental energy sources are zero-emission.

Targets:

- Retrofit 3% (~210) of existing residences per year with air source heat pumps.
- Retrofit 6% (~400) of existing residences per year with energy efficiency measures.
- All new developments are solar photovoltaic ready.

[16] City of Colwood. (2018). Colwood Official Community Plan. Retrieved from: https://colwood.civicweb.net/document/131567/

Pathway 3 Building Blocks

Existing Initiatives	Description
BC Energy Step Code Colwood adoption	Part 9 Residential: Step 5 or Step 3 + Low Carbon Energy System Part 3 residential wood-framed buildings up to six stories: Step Code 3 requirements. Part 3 commercial buildings: Step Code 2 requirements. (Updated requirements coming July 1, 2024 for Part 3 residential and commercial buildings: Step 3 or Step 2 + Low Carbon Energy System)
Sustainable Infrastructure Replacement Plan (2019)	The City of Colwood owns and maintains about $350 million worth of infrastructure, including roads, parks, natural assets, sewer and drainage systems, and buildings and vehicles and it costs nearly $5 million each year to maintain this infrastructure and provide services. This plan provides an Infrastructure Report Card, grading each category and identifying current conditions and the 50-year forecast required to maintain them.
Solar Colwood Program (2011-2015)	From June 2011 to March 2015, the Solar Colwood program made it possible for more than 500 Colwood residents to undertake over 1000 renewable energy and energy saving upgrades, using a grant from the federal government's Clean Energy Fund.
Green Certification from the Vancouver Island Green Business Certification Program (2014)	Colwood City Hall was the first office on Vancouver Island to earn Green Certification from the Vancouver Island Green Business Certification program. The Colwood Fire Department and Colwood Public Works Department have both earned certification as well.
Building Act, Solar Ready Regulation (2013)	Building services check for electrical rough-in for solar readiness in their rough-in inspection of buildings.
CRD Plans, Programs, and Guidelines	• Coastal Flood Inundation Mapping Project (2021) • CRD Residential Energy Retrofit Program (2021) • Residential Energy Retrofit Program (2021) • Green Stormwater Infrastructure Common Design Guidelines (2019) • Coastal Sea Level Rise Risk Assessment (2015)

Pathway 3 Emissions and Risk Reduction Potential, Co-benefits

Pathway 3 Strategies	Pathway 3 MACC Tactics	Emissions Reduction Potential (tCO_2e/yr, 2030)	Risk Reduction Potential
Build zero emissions and resilient new buildings	New Home Efficiency	1,850	• Reduced energy cost burden. • Improved indoor air quality reduces the burden on hospitals by minimizing visits from populations with asthma, respiratory illnesses, and other health concerns. • Improved year-round thermal regulation reduces the impact of increasingly frequent extreme heat or cold events. • Green building features improve local air quality, absorb water, reduce urban heat, provide habitat, and may act as meeting or gathering spots for residents. • Opportunities to integrate natural assets in asset management and adaptation reduces or avoids emissions and are a more affordable option that provides benefits to local habitat and biodiversity.
	Residential Heat Pumps	2,090	
	Commercial Heat Pumps	810	
Promote low carbon and resilient building retrofits	Commercial Retrofits	720	• Improved indoor air quality reduces the burden on hospitals by minimizing visits from populations with asthma, respiratory illnesses, and other health concerns. • Improved year-round thermal regulation in increasing extreme heat events or cold snaps.
	Residential Retrofits	1,550	
	City Building Retrofits	80	
Ensure local energy accessibility and security	Residential Solar PV	20	• Reduced energy cost burden. • Supports energy security, for example, by helping compensate for increased electricity demand caused by increased air conditioning. • Provides redundancy to protect against power outages. • Reduced urban heat island effect.
	Commercial Solar PV	30	
	City Building RNG Procurement	20 (Note that this has a higher $/tonne value in the MACC)	
Co-benefits			

The following tables outline recommended climate action for strategies for the Buildings and Infrastructure pathway.

Strategy 3.1 Build Zero Emissions and Resilient New Buildings

Tactic Class	3.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	The City leads by example and enacts a new policy requiring new civic buildings to be zero emissions and resilient to climate change. For example, requiring improved air quality, green infrastructure features, thermal regulation, built in low-risk areas, and having supplemental sources of low emissions power.	H	H	Building Services		0-2	$$$	OCP Objective 10.3.2

Policy	Enact LCR policy measures for new buildings:
	• Provide Council with options for reducing carbon footprints in new buildings through a new building bylaw proposed soon.
	  ○ Options proposed would be to achieve a higher step of the BC Energy Step Code or the current step (lower one) with maximum carbon emissions identifiable through the energy modeling process. Consider a timeline similar to other municipalities on Vancouver Island and the Lower Mainland;
	  ○ Explore strongly discouraging fossil fuels in new development. (Squamish)
	• Explore policy options for reducing embodied carbon in new construction and retrofits (see forthcoming best practice guide from CEA, which will include guidance and experiences from communities across BC);
	• Use best available climate projections to guide new construction.
	• Provide Council with options to reduce risks in new buildings by:
	  ○ Establishing appropriate Flood Construction Levels (FCL) and appropriately siting new builds out of flood zones.
	  ○ Structural designs for high wind loads.
	  ○ Updating requirements for cooling (if not included in forthcoming building code changes).
	  ○ Updating zoning to be inclusive of passive design and shading elements.
	  ○ Battery storage (where feasible).
		H	H	Building Services	Development Services, Engineering Services, Local Developers, UDI, CHBA BC, BC Housing, Province (Building Safety & Standards Branch)	0-2	$	OCP Objective 10.3.2
								
								Policy 10.3.2.1, 10.3.2.2, 12.2.3.3

	○ Green infrastructure, including permeable surfaces, to reduce temperatures and provide rainwater management. ○ Tools/incentives to promote grey water use and/or water conservation; ○ By 2030, consider requiring all new buildings over a certain size to utilize their roof for one of or a mixture of solar panels, a green, blue, or brown roof, or a cool roof (6-10 years). • Continue to build resilience by adopting recommendations to remove barriers for climate adaptation and resilience in the building sector from forthcoming BC Housing research (3-5 years).							
Policy	• Require enhanced sustainability features in rezoning applications, such as: ○ Zero carbon energy systems, ○ Higher efficiency, ○ Car-share parking spaces, ○ Parking maximums, ○ Secure bike parking, ○ Proximity to green spaces and transit, ○ Affordable housing units.	H	H	Development Services / Community Planning	Building Services, Engineering Services, Local Developers, UDI, CHBA BC, BC Housing, Province (Building Safety & Standards Branch)	0-2	$	OCP Objective 10.3.2 Policy 10.3.2.1, 10.3.3.1, 14.2.1
Policy	• Regular reviews of the Subdivision Servicing Bylaw requirements for permeability and stormwater control should take place following major precipitation events, and at regular intervals to ensure that they are current with latest climate projections.	H	L	Engineering Services	Local Developers, UDI, CHBA BC	0-2	$	Subdivision Servicing Bylaw
Education	Collaborate with stakeholders to implement this strategy by: • Supporting and promoting locally the training that other communities (e.g., CRD, Victoria, Saanich) or stakeholders (e.g., CHBA BC, BOABC, RRU, Camosun College) provide to: ○ Builders ○ Building inspectors ○ Trades ○ Realtors	H	H	Community Planning	CHBA BC, CRD and other Municipalities, BOABC, RRU, Camosun College, Victoria Real Estate Board	0-2	$	

	○ Promote CleanBC incentives for sustainable new construction to builders and developers (e.g., through building/development permit application packages). ○ Work with CRD to promote awareness of water conservation to builders / developers.							
Partnerships & Engagement	Work with the Province and continue to lobby BC Hydro to make new developments to be all-electric by facilitating electrical access/connections for new developments and changing how this is paid for. Consider raising at UBCM to see significant benefits.	H	H	Community Planning	BC Hydro, Province, CHBA BC	0-2	$	

Strategy 3.2 Promote Low Carbon and Resilient Building Retrofits

Tactic Class	3.2 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Lead by example by retrofitting all City controlled buildings to be zero GHGs and resilient. Target zero GHGs by 2050.	H	H	Building Services		0-2	$$$	
Policy	Enact policy measures to reduce GHGs and improve resilience from existing buildings across the community: • Promote and support regional opportunities led by the CRD for retrofitting homes (these include all available incentives), focus on fuel switching from natural gas e.g. by installing air source heat pumps, also insulation, air tightness, and electric or heat pump water heaters. These building energy retrofit measures will also reduce impacts from heat waves, and in some cases also from poor air quality events. To achieve expected impacts, 3% of buildings need to be retrofit with heat pumps each year, and 6% need to achieve a 33% reduction in emissions through energy efficiency measures. This is a very difficult task, as existing buildings are one of the toughest areas to tackle. • Identify opportunities to integrate natural assets and green infrastructure in retrofit design to provide thermal regulation and rainwater management (e.g., landscaping). • Refer to best practices for retrofits to ensure that energy efficiency upgrades by landlords do not negatively impact low-	H	H	Community Planning	CRD, Building Services, Local Energy Advisors	0-2	$$	OCP Policy 10.3.2.2

	and moderate-income tenants. Develop incentives for landlords to undergo retrofits that benefit tenants. • Identify and prioritize vulnerable populations to promote available income qualifying programs and minimize costs for homeowners over time; • Consider additional opportunities to further incentivize resilience and efficiency retrofits, e.g., simplifying retrofit permitting process/fees, tax credits, make PACE available when legislation is adopted, consider RTE bylaw *(3-5 years);* • Encourage building energy benchmarking for Part 3 buildings. Lead among Part 3 buildings with municipal building energy retrofits, working towards zero GHGs *(3-5 years).*							
Data & Research	Build on and expand the City's existing development permit areas to cover coastal flood inundation and in-land flooding risk reduction.	H	L	Community Planning	Development Services, CRD, Province, Utilities	0-2	$$	

Strategy 3.3 Ensure Local Energy Accessibility and Security

Tactic Class	3.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Consider battery storage with solar PV in City-owned buildings where appropriate (e.g., emergency operations center, fire halls).	H	L	Building Services	CRD	3-5	$$	
Partnerships & Engagement	Work with BC Hydro / other partners to ensure that best practices for building electrification, energy storage, solar generation, and EV connection (including vehicle to building) are implemented in new developments and identify where electrical capacity otherwise needs to be upgraded.	H	H	Building Services	CRD, BC Hydro	6-10	$	

Example Key Performance Indicators for Pathway 3 to Track our Progress

- Number of buildings being built at each level of the BC Energy Step Code.
- Number of energy efficiency incentives distributed for building efficiency upgrades, from CRD retrofit program, or CleanBC Better Homes / Better Buildings.
- Reduction in the number of natural gas connections.
- Number of renewable electricity installations, from BC Hydro's Net Metering Program.
- Energy poverty rates in community, (see energypoverty.ca/mappingtool).
- Dollar amount of damages to building from extreme weather events.
- Number of days per year with power outages.

Pathway 4: Natural Systems

Vision: Connected networks of urban and natural infrastructure coexist together in harmony. Biodiversity and the ecosystem services provided by nature are valued and protected to help Colwood achieve its GHG emission reduction targets. Residents have equitable access to diverse green spaces that moderate temperatures, minimize heat impacts, and support mental health and overall well-being. Indigenous plant species in Colwood are protected and valued in terrestrial, aquatic, coastal, and urban areas to foster biodiversity.

Overview: Mature stands of Douglas-fir forests, dry Garry oak ecosystems, and wetland loving red alder and western red cedar are identified by many residents as cherished assets. However, population growth and shifting development demand create tension and challenges to maintaining forested areas. Colwood partnered with the Municipal Natural Assets Initiative (MNAI) for a natural asset inventory to increase understanding of where our natural assets are, the state they are in, ~~and~~ how best to protect them and how to integrate the services they provide in asset management accounting. Adopting natural approaches to climate adaptation (nature-based solutions) where possible align with other goals, such as carbon sequestration, and benefits like reductions in urban heat and stormwater runoff. **For example, by expanding the urban tree canopy by 100 to over 300 hectares, Colwood can reduce stormwater runoff by 7.5% (Figure 28).** The City is also currently working on the Waterfront Stewardship Plan, the development of which has been guided by the Parks and Recreation Master Plan. These plans help the City prioritize nature. In this way, Colwood can maintain a current rate of 97% of residents that live within a 10-minute walk of a park[17].

Goal:

- Value natural assets for their contributions to asset management, resilience, and as sinks and contributors to emissions reductions.
- Expand connected terrestrial and marine ecological networks to support habitat and biodiversity.

Target:

- Increase in tree canopy by 18% (325 hectares).

Figure 28: By rezoning and expanding the urban tree canopy, Colwood can reduce the effects of the urban heat island and reduce stormwater runoff by 7.5% (RCP 2.6).

[17] City of Colwood. (2018). Colwood Official Community Plan. Retrieved from: https://colwood.civicweb.net/document/131567/

Pathway 4 Building Blocks

Existing Initiatives	Description
Waterfront Stewardship Plan (2023)	Explores concepts to protect the sensitive ecology and archaeology of our coastline and lagoon areas through thoughtful design that guides people through space in appropriate ways. The plan will inform Council decision-making for the next ten years.
i-Tree Ecosystem Analysis: Urban Forest Effects and Values (2022)	Enhances understanding of our urban forest's structure, function, and value to promote management decisions that will improve human health and environmental quality. Colwood's tree canopy was identified at 40.9% through the iTree canopy analysis (2021 air photo). It is estimated that further canopy losses will occur due to development at Latoria & potentially Royal Roads int~~o~~ the mid to longer term.
Toward Natural Asset Management in the City of Colwood (2022)	This report by the Municipal Natural Assets Initiative summarizes a natural asset inventory for the City of Colwood and documents steps that the city can take to proceed to a full natural asset management initiative.
Parks & Recreation Master Plan (2021)	Provides overall direction and guidance for managing parks and recreation resources, infrastructure, and investment over a horizon of ten years.
Stormwater Master Plan (2018)	Phase 1 provides guidance to the city in the development of new stormwater infrastructure as well as identifying locations where existing stormwater infrastructure upgrades are required on a City-wide scale. Phase 2 provides an assessment of the current drainage conditions related to the existing engineered wetlands located at the northeast corner of the intersection of Latoria Road and Veterans Memorial Parkway.
CRD Plans, Programs, and Guidelines	CRD Regional Parks and Trails Strategic Plan (2022 - 2023) Land Acquisition Strategy (2020 - 2021) Green Stormwater Infrastructure Common Design Guidelines (2019)

Pathway 4 Emissions and Risk Reduction Potential, Co-benefits

Pathway 4 Strategies	Pathway 4 MACC Tactics	Emissions Reduction Potential (tCO_2e/yr, 2030)	Risk Reduction Potential
Develop a natural asset management plan and implement policy	Urban Tree Canopy	1,250	• Reductions in stormwater runoff. Expanding the urban tree canopy by up to 109 ha, or 6% of the community area will reduce stormwater runoff by 2.5%. Expanding the urban tree canopy by 327 ha, or 18% of the community area can reduce stormwater runoff by 7.5%.[18] • Reduced need for cooling centers and other heat relief infrastructure resulting in reduced pressure on medical services. Minimizing exposure to extreme heat can reduce heat-related hospitalizations by 30% in RCP 2.6 vs. RCP 8.5. On the other hand, increased extreme heat events coupled with reduced protection from tree coverage and lack of cooling centres could result in an increase in health costs. • A naturalized shoreline protects key assets from sea level rise and storm surge events. This can reduce embodied emissions from shoreline protection infrastructure by 85% (RCP 2.6). • Pollution removal from increased vegetation.
Prioritize connected ecological networks to protect habitat and biodiversity.	Not modelled		
Co-benefits			

[18] In a document by the Province, it states that for every 5% increase in tree canopy cover, stormwater runoff is reduced by 2%.

The following tables outline recommended climate action for strategies for the Natural Systems pathway.

Strategy 4.1 Develop a Natural Asset Management Policy and Plan

Tactic Class	4.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Develop a cross departmental asset management team (e.g., Parks, Engineering, and Planning) to fill essential knowledge gaps and integrate natural assets into City workstreams included in the Sustainable Asset Replacement Plan. Example: Murray's Pond Viewing Platform, Esquimalt Lagoon Bridge Repairs	L	L	Community Planning	Development Services, Engineering Services, Parks	0-2	$	OCP Policy 10.3.3.1, Sustainable Asset Replacement Plan
Policy	Develop a Natural Asset Management Strategy and Policy that provides direction on building climate resilience by: • Incorporating best available climate projections into asset management planning (updating climate projections every 5 years); • Identifying the carbon sequestration and storage potential of all land and marine management, asset management, and acquisition decisions where the information is available. • Identifying and prioritizing sites of particular value (e.g., high biodiversity, ecosystem services, cover for wildlife, adaptation, carbon sequestration, etc.); • Incorporating natural assets into built asset management planning, including for transportation corridor and building standards; • Concurrently advancing the priorities of other plans and policy; • Identifying mechanisms like renewed capital projects, policies, and planning processes to protect and expand priority assets; • Identifying short to long term maintenance requirements for natural assets; • Developing accounting structures to track and value the existing ecosystems services that are supporting	H	H	Community Planning	Engineering Services, Parks	0-2	$$	MNAI Plan, OCP Policy 10.3.3.2, Objective 12.2.1 Sustainable Infrastructure Replacement Plan

	the city in alignment with regional services (e.g., water and stormwater management and flood/heat protection under a changing climate).							
Policy	Implement an Urban Forest Strategy that includes: • A revised and streamlined tree protection bylaw to strengthen protection for mature trees (that store and sequester more carbon than young trees) and encourage native/adaptive species as part of the review of new applications; • Identifies tree replacement ratios in the Management and Protection of Urban Forest Bylaw; • A list of native tree species that can be planted in Colwood, including drought tolerant species; • Target 'No Net Loss' in Canopy Cover as part of the review of new applications to maintain canopy coverage; • Prioritize neighbourhoods with less than 30% canopy cover for tree planting, to increase shading and reduce heat risks • Use socio-economic/ demographic data to prioritize areas to increase tree cover and shading, and minimize heat risks; • Recommendations for shading of active transportation corridors. • Targets for carbon sequestration and pollution reduction.	H	H	Parks/Community Planning	Development Services, Community Planning, Engineering Services	0-2	$$	OCP 11.2.3, Tree Protection Bylaw Active Transportation Network Plan
Policy	Protect Colwood's coastal dunes and salt marshes by: • Buffering zones adjacent to salt marshes to minimize trampling, pollution, and damage from overuse; • Minimizing pollutants and runoff in creeks and streams • Limiting obstructive damage from structures like docks, log booms, boardwalks, etc; • Expanding data collection on the value of Colwood's salt marshes for both carbon sequestration and shoreline protection.	H	H	Parks	Development Services, Community Planning, Engineering Services	3-5	$$	Waterfront Stewardship Plan, OCP Policy 11.2.5.1

Partnerships & Engagement	Engage with the development community to co-develop stronger guidelines and clear, quantifiable metrics to support Colwood's natural assets and ecosystem services in the 2023 OCP review and update. • Create stronger incentives for developers to compensate for losses to ecosystem services and carbon sinks. Example: Penticton implemented a 50% Development Cost Charge reduction tied to gaining a number of points on a sustainability checklist. Points could be accrued for the percentage of permeable surface, retention of trees and vegetation on site, landscaping, green roofs, and rainwater reuse / conservation. • Work with developers to build a nursery for the native plants removed from development sites to be replanted once development is finished;	M	H	Community Planning	Development Services Developer Community, CEA, CRD	0-2	$$	OCP Policy 10.3.3.2
Partnership & Engagement	Share the MNAI inventory with adjacent local governments to stimulate collaboration within the watershed. • As per the Parks and Recreation Master Plan, focus greenway links to protect ecological corridors as much as possible to maintain or reconnect key habitats and priority natural assets as identified in the MNAI report.	H	M	Community Planning	Parks	0-2	$$	MNAI Plan, Parks and Recreation Master Plan,
Data & Research	Conduct an economic assessment for Natural Assets in Colwood to: • Develop a market-based indication of the current value of the ecosystem services supporting the city (e.g., the replacement costs of built infrastructure and the avoided costs of projected climate risks and emissions over time • Identify the costs and values of different interventions in terms of service delivery; • Determine the benefits of layering and connectivity of natural assets for enhanced service provision across areas relating to water, stormwater, heat management, transportation corridors, city parks, urban tree canopy, etc.;	H	H	Community Planning	Parks, Engineering Services	0-2	$	MNAI Plan, Parks and Recreation Master Plan, OCP Objective 10.3.3 Policy 10.3.3.1, 11.2.1.4

	• Align protection and/or restoration of areas over time with the benchmarks for land protection and park acquisition determined in the Parks and Recreation Master Plan.							

Strategy 4.2: Prioritize Connected Ecological Networks to Protect Habitat and Biodiversity

Tactic Class	4.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Build internal literacy of biodiversity to expand opportunities for conservation across relevant city projects/departments.	M	L	Community Planning	All	0-2, OG	$	
Policy	Develop Climate Resilient Landscaping Guidelines for city owned lands to sequester carbon, maintain soil health, protect and enhance biodiversity, determine climate appropriate species, and protect against extreme precipitation/drought.	M	M	Community Planning	Parks	3-5	$$	OCP Objective 10.3.3 Policy 11.2.2.3, 11.2.3.1
Policy	Adopt guidelines and explore incentives around permeable surfaces. Example 1: The City of Vernon has detailed guidelines designed to try to limit reliance on piped systems, control runoff at the source, and have developments mimic a natural, permeable watershed as much as possible. Example 2: The City of Victoria has developed a rainwater management program called Rainwater Rewards. Property owners or their representative may apply for credits of up to 40% of the property's stormwater utility charges on an on-going (annual) basis. For example, Multifamily Residential (5+ dwelling units) units are eligible for up to 40% rainwater management credit.	M	M	Development Services	Engineer-ing	3-5	$$	

Policy	Expand new connections and enhance existing connections within ecological networks (both terrestrial and marine) to protect habitat for biodiversity and facilitate species movement under a changing climate: • Use data from the Economic Assessment for Natural Assets to prioritize natural areas for conservation and native habitat restoration, including the consideration of natural areas that provide protection for species in extreme weather events (e.g., shade, shelter, warmth); • Partner with neighbouring municipalities to create regional habitat corridors for long-range species movement; • Identify appropriate benchmarks for park acquisition in alignment with the Parks and Recreation Master Plan (e.g., Triangle Mountain area, Latoria, Wishart North) that can be left in a naturalized state over time to protect biodiversity; • Use park acquisition, environmental DPAs, site adaptive planning, and the development planning process to reduce wildlife/habitat fragmentation and erosion and limit the negative impacts of development on biodiversity; • Require parkland dedication of 5% at subdivision and promote site-adaptive planning on greenfield developments that maintains 40% of the site area as public and private open space; • Incorporate smaller natural areas and features such as pollinator meadows into new and redeveloping parks and city-owned lands; • Improve connectivity between freshwater and marine ecosystems by buffering upland riparian areas; • Use the Waterfront Stewardship Plan's greenshores site adaptive planning approach for shorelines; • Determine appropriate vegetation species selection considering changes to local climate (e.g., heat/drought) and the northern migration of southern species.	H	H	Parks	Community Planning, Development Services, Approving Officer	0-2	$$	OCP Objective 10.3.3 Policy 11.2.2.3
Partnerships & Engagement	Optimize species health and biodiversity of private and public lands in the 2023 OCP update: • Include a definition of biodiversity;	H	M	Community Planning	Development	0-2	$	

	• Integrate local Indigenous ecological knowledge in land management practices; • Ensure soil volumes are adequate to support canopy health, especially where active transportation infrastructure will require shading. • Retain and support pollinators through incentives and education for pollinator planting, natural herbicides, and appropriate species selection on public and private areas; • Support stewardship groups like the Friends of Havenwood Park and promote citizen science to help monitor invasive species and educate the public about invasive species.				Services, Parks			

Example Key Performance Indicators for Pathway 4 to Track our Progress
• Increased percentage of urban tree canopy cover. • Increased in protected hectares of green spaces / parks / natural areas, etc. • Increased in the percentage of permeable land cover. • Reduction in insurance claims related to flooding. • Reduction in Urban Heat Island temperatures. • Number of native species planted on public / City owned lands. • Increased number of linkages or connections between green spaces / parks / natural areas, etc. • The number of days exceeding a certain Air Quality Index (AQI), see British Columbia AQI Health Index.

Pathway 5: Eco-Innovation & Circular Economy

Vision: Colwood has a reimagined, circular waste system reduces and repurposes waste, encouraging local modes of production and innovative, secure supply chains. Waste is viewed as a resource and waste diversion helps the City meet GHG emission reduction targets. Colwood understands projected climate impacts to protect the prosperity of residents and businesses, encourage resilient local business opportunities, bolster quality of life, and attract residents and investment.

Overview: A strong economy is an essential building block of a sustainable community. Colwood's economy is highly integrated with the Capital region with over 85% of Colwood's workforce finding employment outside the municipality (2019, pre-pandemic)[19]. The relatively small commercial base not only limits local employment opportunities, but it also limits the tax base. According to the City's Economic Development Strategy (2014), Colwood is at a critical point in its development, due to growing levels of traffic congestion and the absence of a vibrant waterfront or downtown. To expand opportunities for sustainable economic development Colwood must develop and/or support opportunities that drive growth in climate-ready industries like renewable energy, smart-land uses, nature-based solutions, low carbon mobility, energy efficiency, and the circular economy and advance communities that showcase Colwood as a leader in climate action and convey opportunities for green, clean business. Colwood can also tap into low carbon or ecotourism opportunities to connect the economy with the natural environment.

Goal:

- Transition to a zero-waste community.
- Become a thriving eco-innovation hub with local training and employment opportunities.

Target:

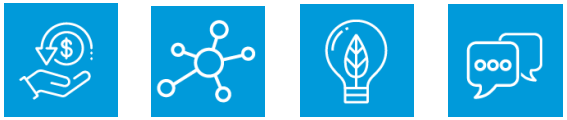
- Develop a Zero Waste Strategy to divert 100% of divertible waste from Colwood's waste stream.

[19] City of Colwood. (2020). City of Colwood's Economic Recovery Plan. Retrieved from: https://colwood.civicweb.net/document/165328/

Pathway 5 Building Blocks

Existing Initiatives	Description
Business Retention and Expansion Strategy (draft)	Provides a list of programs, services, and funding programs that businesses may need to expand in the city. This includes workforce development programs, research and development funding opportunities and educational institutions willing to partner with local firms or investors.
Economic Recovery Plan (2020)	Colwood's COVID-19 Economic Recovery Plan provides a foundation on which to build a stronger, more prosperous and more vibrant community through close collaboration between the City and our business and development sectors.
Economic Development Strategy (2014)	Provides the City with an opportunity to define the character and trajectory of projected population growth, as opposed to letting the growth define what the City will become. As such, the approach to economic development for Colwood is premised on respect for and protection of the City's history and heritage, as well as recognition of the City's future.
Colwood Clean Up	Beginning as a service for Colwood residents when the only other option was a trip to Hartland Landfill, this annual service makes it easy for Colwood residents to keep their homes and yards looking great. In 2019, the City welcomed 630 vehicles and received 70 tonnes of refuse and recyclables. Residents pay a fee for drop off, but the City subsidizes a portion of the cost of staffing and removal of all the materials that must be processed and hauled away for safe disposal and recycling.
CRD Plans, Programs, and Guidelines	• Solid Waste Composition Study (2016)

Pathway 5 Emissions and Risk Reduction Potential, Co-benefits

Pathway 5 Strategies	Pathway 5 MACC Tactics	Emissions Reduction Potential (tCO_2e/yr, 2030)	Risk Reduction Potential
Promote zero-waste & local food production for a thriving circular economy	Residential Organics Diversion	1,740	• Improved food security amidst disruptions and delays. • Employment opportunities through waste diversion and reuse/repair businesses. • Reductions in the conversion of natural areas for landfill.
	Commercial Organics Diversion	1,580	
Incentivize eco-innovation networks & programming	Not modelled		• Introduction of innovative practices and capacity for continuous learning and innovation. • Linkages between governance systems and academic institutions are strengthened. • Strengthened local workforce with strong green employment opportunities.
Co-benefits			

The following tables outline recommended climate action for strategies for the Eco-Innovation and Circular Economy pathway.

Strategy 5.1 Promote Zero-Waste & Local Food Production for a Thriving Circular Economy

Tactic Class	5.1 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	Lead by example and adopt a Green Event Guide that promotes City events (see CEA template) • Build awareness of repair and reuse shops at the Colwood Spring Clean Up (e.g., unused items on residents' front lawns for people to take and reuse, pop-up repair cafes, etc.) • Support existing sharing platforms and reuse and repair initiatives and track measurable reduction in waste to landfill and/or target high volume, complex or challenging waste streams.	L	L	Communication Services	Community Planning, CEA	0-2	$	
Policy	Commit to a zero-waste target, and develop a Zero Waste Strategy to eliminate 100% of divertible materials from Colwood's waste stream by: • Introduce regulations to ban and/or restrict problematic single-use plastics (e.g., account for equity/accessibility needs). • Work with the CRD to implement recycling and composting requirements for Single Family Homes, MURBs and the ICI sector • Work with local businesses and community partners to develop and deliver a cost-effective, city-wide organics diversion program. • Participate in the Provincial "Love Food Hate Waste" campaign and educate around source-separation requirements • Implement organics collection in public waste bins in high traffic areas throughout Colwood (including Recreation Centre, major shopping centres, transit hubs, etc).	L	M	Community Planning	Communication Services	0-2	$$	OCP Objective 10.3.4, Policy 10.3.4.1 OCP Objective 12.2.5

	• Implement a food waste prevention system and supporting infrastructure to recover edible food, by fostering connections between businesses and organizations to transfer unwanted food to communities in need. • Develop ambitious interim targets and revise pricing signals, bylaws, and educational programming accordingly (*3-5 years)*.							
Policy	Develop a local food production and food security policy and: • Support a weekly Farmers Market (e.g., parking lot at City Hall). • Revisit the idea of allowing roadside produce stands on private property. • Create a policy to support the creation of community gardens for food production. • The use of socio-economic data to prioritize areas to develop community gardens. • Consider developing a Food Security Strategy (3-5 years).	M	L	Community Planning	Communication Services	0-2	$	OCP Objective 14.2.1
Policy	Develop a community garden policy to support the retention of new sites for gardening and retain existing area.	H	L	Community Planning	Parks	0-2	$	
Partnerships & Engagement	Coordinate with the CRD and other relevant partners to advocate to provincial and federal governments for advanced Extended Producer Responsibility (EPR), 'Right to Repair' Legislation and restrictions on single use plastics/items (e.g., shopping bags, cups, straws, utensils, and takeout containers).	L	L	Community Planning	CRD	0-2	$	
Partnerships & Engagement	Partner with and support the Colwood Garden Society to teach community members about growing their own food, providing education on when to plant, what to plant, how to compost properly, and how to use natural fertilizers, etc.	M	L	Community Planning	Colwood Garden Society	0-2	$	OCP Objective 14.2.1

Data & Research	Obtain or initiate a local specific waste composition study to better understand the local waste stream and mechanisms to track local waste diversion progress over time.	L	L	Community Planning	CRD	0-2	$	OCP Objective 12.2.5

Strategy 5.2 Incentivize Eco-Innovation Networks & Programming

Tactic Class	5.2 Tactics to Support the Strategy	RRP	ERP	LD	SD	T	$	AP
City Operations	• Develop or support an eco-innovation and learning network to foster cleantech development, facilitate business-to-business connections, and identify top priorities for the sector and the city. • Develop and/or support public-private partnerships, pilot projects and innovation challenges that drive growth in climate-ready industries such as renewable energy, smart land-uses, nature-based solutions, low carbon mobility, energy efficiency and circular economy • Advance communications that showcase green, clean businesses and manufacturing activities (e.g., promotional materials, case studies, awards etc.). • Pilot a campaign that focuses on low carbon tourism/ecotourism opportunities that connect people with the local environment.	M	M	Community Planning	Chamber of Commerce, CRD, Royal Roads	0-2	$	OCP Objective 15.2.2
Education	Develop or support local outreach initiatives and training programs that help local businesses in reducing emissions and preparing for climate impacts. • Provide incentives and grants for low carbon resilience innovation that aligns with Colwood's CAP/climate priorities *(3-5 years).*	H	H	Community Planning	Chamber of Commerce	0-2	$	

Education	Work with the CRD and neighbouring municipalities to evaluate green, clean economic development strategies within the region, including: • Support for local businesses and industry sectors to reduce their climate risks, energy consumption and emissions, and reduce waste and pollution; • Explore opportunities related to the blue economy, in support of traditional and emerging marine-related industries.	M	H	Community Economic Development	Chamber of Commerce, CRD, Royal Roads	0-2	$	OCP Policy 15.2.2.7
Education	Collaborate with high schools, higher education institutions, and relevant non-profits to design collaborative green economy education and training programs for youth and equity-seeking populations.	L	L	Community Planning	Royal Roads	3-5	$	

Example Key Performance Indicators for Pathway 5 to Track our Progress

- Percent of organics diverted from landfill.
- Amount of food waste.
- Amount of food grown locally.
- Number of community gardens.
- Reductions in single use plastics sent to landfill.
- Recycling rates.
- Tonnes of waste per capita sent to landfill.
- Number of local clean tech, green infrastructure, etc. available.

8. Implementation by the City

Implementation and Expected Results

Based on actions implemented under an RCP 2.6 scenario, the City of Colwood will reduce emissions by 15,800 tCO_2e by 2030 versus BAU, and 46,700 tCO_2e by 2050, as shown in the wedge chart (figure 31). This translates to almost a 30% reduction vs. 2007 levels by 2030, and a 91% reduction by 2050. Addressing the remaining emissions by 2050 is noted below.

The largest individual actions by 2030 will be:

- Electrify Passenger Vehicles, 3,600 tCO_2e
- Organics Diversion, 3,300 tCO_2e
- Deep Retrofits, 2,400 tCO_2e
- Residential Heat Pumps, 2,100 tCO_2e

Note that reductions for Electrify Passenger Vehicles tapers off after 2033 as a result of increasingly stringent new vehicle purchase requirements from the Federal and Provincial Governments (until 100% of all passenger vehicles sold will be zero emission vehicles by 2035).

The Reductions from Other Sources category is included in the inventories that the CRD commissioned from Stantec in order to give a more complete picture of the emissions associated with the community, even though local governments have so little control over them. In order to meet net-zero targets, the plan assumes that other orders of government (i.e. Provincial, Federal) will implement legislation to curtail these emissions. These sectors include:

- Commercial Vehicles
- Off-Road Transportation
- Other Buildings
- Industrial Processes and Product Use (IPPU)

At the time of this report, it is not clear that Provincial and Federal policies to deal with these emissions will be implemented effectively, and so emission reductions to these have not been included in the BAU. In addition, in some cases, e.g., Commercial Vehicles or Off-Road Transportation, low-carbon options are close to, but not yet technologically mature.

Notwithstanding this issue, the City should not underestimate the amount of effort that will be involved to reduce its carbon liability as predicted in our modelling. Funds and staff capacity will need to be allocated, and actions will need to be implemented, in many cases with the support of the Regional District and other municipalities in the region.

The Remaining Carbon Liability will, in time, need to be tackled with further actions or augmenting existing ones. Future planning processes can reduce these remaining emissions with the new technologies, business cases, and policy and planning tools that will exist. By 2040-2050, at current trends and with current limitations in policy tools and technologies, we predict that most of the Remaining Carbon Liability will be from Residential Buildings, Commercial Buildings, and Waste (but not from Passenger Vehicles).

Expected GHG reductions under an RCP 2.6 scenario are also shown in the following Figures, both total and per capita. These clearly demonstrate where most of the remaining emissions are predicted to be. These also demonstrate how impressive Colwood's emission reductions could be on a per capita basis, although more work will still be needed.

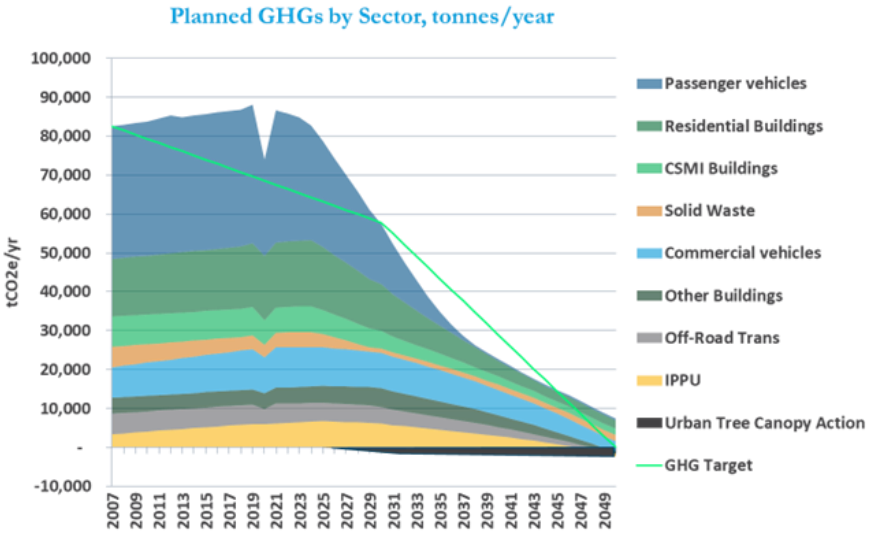


Figure 29: Planned GHG Emission Reductions

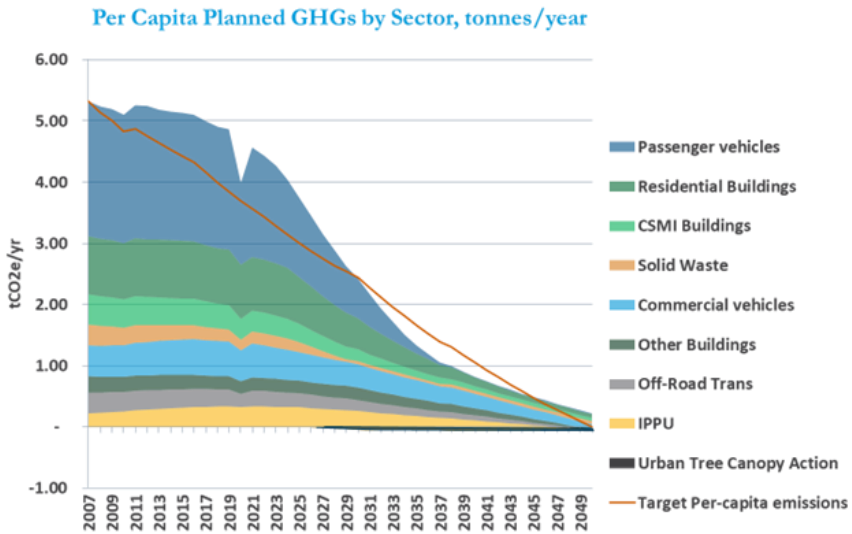


Figure 30: Per Capita Planned GHG Emission Reductions

In addition to reducing the remaining emissions, the City will need to continue to consider how a changing climate will affect its operations, residents, and businesses within it. This will be a challenge on many levels, including staying up-to-date with the latest science and being aware that things may not change in ways that have been predicted or are easy to prepare for. Future planning processes will need to reduce the community's risks and vulnerabilities to a changing climate at the same time as maintaining the pathway to net zero emissions and maximising all possible co-benefits for the community.

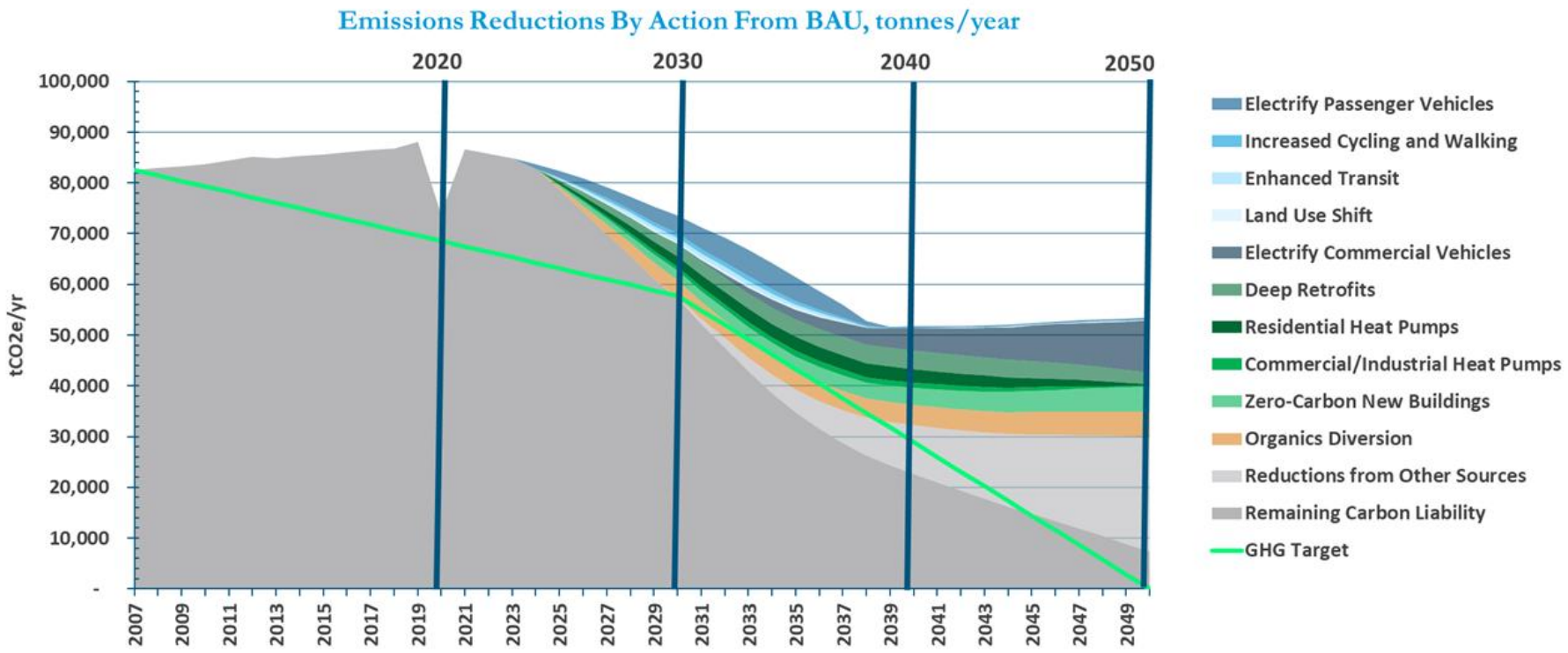


Figure 31: Emissions reductions by action from BAU tonnes/year

9. What Can Individuals and Families Do?

What Can Individuals Do?

We cannot rely on government action alone – we all have a role to play. Our success depends on everyone working together, including residents, businesses, community groups and other organizations.

Acting on climate change will ensure our community continues to be a healthy place for us – and future generations. The good news is that as we take action to reduce GHG emissions at home, on the road, and at work, we can also improve health and well-being, protect our natural environment, save money, support clean energy jobs, and prepare for extreme weather.

Where do our household emissions come from?

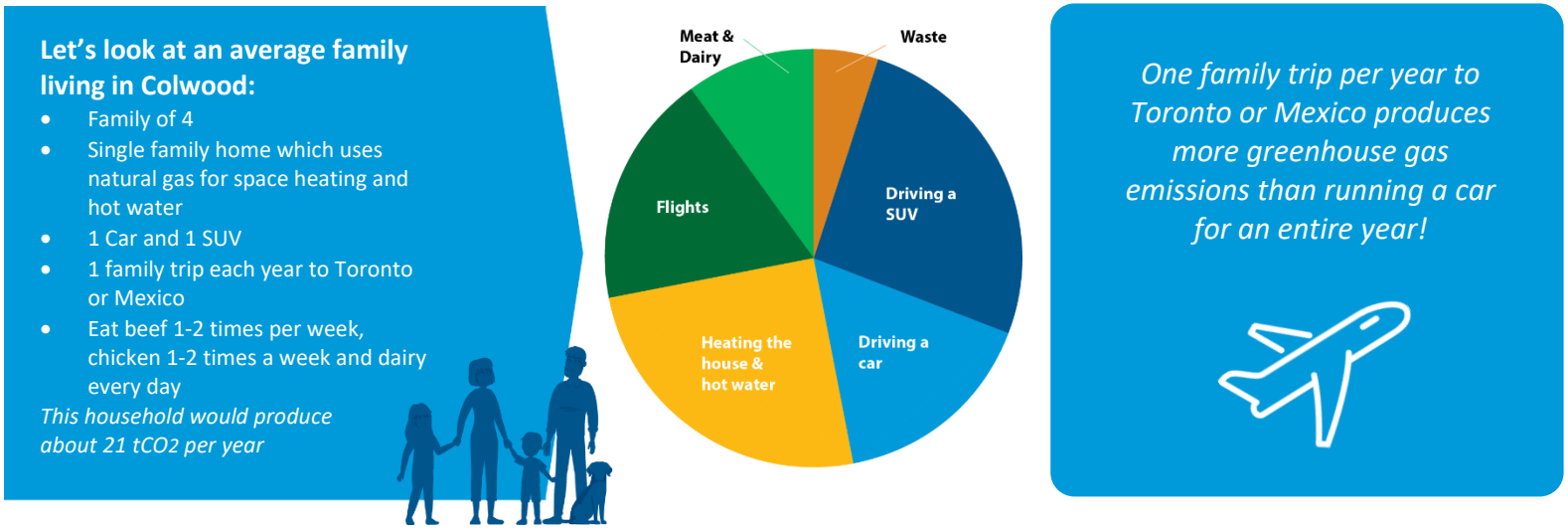


Figure 32: Snapshot of the emissions from the Average family in Colwood.

To tackle these emissions, individuals and families can conduct many actions. As a snapshot, you can:

- Drive less, and walk, cycle, or take the bus to work and school
- Compost kitchen waste
- Eat less meat
- Take a staycation instead of flying
- Replace your natural gas furnace with an air source heat pump
- Replace your household vehicle with an electric vehicle

Appendices

Appendix 1: City of Colwood Low Carbon Resilience Climate Terms of Reference

***Note: this initial draft climate lens tool developed by consultants will be revised by staff as part of the final Climate Action Plan**

Introduction

The City of Colwood declared a climate emergency in May 2019, and in [date] the City approved its Climate Action Plan. This plan uses an integrated climate lens to develop a comprehensive climate change roadmap for Colwood, that concurrently reduces climate risks and greenhouse gas (GHG) emissions, while also advancing other social, cultural, environmental, and economic priorities (also referred to as 'co-benefits').

Climate change impacts will influence staff work in all departments at the City of Colwood; the flipside is that all staff across the organization can also identify and act on key opportunities to advance climate action through ongoing operational work and/or new initiatives. These new terms of reference aim to support and guide staff toward a deeper understanding of projected climate changes and impacts, as well as key risks and opportunities associated with the design and implementation of municipal projects. The goal is to encourage more effective decision-making and investments for how the city develops under rapidly changing conditions. Decisions and investments made *now* will advance the leadership necessary to transition Colwood into a low carbon and resilient *future*.

To facilitate project alignment with the Climate Action Plan, City of Colwood Council Reports now have a requisite 'Climate Implications' section. This ensures that there is a high-level review and consideration - by both staff and council - of the climate implications of all future initiatives.

INSTRUCTIONS FOR STAFF

The following is a guidance document to aid staff in preparing and fulfilling the 'Climate Implications' section of Council reports. For projects under $50,000 (Tier 1 Projects) staff members are requested to follow the instructions in **Section A** of this guidance document.

For projects above $50,000 (Tier 2 Projects), more detailed analysis is required to ensure that projects that move forward are considering short and long-term climate risks and opportunities to avoid and/or reduce emissions, and ultimately, are contributing to the long-term resilience of Colwood's infrastructure, residents, and urban and surrounding environments. To complete the 'Climate Implications' section of Council reports for Tier 2 Projects, staff are requested to follow the instructions in **Section B** of this guidance document and fulfill an in-depth LCR assessment.

SECTION A: Tier 1 Projects

For projects with a budget under $50,000 please use the following instructions to complete the 'Climate Implications' section on the Council report.

To mainstream a climate lens in organizational decision making and planning, staff are now requested to identify the climate implications of proposed projects and initiatives.

Please use the prompts below as a guide for outlining how your proposed project is in alignment with the goals and targets of the Climate Action Plan, how the project will build resilience and reduce emissions over time, and how the project will advance other social, cultural, environmental, and economic priorities in Colwood. Please note that each prompt requires an answer, and 'not applicable' responses are discouraged and require an explanation.

Climate Implications

1. **Aligning with Colwood's LCR Climate Action Plan**

- Please identify which Pathways and Strategies from Colwood's Climate Action Plan that this project advances and clarify how:
- **Pathway 1: Municipal Leadership**
  - Strategy 1.1 Ensure Capacity and Resources for Ongoing Climate Action
  - Strategy 1.2 Update Emergency Planning and Responses to Prepare for Climate Change
- **Pathway 2: Transportation and Connected, Complete Communities**
  - Strategy 2.1 Growth Management and Smart Land Use
  - Strategy 2.2 Prioritize Connected Active Transportation Networks
  - Strategy 2.3 Support Enhanced Transit Services
  - Strategy 2.4 Promote Affordable and Accessible Zero Emissions Mobility
- **Pathway 3: Buildings and Infrastructure**
  - Strategy 3.1 Build Zero Emissions and Resilient New Buildings
  - Strategy 3.2 Promote Low Carbon and Resilient Building Retrofits
  - Strategy 3.3 Ensure Local Energy Accessibility and Security
- **Pathway 4: Natural Systems**
  - Strategy 4.1 Develop a Natural Asset Management Plan and Implement Policy
  - Strategy 4.2: Prioritize Connected Ecological Networks to Protect Habitat and Biodiversity
- **Pathway 5: Thriving Circular Economy and Eco-Innovation Hub**
  - Strategy 5.1 Promote Zero-Waste & Local Food Production for a Thriving Circular Economy
  - Strategy 5.2 Incentivize Eco-Innovation Networks & Programming

2. Ensuring Resilience in the Face of Projected Climate Risks

- Please identify the projected climate hazards the project may influence the lifecycle of the project. This will help ensure the resilience of both the project and the investment over time:
    - Climate hazards:
        - Extreme heat
        - Drought
        - Wildfire
        - Flooding
        - Extreme weather
        - Sea level rise and storm surge
        - New viruses
        - Other
    - For each hazard chosen, explain the measures that will be utilized to reduce impact.

- Please identify how the project will interact with the following risk areas, detailing if it is likely to increase or decrease risk, or have no impact. *Risk is defined as the combination of the likelihood of an event occurring and its negative consequences. Risk can be expressed as a function where risk = likelihood × consequence. In this case, likelihood refers to the probability of a projected impact occurring, and consequence refers to the known or estimated outcomes of a particular climate change impact.*
    - Risk Areas:
        - **Infrastructure and Service Delivery**
            - This project will increase risk to infrastructure and service delivery by…
            - This project will decrease risk to infrastructure and service delivery by…
            - This project will have no impact on infrastructure and service delivery.
        - **Population Health and Community Wellbeing**
            - This project will increase risk to population health and community wellbeing by…
            - This project will decrease risk to population health and community wellbeing by…
            - This project will have no impact on population health and community wellbeing.
        - **Urban Environment and/or Surrounding Ecosystems**
            - This project will increase risk to the urban environment and/or surrounding ecosystems by…
            - This project will decrease risk to the urban environment and/or surrounding ecosystems by…
            - This project will have no impact on the urban environment and/or surrounding ecosystems.
        - **Other (please list and clarify)**

- Climate change is expected to have severe and disproportionate impacts on already vulnerable groups (e.g. seniors, low income, people with disabilities, Indigenous people, etc.). Existing social and economic inequities are expected to exacerbate, and are likely to increase social and economic costs for the broader community. Have equity implications been considered in this project? Y/N
    a. *If no, why not?*
    b. *If yes, explain how.*

3. **Committing to Colwood's Net-Zero Emissions Targets**
    - Consider both construction and operations phases of the project and identify if and how the project will a) increase GHG emissions, b) neither reduce nor increase GHG emissions, or c) reduce or avoid GHG emissions.

4. **Advancing the Sustainability Benefits of Climate Action**
    - Please identify and explain how efforts to reduce climate risk and/or emissions will advance other social/cultural, environmental, and economic priorities in Colwood. *Refer the Climate Action Plan for descriptions of the co-benefits.*
        - Green economic growth and innovation
        - Improved air and/or water quality
        - Public mental and physical health
        - Community cohesion and livability
        - Carbon storage and/or sequestration
        - Awareness and education
        - Habitat and biodiversity
        - Regional collaboration and connectivity
        - Ecosystem preservation
        - Cost savings to the city and/or taxpayers

SECTION B: Tier 2 Projects

For projects with a budget over $50,000 please use the following instructions to complete the 'Climate Implications' section on the Council report.

To mainstream a climate lens in organizational decision making and planning, staff are now requested to identify the climate implications of proposed projects and initiatives.

Please use the prompts below as a guide for outlining how your proposed project is in alignment with the goals and targets of the LCR Climate Action Plan, how the project will build resilience and reduce emissions over time, and how the project will advance other social, cultural, environmental, and economic priorities in Colwood. Please note that each prompt requires an answer, and 'not applicable' responses are discouraged and require an explanation.

Climate Implications

1. **Aligning with the Climate Action Plan**

    Rationale: *All staff can play a role in addressing climate change by integrating climate risk and emissions data and triple bottom-line considerations into their strategic and operational work, and by collaborating across departments and sectors. Working in this way leads to avoided costs from*

climate-related damage over time, the advancement of emissions targets across all scales of government and institutions, and more impactful co-benefits.

- Please identify which, if any, departments will be collaborating on this project.

- Please identify which Pathways and Strategies from Colwood's LCR Climate Action Plan that this project advances and clarify how:
    - **Pathway 1: Municipal Leadership**
        - Strategy 1.1 Ensure Capacity and Resources for Ongoing Climate Action
        - Strategy 1.2 Update Emergency Planning and Responses to Prepare for Climate Change
    - **Pathway 2: Transportation and Connected, Complete Communities**
        - Strategy 2.1 Growth Management and Smart Land Use
        - Strategy 2.2 Prioritize Connected Active Transportation Networks
        - Strategy 2.3 Support Enhanced Transit Services
        - Strategy 2.4 Promote Affordable and Accessible Zero Emissions Mobility
    - **Pathway 3: Buildings and Infrastructure**
        - Strategy 3.1 Build Zero Emissions and Resilient New Buildings
        - Strategy 3.2 Promote Low Carbon and Resilient Building Retrofits
        - Strategy 3.3 Ensure Local Energy Accessibility and Security
    - **Pathway 4: Natural Systems**
        - Strategy 4.1 Develop a Natural Asset Management Plan and Implement Policy
        - Strategy 4.2: Prioritize Connected Ecological Networks to Protect Habitat and Biodiversity
    - **Pathway 5: Thriving Circular Economy and Eco-Innovation Hub**
        - Strategy 5.1 Promote Zero-Waste & Local Food Production for a Thriving Circular Economy
        - Strategy 5.2 Incentivize Eco-Innovation Networks & Programming

- Please comment on how this project advances Colwood's compliance toward other national and provincial net-zero (e.g. Canada's Emissions Reduction Plan) and/or resilience targets (upcoming Canada's Adaptation Strategy):

2. Ensuring Resilience in the Face of Projected Climate Risks

Rationale: *Colwood's resilience is a function of vulnerability, in other words, how sensitive and exposed our infrastructure, ecosystems, and populations are to climate change. Issues of* social *vulnerability and differential access to power, knowledge, and resources must also be taken into account when determining how to achieve equitable resilience outcomes for all.*

- Were downscaled climate projections for Colwood used to determine the projected climate impacts and hazards? Y/N
    - *If no, why not?*
    - *If yes, explain how.*

- Please identify the projected climate hazards the project may influence the lifecycle of the project. This will help ensure the resilience of both the project and the investment over time:
    - Climate hazards:
        - Extreme heat
        - Drought
        - Wildfire
        - Flooding
        - Extreme weather
        - Sea level rise and storm surge
        - New viruses
        - Other

- Please identify if and how the project will contribute to the life cycle resilience of Colwood's assets and infrastructure under projected climate changes over time and clarify your response.
        - The project is likely to increase the exposure of assets and infrastructure to climate change over time (e.g. located in floodplain, will contribute to urban heat island effect, etc.).
        - The project includes adaptations to projected hazards that are likely to decrease potential losses and/or damages to assets and infrastructure over time.
        - The project accounts for and avoids projected loss or damage to assets and infrastructure over time.
    - Explain Response:

- Please identify if and how the project will advance the resilience of Colwood's ecosystems (e.g. urban forests, green spaces, streams/creeks) and surrounding natural assets, and clarify your response.
        - The project will lead to losses of, or damages to Colwood's ecosystems and natural assets.
        - The project will limit negative impacts to Colwood's ecosystems and natural assets.
        - The project will protect, expand, and/or regenerate Colwood's ecosystems, natural assets, and the ecosystem services provided to the community.
    - Explain Response:

- Please identify if and how the project will minimize and/or avoid climate risks and costs for Colwood's residents over time, and clarify your response.
        - The project may increase inequities, increasing climate risks to vulnerable populations from climate hazards.
        - The project does not address the risks to vulnerable populations from climate hazards.
        - The project reduces risks to vulnerable populations from climate hazards.
    - Explain Response:

- Climate change is expected to have severe and disproportionate impacts on already vulnerable groups (e.g., seniors, low income, people with disabilities, Indigenous people, etc.). Existing social and economic inequities are expected to exacerbate and are likely to increase social and economic costs for the broader community. Have equity implications been considered in this project? Y/N
    - *If no, why not?*
    - *If yes, explain how.*

- How does the project consider the equitable distribution of benefits across our population?
        - The project primarily supports one group of stakeholders (e.g., homeowners, residents in a particular neighborhood/area, a specific economic sector etc.).
        - Project benefits will be *equally* distributed to the majority of Colwoodian's, so that all residents will reap the benefits equally (e.g., public green space).
        - The project will prioritize the most vulnerable groups, and help to build their adaptive capacity, so the benefits are *equitably* distributed across Colwood's population (e.g., affordable housing, green and efficiency retrofits for low-income homes to protect from heat and lower energy costs over time etc.).
    - Explain Response:

- Please identify if your project uses any other adaptive measures not already specified to minimize or avoid the hazards selected above.
    - Hazard 1:
        - *If no, why not?*
        - *If yes, explain*

3. Contributing to Colwood's Net-Zero Emissions Targets

Rationale: *Colwood has set a target to reduce its emissions by 80% of 2007 levels by 2050. As such, all new projects must be considered for their construction and operational emissions over the life cycle of the project, including the influences of projected climate changes over time (e.g., projected increased days over 30°C).*

- Please explain how the project will either increase, decrease, or avoid emissions over its life cycle across emissions sectors. Where possible, provide quantitative data.
    - Consumption of fossil fuels in buildings:
        - Increase (e.g., use of natural gas)
        - Decrease (e.g., heat pumps)
        - Avoid (e.g. renewable energy - hydro, solar, wind, etc.)
        - No effect

        Explain Response:

- Consumption of fossil fuels in vehicles:
  - Increase (e.g., increases car/fleet use)
  - Decrease (e.g., use of electric vehicles; car co-ops; ride-sharing)
  - Avoid (e.g. public transit, active transportation)
  - No effect

  Explain Response:

- Production of waste:
  - Increase in waste volume to landfill
  - Decrease in waste volume to landfill
  - No effect

  Explain Response:

- The use of high embodied GHG materials such as concrete, asphalt, cement, steel, and others:
  - Increase (e.g., conventional cement and steel)
  - Decrease (e.g., carbon cure, wood)
  - No effect

  Explain Response:

- The use of single occupancy vehicles.
  - Increase (e.g., SOV EVs)
  - Decrease (e.g., electric public transit)
  - No effect

  Explain Response:

- Direct removal of GHGs from the atmosphere via carbon sequestration, for instance by protecting and expanding natural assets or advanced carbon removal technology.
  - Increases GHG removal (e.g., tree planting)
  - Decreases GHG removal (e.g., wetland/forest conversion)
  - No effect

  Explain Response:

4. Advancing the Sustainability Benefits of Climate Action

Rationale: *Many important indirect benefits arise when we take climate action. In addition to reducing climate risk and emissions, additional social/cultural, environmental, and economic goals can also be advanced, such as cost savings, clean economic development, biodiversity, and health and well-being. Identifying opportunities to advance other sustainability priorities alongside climate actions builds public acceptance, and helps to catalyze and incentivize changes in decision-making, norms, and behaviors.*

- Does this project advance additional social/cultural, environmental, and/or economic benefits that build toward the resilience and sustainability of the city? Y/N
    - *If no, why not?*
    - *If yes, explain*

- Which of the following benefits will be advanced alongside the climate actions in this project? Check co-benefits boxes.

    - Green economic growth and innovation
    - Improved air and/or water quality
    - Public mental and physical health
    - Community cohesion and livability
    - Carbon storage and/or sequestration
    - Awareness and education
    - Habitat and biodiversity
    - Regional collaboration and connectivity
    - Ecosystem preservation
    - Cost savings to the city and/or taxpayers

- Were relevant stakeholders - those people and/or organizations who will be directly impacted by the project - engaged in the framing and/or decision-making related to this project? Y/N
    - *If not, why not?*
    - *If so, please identify the relevant stakeholder groups.*

- Have any external partnerships formed to support the implementation of the project? Y/N
    - *If not, why not?*
    - *If yes, please clarify who will be involved and how.*

5. Feasibility

Rationale: *The feasibility of actions to reduce climate risk and emissions is a critical success factor for effective climate action. Projects that are*

economically and technically feasible, and also publicly acceptable/desirable, have a greater chance of success and are likely to be implemented more efficiently and rapidly.

- Were there additional upfront costs associated with undertaking climate action in your project? Y/N
    - If not, why not?
    - If so, what were they?

- Have you performed a life-cycle assessment for the project that includes a return on investment (ROI) related to implementing climate-prepared actions now? Y/N

    - If not, why not?
    - If so, did your analysis include avoided climate damages and costs projected over the life cycle (e.g. any projected damages from flood, heat damage, wildfire, etc.)? Y/N
    - Explain:
    - If so, did your analysis include the influence of carbon pricing over time? Y/N
    - Explain:

- Please identify the level of public support for the project.
        - A majority of the public oppose the project.
        - There is equal public support and opposition.
        - A majority of the public supports the project.
    - Explain:

- Please identify if the funding required for this project is already in place. If yes, detail the expected sources and amounts.

- Please identify if the project will require additional staff resources and/or technical support to implement. If yes, please clarify what is needed.

Terminology

- **Adaptation:** Any initiative or action in response to actual or projected climate change impacts that reduces the effects of climate change on built, natural, and social systems.
- **Mitigation:** Any initiative or action that reduces the magnitude and rate of climate change, by reducing greenhouse gas (GHG) emissions.
- **Co- Benefits:** The beneficial social, cultural, economic, and/or environmental effects of a policy or action that aims to reduce climate change risks and greenhouse gas emissions. Effective climate action advances sustainable community priorities.
- **Low Carbon Resilience:** A step change in climate action that coordinates and mainstreams adaptation, mitigation, and co-benefits in municipal planning and decision-making processes.

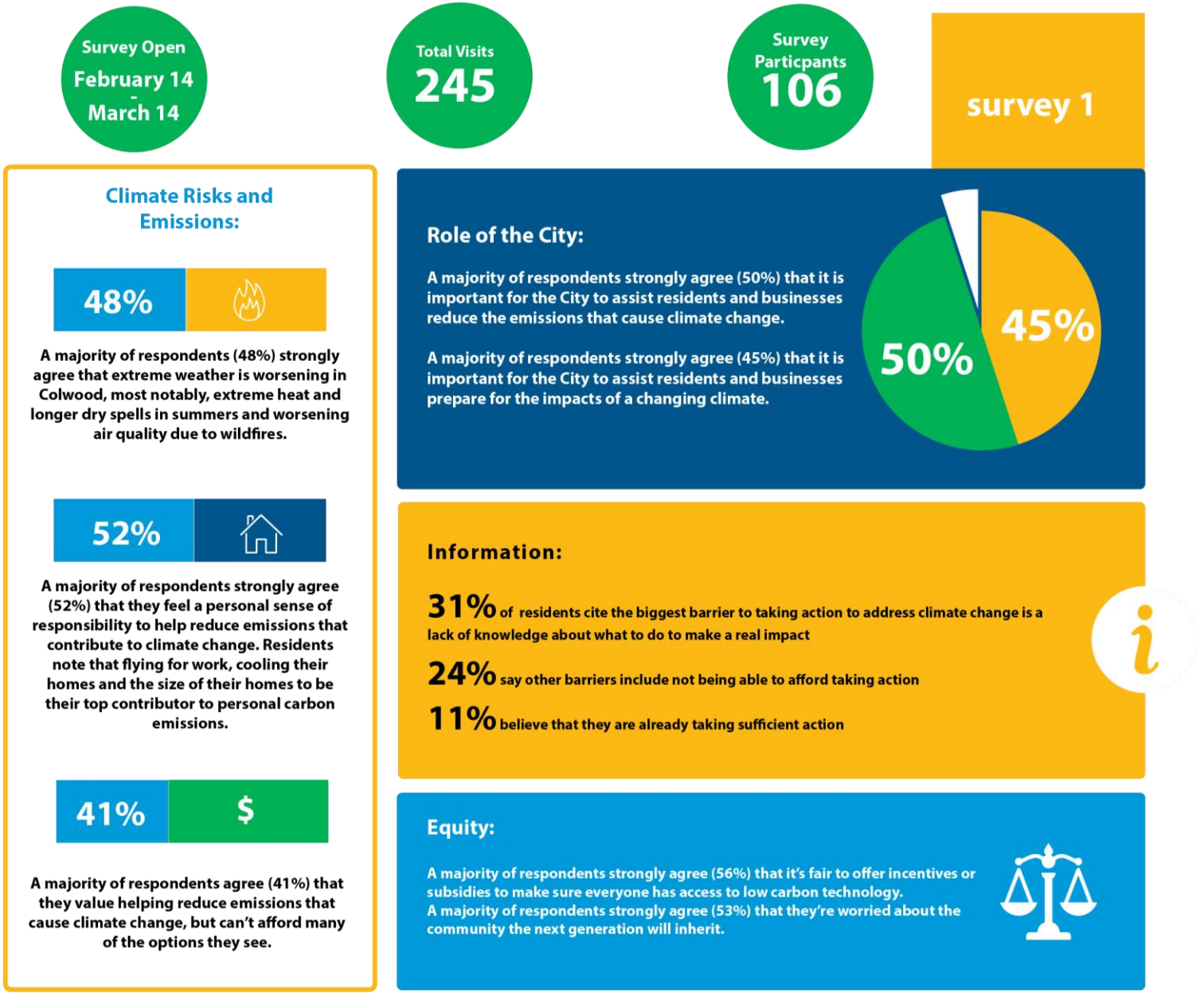
- **Risk:** The combination of the likelihood of an event occurring and its negative consequences. Risk can be expressed as risk = likelihood x consequence, where likelihood refers to the probability of a project impact occurring, and consequence refers to the known or estimated outcomes of a particular climate change impact.
- **Vulnerability:** The degree to which a system (built or natural) or jurisdiction is susceptible to harm arising from climate change impacts. A function of the community's sensitivity to climate change and its capacity to adapt to climate change impacts.
- **Climate Projections:** Climate modeling that projects changes in a specific geographic area and throughout a specific time frame.
- **Climate Hazard:** A biophysical event (e.g., drought, rain, or wind) that could cause potential impacts to a geographical area or community.
- **Climate Impacts:** The effects of existing or forecasted changes in climate on built, natural, and human systems. In other words, the effects of climate change on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure. For example, in Colwood increased risk of wildfires in surrounding areas can affect air quality and impact human health.
- **Vulnerable Populations:** A group of individuals within the general population who, due to either greater susceptibility and/or greater exposure, may be at greater risk than the general population of experiencing adverse effects from the impacts of climate change. Vulnerable populations can include women & girls; children & youth; the elderly; marginalized groups; persons with disabilities; persons with chronic diseases; low-income households; unemployed persons; and persons living in substandard housing.
- **Natural Assets:** Assets or features of the natural environment that provide or contribute to the provision of services required for the health, well-being, and long-term sustainability of a community.

Resources

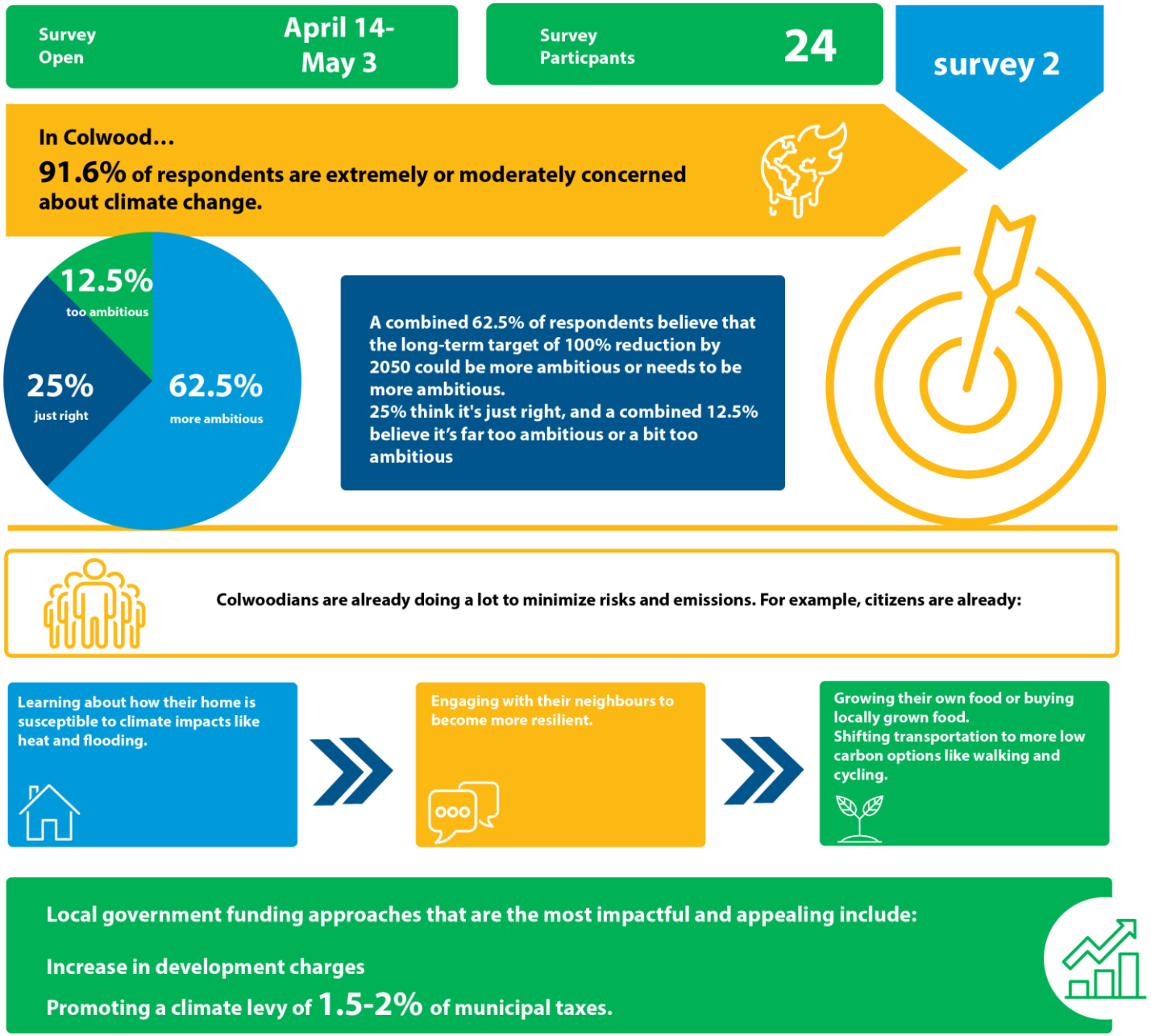
City of Colwood Climate Action Plan
Relevant Provincial and Federal Plans

Appendix 2: City of Colwood Climate Planning Public Engagement Surveys

Survey 1:



Survey 2


Survey Open
April 14- May 3
Survey Particpants
24
survey 2
In Colwood...
91.6% of respondents are extremely or moderately concerned about climate change.
12.5%
too ambitious
25%
just right
62.5%
more ambitious
A combined 62.5% of respondents believe that the long-term target of 100% reduction by 2050 could be more ambitious or needs to be more ambitious.
25% think it's just right, and a combined 12.5% believe it's far too ambitious or a bit too ambitious
Colwoodians are already doing a lot to minimize risks and emissions. For example, citizens are already:
Learning about how their home is susceptible to climate impacts like heat and flooding.
Engaging with their neighbours to become more resilient.
Growing their own food or buying locally grown food.
Shifting transportation to more low carbon options like walking and cycling.
Local government funding approaches that are the most impactful and appealing include:
Increase in development charges
Promoting a climate levy of 1.5-2% of municipal taxes.

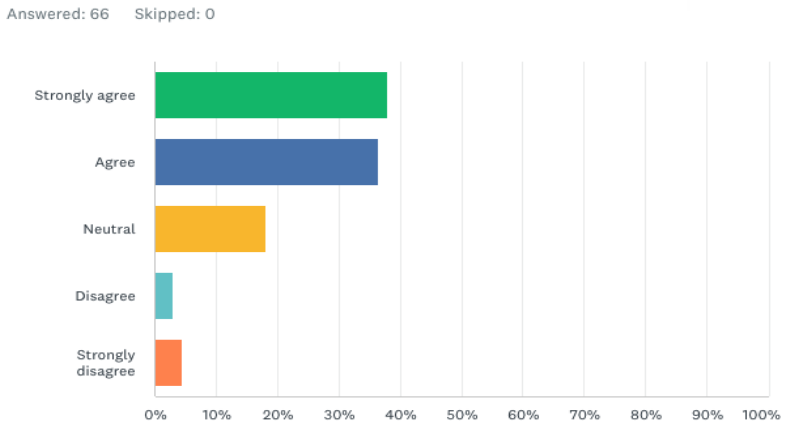
Youth Survey

Public Survey April 12 - May 2:

I feel worried about climate change: 38% strongly agree and **36%** agree

Hearing solutions make them feel more helpful about the future: 48% of students agree

Noticed changes in local climate and weather recently: 77% of students



From the youth survey, 38% strongly agree and 36% agree that they feel worried about climate change.

What do you think we should be doing in Colwood to fight climate change?

- Better road design, especially in Royal Bay, to cut down on people idling in traffic jams.
- Solar roofs should be taken into consideration for future developments, and less trees taken down.
- Plant more trees, fix the recycling system so things actually get recycled.
- More sustainable power that doesn't interrupt ecosystems.
- Stop cutting down trees, remove invasive species, add more places to grow food, increase access to public transportation.

What does a healthy and sustainable Colwood look like to you?

- Lots of trees/green-space, solar electricity, more transport by bus.
- Compost and recycling bins spread around the cities, city clean up volunteers, community shared electric bikes.
- Lots of greenery, renewable energies, a community that relies on more local food production maybe?
- A Colwood that is attuned to nature and where people care and are educated about the consequences their actions cause.
- Trees, people riding nonelectric bikes, kindness for every ethnicity no matter where they're from or the color of their skin.
- Less reliance on cars, more parks with trees, and most importantly: more sidewalks, because as it is, it is very difficult to walk even to nearby stores.
- Plants everywhere minimal litter.

"I feel worried about climate change"

Is there anything else you would like to share about how you're feeling about climate change?

- Change needs to happen fast and more funding is needed in this area.
- Very concerned - it feels like things are unraveling fast.
- I'm worried but hopeful. Colwood and Langford need to stop destroying forests to build new properties. Just stop.

Draft Climate Plan Review

November 2022 to February 2023:

The draft LCR Climate Action Plan was endorsed by Council for engagement on November 14, 2022. The review of the draft work was conducted through public and stakeholder engagement, including through Colwood's Let's Talk Platform. The following summarizes the results of this engagement:

Public and Stakeholder feedback was received from ten residents and organizations (including "CENiC" Citizen's Environmental Network in Colwood and Royal Roads University) via email and survey. Some lengthy and specific feedback was received.

Key Repeated Feedback:

- Strong support from respondents & sense of urgency
- Revise the plan to make it more accessible - reduce length, data/ scenarios and distractions from focus (including providing a new executive summary or introduction)
- Increase importance of natural environment (nature-based solutions)

Feedback from organizations and residents also noted extensive editing needed, recommended the identification of priority actions, and for more work on the key performance indicators in each pathway. Indigenous engagement and representation were recommended. Concerns were raised about including RNG, in part because it is not a zero-emission solution.

March to July 2023:

Additional Staff Review:

A revision of the initial climate plan document was recommended considering the feedback above and due to further staff feedback. This process included a review by the new internal Colwood Climate Action Team. The need for an updated plan was identified due to the importance of having a plan that is accessible, clear, engaging, and implementation ready. The initial draft LCR Climate Action Plan was revised to a report (Climate Planning Foundations Report) and an updated Climate Action Plan developed based on that foundational work and the feedback received.

Appendix 3: Colwood Climate Impacts

Hazard	Impact	Risk	Vulnerability
A biophysical event (e.g., drought, rain or wind) that could cause potential impacts.	The effects of existing or forecasted changes in climate on different built (e.g., infrastructure), natural (e.g., ecosystems), and human (e.g., health, economies, societies, cultures) systems.	The combination of the likelihood of an event occurring and its negative consequences. Risk = likelihood × consequence.	The degree to which a system or jurisdiction is susceptible to harm arising from climate change impacts. It is a function of a community's sensitivity to climate change and its capacity to adapt to climate change impacts.

Priority Risks & Vulnerabilities

Climate Impacts across Built, Social, and Environmental Systems Prioritized by Colwood's CAT			
Risk Priority	**Built - City Services & Infrastructure**	**Social - Population Health & Well-being**	**Environmental - Ecosystems & Natural Assets**
High Risk	• Increased cooling demand on the grid from buildings and facilities; related power surges/outages. • Intense rainfall events that lead to increased run-off and flooding, causing erosion, slope instability and landslides, overfilling of wetlands, exceeding capacity of sewer infrastructure, and affecting development (e.g., Royal Bay, Triangle Mountain). • Extreme weather events like heat waves, storms, and air quality advisories impact active transportation networks (and people in general). • Disruptions to services and supply chain.	• Intense heat/rainfall events cause health and safety risks such as respiratory illness, displacement, loss of life/property, poor water quality, and concerns for water disinfection and treatment. • Mobility concerns, especially for the elderly.	• Extreme weather, precipitation and sea level rise impact biodiversity and wildlife, specifically, the health of the bird sanctuary and requires heightened maintenance. • Temperature and precipitation changes impact the urban forest, specifically challenging Indigenous species to thrive.
Medium Risk	• Extreme weather causing disruptions and delays to transportation infrastructure and networks (e.g., Ocean Blvd and Lagoon Bridge). • Temporary flooding damages coastal infrastructure and requires heightened maintenance (e.g., bridge on Coburg Peninsula, drainage, transportation, buildings).		• Sea level rise causes habitats to shift landward and risks loss. • Flooding causes erosion and siltation, impacting fish-bearing streams and migratory bird habitat. • Changes in temperature and precipitation patterns lead to native habitat and native species loss (e.g., nesting bird habitats, salmonids, vegetation loss).

Appendix 4: Colwood Climate Data

Colwood Climate Futures	**Baseline**	**Low Emissions Scenario (RCP 2.6)**		**Medium Emissions Scenario (RCP 4.5)**		**High Emissions Scenario (RCP 8.5)**	
Variable	1976-2005	2021-2050	2051-2080	2021-2050	2051-2080	2021-2050	2051-2080
Mean Temperature	10.2°C	11.5°C	11.9°C	11.6°C	12.5°C	11.9°C	13.5°C
Mean Days with Maximum Temperature >25°C	11 days	21	23	22	35	26	54
Mean Days with Maximum Temperature >30°C	0.5 days	1	1	1	3	2	7
Mean Freeze Thaw Days	10.3 days	4.2	2.9	4.4	1.7	3.2	0.6
Heating Degree Days	2855 days	2428	2428	2401	2130	2314	1868
Cooling Degree Days	21 days	63	73	66	125	87	225
Total Precipitation (rain and snow combined)	922mm	970mm	962mm	957mm	971mm	953mm	999mm
Wettest Day (Max 1 Day Total Precipitation)	50.37mm	52.3mm	53.4mm	54.2mm	53.9mm	51.6mm	55.4mm
Data from Climatedata.ca for Colwood.							

Appendix 5: Priority Emissions Sources in Colwood – Further Details

The CRD has made available three different years of inventories for Colwood's greenhouse gas emissions: 2007, 2018, and 2020. The three are compared to identify changes over time, however more years of data would be needed to have confidence in any trends.

Due to the COVID pandemic, 2020 numbers can be used to show how the pandemic affected energy and emissions, but not be included in baseline emission projections. The inventory methodology was updated in the 2020 reporting year to include updated electricity emission factors, and also to integrate changes in reporting for certain sectors (described in the sectoral analysis). Note that there are varying degrees of uncertainty in aspects of the data.

In 2018, for the whole community of Colwood;

- Total energy consumption was 1,604,000 GJ
- Total GHG emissions were 85,000 tonnes of CO2e
- Total energy expenditure was $62,200,000

In 2020, for the whole community of Colwood;

- Total energy consumption was 1,483,000 GJ
- Total GHG emissions were 76,600 tonnes of CO2e
- Total energy expenditure was $57,300,000

Colwood's Energy, Emissions, and Costs by Sector and Fuel This section extends from the pie charts and brief discussions in the main body of the report.

Transportation --Passenger Vehicles and Commercial Vehicles

Passenger vehicles account for 41% of Colwood's GHG emissions and residents spend approximately $28.5 million annually at the gas station. Commercial vehicles account for 10% of emissions and businesses spend approximately $6.9 million annually on transportation fuel. Overall emissions from vehicles have only increased by 4% between 2007 and 2018, despite energy usage increasing by 11% during that same period, which may be due in part to low carbon fuel standards and improved vehicle emissions standards.

Buildings --Residential, Commercial, and Other Buildings

Residential buildings account for 20% of emissions, and commercial and industrial buildings account for 9% of emissions. It should be noted that multi-family buildings (e.g., apartment buildings) are typically categorized as commercial buildings in emissions inventories, since they often have a commercial utility account. Residents and businesses spend over $23 million annually on energy for their homes and buildings. Emissions from residential buildings have increased by 18% between 2007 and 2018 whereas emissions from commercial and industrial buildings have decreased by 1%. Significant increases in residential natural gas and heating oil contributed to the increase in emissions.

The emission factor for electricity was updated in the 2020 report to reflect the impact of imported energy. This increased the electricity emissions for the 2020 year by approximately 4 times, but also was applied retroactively for the 2018 year, increasing emissions by approximately 2.6 times.

Natural gas provides heating and hot water in residential and commercial buildings. It accounts for 23% of Colwood's emissions and 9% of community energy spend.

Electricity also provides heating and hot water in buildings, but also powers appliances (and some electric vehicles although this is still small). It accounts for 2% of emissions in Colwood and is responsible for 33% of community energy spend. Electricity in British Columbia is largely produced from renewable resources, and therefore has much lower emissions than natural gas. Currently, natural gas costs less per unit of energy than electricity, however energy prices may change in the future.

Heating oil, propane, and wood are the main source of heat in a relatively small number of homes in Colwood, therefore they do not contribute significantly to overall emissions.

Waste

Waste accounts for 4% of Colwood's emissions, and has no energy consumption or expenditure associated with it. Its decomposition in landfill results in emissions. Emissions from waste have decreased by 34% between 2007 and 2018, likely due to enhanced landfill gas capture at the Hartland landfill.

Agriculture, Forestry, and Other Land Use

Agriculture, forestry, and other land use (AFOLU) emissions are those that are captured or released because of land management activities. In Colwood, the 2020 report inventory methodology was updated such that AFOLU emissions were classified as disclosure only, and not to be included in inventories; they were included in the original 2018 report. For the purposes of this report, AFOLU emissions have been excluded from the inventory. Total land-use emissions sequestered for 2018 were 3,072 tCO_2e, and 3,208 tCO_2e in 2020. Sequestration has increased by 21% between 2007 and 2018, but the reason for this is unknown.

Other Emissions

Agriculture, forestry, and fishing activities emissions include those from buildings and facilities, and off-road transportation in this sector. They account for 5% of Colwood's emissions. Emissions from this sector decreased by 9% between 2007 and 2018. Off-road transportation emissions include those from aviation and marine transportation and account for 6% of Colwood's emissions. Emissions from this sector have decreased by 5% between 2007 and 2018.

Industrial Processes and Product Use

Industrial process and product use (IPPU) emissions include those from industrial processes that chemically or physically transform materials and products used by industry and end-consumers (e.g., refrigerants, foams and aerosol cans). IPPU emissions account for 7% of Colwood's total emissions. Emissions from this sector increased by 72% between 2007 and 2018. From the calculation methodology this is just due to increases in population in Colwood and increases in industrial emissions in BC – it is not due to any increase in emissions within the municipal boundary.

Pandemic Impacts

2020 saw major shifts in energy usage due to the COVID-19 pandemic. Passenger vehicle emissions were most affected, seeing a decrease of 41% vs. 2018 levels. Overall, on-road transportation saw a 25% reduction in emissions, while off-road transportation decreased by 21%. On the other hand, the pandemic resulted in considerably more time spent indoors, as reflected by a 21% increase in residential natural gas usage, and 13% increase in heating oil from 2018 to 2020. Residential electricity emissions also rose 71% during that period, but this was due to the updated emission factor more so than increased electricity usage, as usage only increased by 8%. Commercial building emissions remained relatively stable in 2020, despite many businesses being closed or seeing significantly reduced hours due to health restrictions.

Consumption Based Emissions

Of note, although this inventory does attribute a proportion of BC's industrial emissions to Colwood based on population, and a proportion of the emissions from Victoria airport to Colwood, there is no other attempt to attribute consumption-based emissions to the community. These emissions are generally outside of the scope of what municipalities can meaningfully address currently, but are important for everyone to think about when they are buying goods or services. How was your item created, how far did it travel, how is it packaged? These are all important questions to consider the embodied emissions of purchased consumer goods.

Appendix 6: Inventory and Modeling Methodology

Colwood's GHG inventory was created using data for buildings, transportation, waste, and other sectors sourced from the Stantec reports *Capital Regional District – Municipalities and Electoral Areas 2007 Base Year and 2018 Reporting Year Energy & GHG Emissions Inventory*, and *Capital Regional District – Municipalities and Electoral Areas 2007 Base Year and 2020 Reporting Year Energy & GHG Emissions Inventory,* herein referred to as the "Stantec Municipal Report 2018" and "Stantec Municipal Report 2020".

Selected methodological data will be made available in this report; for a full list of methodologies employed, please consult the following Stantec report: *Capital Regional District 2018 GPC BASIC+ Community Greenhouse Gas (GHG) Emissions Inventory Report*, herein referred to as the "Stantec CRD report". Based on the data compiled, full inventory years were created for 2007, 2018, and 2020.

The following emission sources were included as part of this inventory, and divided into the appropriate scope:

Scope 1 Emissions

Stationary Energy
- Residential buildings
- Agriculture, forestry, and fishing activities
- Commercial and institutional buildings, and facilities
- Energy industries
- Fugitive emissions from oil and natural gas systems

Transportation
- On-road
- Waterborne
- Aviation
- Off-road

Industrial Process & Produce Use (IPPU)
- Product Use

Agriculture, Forestry, and Other Land Use (AFOLU)
- Land-Use
- Livestock
- Aggregate Sources and Non-CO2 Emissions Sources On Land

Scope 2 Emissions

Stationary Energy
- Emissions from the consumption of grid-supplied electricity, steam, heating, and cooling

Scope 3 Emissions

Stationary Energy
- Transmission and distribution losses of electricity, steam, heating, and cooling

Transportation
- On-road
- Waterborne
- Aviation
- Off-road

Waste
- Solid waste disposal
- Biological treatment of waste
- Wastewater treatment and discharge

The Stantec CRD report states that:

- BC Hydro and Fortis BC provided the Province of BC electricity and natural gas consumption data in MWh and GJ, respectively.
- The Province developed 2007, 2010 and 2012 residential fuel oil, propane and wood GHG energy use estimates from the number and type of dwellings and the average dwelling consumption by authority and region from the BC Hydro Conservation Potential Review. This data was used to estimate the reporting year GHG emissions for all CRD members except for the District of Saanich and the City of Victoria who provided fuel oil estimates for residential and commercial buildings.
- Fortis BC provided the fugitive emission estimate.
- The CRD provided landfill gas energy generation data from the Hartland landfill.
- Applicable, off-road GHG emissions included in the Stationary Energy Sector are based on the 2020 NIR as prepared by Environment and Climate Change Canada. These emissions are pro-rated to the CRD on a per capita basis.
- The Province of BC provided 2007, 2010 and 2018 ICBC vehicle registration data.
- BC Transit provided total diesel and gasoline fuel use. This data was used to estimate GHG emissions from busses serving the CRD.
- The 2017 CRD Origin Destination Travel Survey was used to estimate on-road in-boundary and transboundary split for registered vehicles and busses. The CRD Origin Destination Travel Survey is based on travel patterns observed in the Capital Regional District (CRD) level.
- Aviation GHG emissions from the Victoria International Airport were estimated using 2015 aircraft flight profiles, and the total number of aircraft movements reported in 2018. These data sets were provided by the Victoria International Airport.
- Victoria harbour aviation GHG emissions were estimated using Victoria harbor aircraft movement statistics, estimated taxi times, and estimated fuel use for the DHC-6 Twin Otter type of plane. This data was taken from Statistics Canada.
- Marine watercraft GHG emissions were estimated using published BC Ferries fuel statistics. GHG emissions from the Coho Ferry, the Victoria Clipper Ferry, personal and commercial watercraft, were estimated based on a Study entitled “Marine Vessel Air Emissions in BC and Washington State Outside of the GVRD and FVRD for the Year 2000”. The Transport Canada Vessel Registration System provided the total number of registered waterborne vehicles for the reporting year.
- The Greater Victoria Harbour Authority provided an estimate of cruise ship emissions.
- Other off-road transportation emissions are based on the 2020 NIR as prepared by Environment and Climate Change Canada.

Emissions factors for the 2007 base year, and 2018 and 2020 inventory years are shown in the following table and are sourced from the 2020 National Inventory Report.

Emissions Factors Used for Inventory Years
Note: some of the emission factors have changed over time. For example, the emission factors for mobility fuels have decreased as a result of the Renewable and Low Carbon Fuel Requirements Regulation.

GHG/GJ, by Year	2007	2018	2020
On-road Mobility fuels	0.071	0.065	0.063
Off-road Mobility fuels	0.097	0.089	0.065
Non-Mobility Diesel	0.077	0.073	0.072
Electricity	0.010	0.009	0.011
Natural gas	0.050	0.050	0.050
Wood	0.023	0.023	0.023
Heating Oil	0.068	0.068	0.068
Propane	0.061	0.061	0.061

Inventory Assumptions

Assumptions made with respect to the inventory are as follows:

- The Province of BC made a series of standard assumptions in the creation of the CEEI data for 2007, which are outlined on the CEEI webpage: https://www2.gov.bc.ca/gov/content/environment/climate-change/data/ceei.

Additional assumptions were derived from the Stantec Municipal Report as follows:

- Stationary Energy: Propane, Wood and Fuel Oil – Residential Buildings. Propane, and wood GHG emissions were estimated using linear regression methods. The data used in the estimates included historical propane and wood energy data published in the 2007, 2010 and 2012 CEEIs, and heating degree days (HDD) published by Environment Canada. This approach was also applied to the estimate of heating oil for all local governments, except the City of Victoria and District of Saanich. For the District of Saanich and the City of Victoria, heating oil GHG emissions were estimated based on the number of known tanks, average heated floor areas and estimated average fuel volumes.
- Stationary Energy: Electricity and Natural Gas Consumption - All Buildings. Prior to releasing the electricity and natural gas consumption data, the Province completes a series of quality assurance and control checks which has resulted in the re-allocation of energy between local governments.

This data is then published on the Province's website. When the published 2007-2018 natural gas data was trended, several unexplained data anomalies and trends were identified for several local governments in the CRD. As these data anomalies and trends could not readily be explained, the raw natural gas data sets were acquired from FortisBC, reviewed and compared to the published data. In the 2007 and 2010 reporting years, the published data was under reporting natural gas volumes by upwards of 17% at the CRD level and had several large allocations between the City of Victoria and other local governments in 2012. Based on the issues with the published data, and on the basis the annual raw natural gas consumption trends align with the reported 2018 consumption data and align with historical raw data provided to the City of Victoria and the District of Saanich for their energy and GHG emissions inventories, the raw FortisBC dataset was used to estimate GHG emissions. A similar issue was noted for the Juan de Fuca electoral area and electricity data for the 2007, 2010 and 2012 reporting years (i.e., the under reporting of energy consumption) in the published data. As such, the raw electricity data from BC Hydro was used to estimate GHG emissions.

- Stationary Energy: Fugitives. FortisBC provided total fugitive emissions for the 2018 reporting year at the regional level. To estimate local government fugitive emissions, the value was prorated based on the number of reported natural gas connections (provided by Fortis BC). Since no historical numbers were provided, the 2018 value was applied to the 2007 base year as well. The estimate of fugitive emissions is an understatement of GHG emissions as FortisBC did not estimate the upstream GHG emissions as recommended by the GPC Protocol.
- Transportation: On-Road. The Province of BC provided Insurance Corporation of BC (ICBC) vehicle registration data from April 1, 2018 – March 31, 2019. When compared to local government population trends, there appears to be a high degree of uncertainty as to the accuracy of the 2018 vehicle registration data in terms of total registered vehicles. Without having reliable historical (e.g. 2011-2017) and current (2019) data to compare this dataset against, the reasonableness of the data was too uncertain to be applied in the estimation of GHG emissions for the 2018 reporting year. Therefore, to estimate on-road energy and GHG emissions for the 2018 reporting year, 2010 vehicle populations were grown in proportion to the reported changes in local government populations. Each of the local government vehicle profiles were then adjusted to match the proportion of vehicle classes reported in the 2018 ICBC data.
- Transportation: On-Road. In cases where vehicle registration counts were 10 or less, the Province assigned a value of "<10" rather than report the actual number. In these cases, the inventory assumes there was 10 vehicles of that particular classification. This is likely to result in an over-estimation of GHG emissions, but it will be immaterial to the overall GHG inventory.
- Transportation: On-Road. Vehicle fuel consumption rates and Vehicle Kilometers Travelled (VKT) were taken from the activity data summary for British Columbia on-road transportation from the 2018 National Inventory Report (1990-2018) as prepared by Environment Canada. Based on the clear diesel and clear gasoline consumption values reported by the Province of BC for the Victoria region, the VKT and fuel efficiency values are reasonable and result in a similar estimate of fuel consumption for the Region.
- Transportation: Aviation. 2018 aviation GHG emissions were estimated using 2015 aircraft flight profiles (the last available data), and the total number of aircraft movements reported in 2018. The emissions were prorated to each local government on a per capita basis.
- Transportation: Waterborne Recreational Watercraft. GHG emissions from recreational watercraft and US/Canada ferries were estimated based on a publicly available year 2000 study for the Victoria, Vancouver, and Washington harbors. These GHG emissions were prorated to each local government on a per capita basis.
- Transportation: Cruise Ships. The Greater Victoria Harbour Authority reported on cruise ship emissions for the 2018 reporting year but did not provide an estimate for 2007. As a result, no cruise ship emissions are included in the 2007 base year inventory.
- Waste: Solid Waste. To quantify GHG emissions from the Hartland Landfill, the CRD utilized the waste-in-place (WIP) method which is accepted under the GPC Protocol. The WIP assigns landfill emissions based on total waste deposited during that year. It counts GHGs emitted that year, regardless of when the waste was disposed. Except for the City of Victoria, who claims 31% of the CRD's landfill GHG emission, the remaining landfill GHG emissions were allocated to each local government on a per capita basis. Using this allocation method, the CRD members may over,

or underestimate associated solid waste GHG emissions as the current year landfill GHG emissions are based upon cumulative waste over time, and each member may have contributed more waste in past years than the current year (and vice versa).

- AFOLU: Aggregate Sources And Non-CO2 Emission Sources On Land. These emissions are based on the 2019 NIR as prepared by ECCC and the total area of farmland BC in 2016 as reported by Statistics Canada. These GHG emissions were assigned to each local government on a per hectare (ha) of cropland basis.
- AFOLU: Land-Use. The land cover change analysis requires a consistent land-use category attribution and spatial resolution for the 2007 base and 2018 reporting years. For the land use change analysis, land cover data was available for the 2007, 2011 and 2017 years for only part of the CRD. Unfortunately, no more recent or higher quality data source was available to represent the land cover consistently for all three years. Furthermore, since annual data was not available, the change between land cover data years (2007-2011, 2011-2017) was averaged and may not represent actual changes in each year.
- AFOLU: Land-Use. There was limited land-use datasets for the Juan de Fuca, Salt Spring Island and Gulf Island Electoral Areas and this data was only available for 2007 and 2011. On this basis, land-use GHG emissions estimates for these electoral areas has been withheld.

Business As Usual Projection

Data describing the community's emissions profile are provided for 2007, 2018, and 2020 only. Because of the COVID-19 pandemic though, emissions in 2020 were not deemed to be representative and were excluded from the BAU projections; 2018 data was used instead as the baseline for BAU projections. Emissions for the years in between are assumed to have followed a linear trajectory.

The assumption is that energy consumption and emissions will increase proportionally with increases to population, although the impact of policies from higher levels of government are also incorporated, and other assumptions. Only policies that have already been adopted and that will have quantifiable impacts are incorporated. Unless otherwise stated, all assumptions stated are for the RCP 4.5 scenario, which is used as the basis for modeling projections.

Assumptions related to projections are as follows:

- The Province's incremental steps to net zero energy ready buildings by 2032, via the BC Energy Step Code. In the RCP 8.5 scenario, Step Code reductions for new buildings have been removed.
- Federal and provincial tailpipe emissions standards: new light duty vehicle emissions decline from 200 g CO_2e/km in 2015 to 119 g CO_2e/km in 2025 (federal policy), and then decline again to 105 g CO_2e/km in 2030 (provincial strengthening of this policy). This is for new vehicles, and is included in the projections taking account of vehicle turnover rate
- Renewable & low carbon transportation fuel standards: 20% by 2030, as in CleanBC Plan
- An average annual decrease of 0.6-1.1% in natural gas consumption per residential connection is included, to align with FortisBC planning
- Public sector buildings will have their GHGs reduced by 80% by 2050, and are assumed to account for 3% of all commercial buildings. In the RCP 8.5 scenario, this assumption has not been included. For the RCP 2.6 scenario, it is assumed that *all* commercial buildings will undergo an 80% reduction in emissions by 2050
- In the RCP 2.6 scenario only, RNG content in the natural gas stream will increase to 15% by 2030, thereby reducing the emission factor for natural gas to 0.042 tCO_2e/GJ. Natural gas consumption will also be gradually phased out, reducing by 7% in 2030, 54% in 2040, and 96% in 2050.
- The Province's CleanBC Roadmap commitment to Zero Emission Vehicle Mandate of 100% of new vehicles by 2035. From the impacts of this, in our BAU scenario we assume that the proportion of electric vehicles on Colwood's roads will be:

- 14% in 2025
- 40% in 2030
- 99% in 2040 (even with 100% of all new vehicles sold having zero emissions, there is still a lag with vehicle turnover rates)
- In the RCP 8.5 scenario, this mandate has been removed from BAU projections

- How the impacts of a changing climate will affect building energy consumption:
  - Climate change data for the region was obtained from ClimateData.ca. CEA obtained this from the "downloads" section of the website, selected the BCCAQv2 (annual) dataset, Heating Degree Days (HDD's) or Cooling Degree Days (CDD's) variables, and the location on the map to be analysed
  - Projected global emissions to 2030 currently places the world in the range for the IPCC's Fifth Assessment Report's Representative Concentration Pathway (RCP) 6.0 scenario. As RCP 6.0 scenario not available on ClimateData.ca, RCP 4.5 (median values) were used as a proxy even though this is a more conservative scenario
  - Decreases in residential and commercial natural gas consumption are assumed to be proportional to decreases in HDD's and the proportions of natural gas consumed for space heating for each sector, with this data obtained from the Navigant 2017 Conservation Potential Review for FortisBC Gas
  - Based on ClimateData.ca RCP 4.5 median values, the 30-year average of HDD's around 2018 are 2,920, and in 2050 they will be 2,492. For the RCP 2.6 scenario, 2018 HDD's are 2,905 and 2050 HDD's are 2,554. For the RCP 8.5 scenario, 2018 HDD's are 2,902 and 2050 HDD's are 2,292.
  - Decreases in residential and commercial electricity consumption are assumed to be proportional to decreases in HDD's and the proportions of electricity consumed for space heating for each sector. However, for residential this is partially offset by, and for commercial more than offset by the proportions of electricity consumed for space cooling by each sector and how this will increase proportional to projected increases to CDD's. These proportions were obtained from the Navigant 2016 Conservation Potential Review for BC Hydro
  - Based on ClimateData.ca RCP 4.5 median values, the 30-year average of CDD's around 2018 are 36, and in 2050 they will be 96. For the RCP 2.6 scenario, 2018 CDD's are 36 and 2050 HDD's are 77. For the RCP 8.5 scenario, 2018 HDD's are 38 and 2050 HDD's are 139.

Appendix 7: Exploring Colwood's LCR CAP Pathways across Different Emission Scenarios

RCP 8.5 - High Emissions and High Risk *What We Need to Avoid*	**RCP 4.5 - Medium Emissions and Medium Risk** *What We're on Track to Meet*	**RCP 2.6 - Low Emissions and Low Risk** *What we Should Strive For*
Pathway 1: Strong Municipal Leadership on Low Carbon Resilient Solutions		
• Climate action is considered to be an expensive undertaking, and few understand that without factoring it in costs to the city, businesses, and individual households are projected to dramatically increase as will damages from more frequent and severe extreme weather events.	• Coordinated adaptation and mitigation responses to climate change support aligned responses and decision-making. Staff and residents are motivated to anticipate future impacts and are beginning to understand the importance of responding to these impacts using low emissions strategies. The City is a leader in integrated climate action.	• Climate risk and emissions data are integrated into all decisions, ranging from procurement, to land-use planning, asset management, capital expenditures, and development permitting. This commitment showcases Colwood as a nationally recognized leader in climate action that other communities model. Staff and resident climate literacy ensures community safety and resilience now and into the future, while advancing the overall sustainability of the area.
Pathway 2: Low Carbon Transportation and Connected, Complete Communities		
• The 2018 OCP states that currently, only two percent of Colwood's population lives within a 5-minute walk of a grocery store and just 13% live within a 10-minute walk of one. This maintains **high vehicle kilometers traveled (VKT) (85%) in single occupancy vehicles (SOVs)** and requires residents to take trips outside the city. • Wider roads and greater parking infrastructure increases the number of cars on the road, in turn **increasing emissions and air pollution by 5% by 2030. 31% of passenger vehicles on the road are EVs.**	• Intentional growth and land use planning leads to greater walkability and proximity to services as well as greater collaborations between the City and BC Transit on the development of bus rapid transit to Victoria, and alternative transit routes within the City. This **reduces commuter VKT to 70% in SOVs.** • EV infrastructure and incentives continue, in alignment with CRD direction. Linking new development to services and promoting alternative mobility options **by 2030 reduces air pollution by 26% from reductions in gas and diesel consumption. 41% of passenger vehicles on the road are EVs.**	• The City promotes vibrant mixed commercial-residential developments, with amenities and services nearby, keeping people and money in the City and increasing opportunities for local businesses, social interaction and cultural development, and alternative transportation options. These factors, in addition to strong public and active transportation networks, work together on a systems-level to reduce **VKT in SOVs by 57% and air pollution by 39% by 2030. 50% of passenger vehicles still driving on the road are EVs.**
Pathway 3: Low Carbon and Resilient Buildings and Infrastructure		
• To protect assets worth $25.4 million in the area of Colwood that is projected to be heavily impacted during a 500-year storm surge event by 2100, shorelines will need to be fortified to protect against up to an estimated 1.39m rise in sea levels.22F22F22F22F22F[20] Constructing a barrier to protect shorelines will cost taxpayers millions of dollars, devastate intertidal habitat, and contribute **an additional**	• New infrastructure in high risk areas is minimized. A naturalized shoreline approach is applied to buffer against storm surges and sea level rise, protecting key assets and biodiversity at the same time. **This reduces taxpayer costs and minimizes the embodied emissions of new**	• Infrastructure and assets are significantly retrofitted with resilient design or moved entirely, if necessary, at timely intervals. The coastline and marsh become a critical part of the community, operating as education sites for the protection of biodiversity, and habitat changes over time. Salt marshes and eelgrass beds are rehabilitated and expanded along shorelines to minimize the force of waves

[20] CRD. (2015). Capital Regional District Coastal Sea Level Rise Risk Assessment. Retrieved from: https://www.crd.bc.ca/docs/default-source/climate-action-pdf/reports/coastal-sea-level-rise-risk-assessment-report.pdf?sfvrsn=c09757ca_0

37,000 tCO_2e in concrete-based embodied emissions to the atmosphere --this is more than the annual emissions from all buildings in Colwood, or about 40% of Colwood's annual emissions. • For new buildings, the Step Code is not implemented, **and energy efficiency improvements in the BC Building Code are not implemented by the Province or not enforced.** • For existing buildings, heating oil will continue to be used in some buildings, and natural gas will continue to be the default fuel. **No building retrofit programs will take place.**	**shoreline infrastructure from 37,000 tCO_2e (RCP 8.5) to 9,000 tCO_2e.** • For new buildings, a tiered Step Code approach is rapidly introduced which **reduces GHG emissions from new buildings by 90% on average.** • For existing buildings, heating oil will be eliminated, and an ambitious energy efficiency retrofit program for buildings has been started. **2% of buildings will fuel switch from natural gas to air source heat pumps every year, and 3% will undergo an energy efficiency retrofit to reduce emissions by 33%.** This will be difficult.	and sequester carbon. These early efforts avoid damages and costs into the future, avoid the cost and embodied emissions of hardened infrastructure, and save taxpayers money over time. **Even if it becomes necessary to build protective features, a lower barrier would be required and embodied emissions would be 6,200 tCO_2e compared to 37,000 tCO_2e in RCP 8.5.** • For new buildings, a tiered Step Code approach is rapidly introduced which **reduces GHG emissions from new buildings by 90% on average.** • For existing buildings, heating oil will be eliminated, and a very ambitious energy efficiency retrofit program for buildings has been started. **3% of buildings will fuel switch from natural gas to air source heat pumps every year, and 6% will undergo an energy efficiency retrofit to reduce emissions by 33%.** This will be extremely difficult.
Pathway 4: Connected Urban and Natural Systems		
• **Colwood has lost 24.2% of tree cover in 25 years, between 1986-2011.**23F23F23F23F23F[21] **This trend continues at an accelerated rate into the future; an additional 12% of vegetated land cover is converted to non-permeable surfaces by 2030.** • Habitat loss is accelerated, and fragmented ecosystems lead to declines in biodiversity and ecosystem service provision. • Escalating extreme heat events coupled with reductions in vegetated land cover results in increases in heat-related hospital visits by 2050.24F24F24F24F24F[22].	• Colwood's commitment to brownfield development minimizes further losses in land cover and encroachment. **Tree canopy cover is expanded by 109 ha, which helps to reduce stormwater runoff by approximately 2.5%.** • Habitat loss and fragmentation is minimized, and ecosystems are supported, but not thriving.	• **The urban tree canopy is expanded by an additional 327 ha, increasing ground permeability and reducing stormwater runoff by 7.5% compared to keeping it the same.** • Ecosystem protection and regeneration is strategic, supporting connected and biodiverse ecosystems that provide numerous services at minimal costs. • Residents spend more time outside and feel less exposed to extreme heat and other climate risks, **reducing heat-related hospitalizations by 30% compared to RCP 8.5.**
Pathway 5: Thriving Circular Economy and Eco-Innovation Hub		
• Rates of consumption and a waste rate of 382 kg per capita are maintained. **Only 38% of organics** are diverted from the landfill, contributing to high levels of methane.	• Waste retrieval and re-use is incentivized, reducing landfill waste in spite of population growth. **Between 65-80% of organics and compostables are diverted and landfill waste is significantly minimized by 2030.**	• **Between 80-100% of organics and compostables are diverted and landfill waste is significantly minimized by 2030.**

[21] CRD. (2011). Capital Regional District Land Cover Mapping – 1906, 2005, and 2011 Summary Report. Retrieved from: https://www.crd.bc.ca/docs/default-source/es-watersheds-pdf/crd_2011_land_cover_summary_report_final.pdf

[22]Canadian Institute for Climate Choices. (2021). The Health Costs of Climate Change: How Canada can Adapt, Prepare, and Save Lives. Retrieved from: https://climatechoices.ca/wp-content/uploads/2021/06/ClimateChoices_Health-report_Final_June2021.pdf

Appendix 8: RCP 8.5 Scenario Doing the Minimum: High Emissions, High Impacts and Reacting to Climate Change as it Comes

- **Governance:** Planning and investments in the City and region continue along current trends, and there are missed opportunities to save time and resources. Residents demand more parking and wider roads to reduce congestion, but rarely connect these demands with their associated costs, including upward pressure on taxes, encroachment into natural areas, and even more congestion and air pollution. Climate action is considered to be an expensive undertaking, and few understand that without factoring it in costs to the city, businesses, and individual households are projected to dramatically increase as will damages from more frequent and severe extreme weather events. A constant stream of siloed, conflicting priorities leaves little time and money to anticipate and prepare for climate impacts or ways to reduce climate risk and emissions. Instead, a wait and see approach is adopted, leading to reactive and far more expensive responses to climate impacts into the future.
- **Transportation:** Colwood remains a bedroom community of Victoria and most of the population relies on single occupancy vehicles (SOVs) to commute to work and for shopping and services. Just 2% of Colwood's population lives within a 5-minute walk of a grocery store and just 13% live within a 10-minute walk of one, requiring residents to take trips outside the city and maintaining **high vehicle kilometers traveled (VKT) (85%) in SOVs**. This takes money out of the city, increases the transportation cost burden as people struggle to keep up with rising gas prices, and adds pressure to families due to increased amounts of time spent in congestion. Opportunities to charge electric vehicles remain limited, especially for people in multi-unit residential buildings (MURBs). The City pilots bike and walking paths but few people use them; this lack of demand minimizes alternative transportation options as a city priority. Public transit is limited due to low demand, spread out, low-mid density communities, high expense, and population size. Wider roads and greater parking infrastructure increases the number of cars on the road, in turn increasing emissions and **air pollution (5% by 2030).** Ground-level ozone from tailpipe exhaust, combined with increased extreme heat events, increases hospital visits for respiratory illnesses.
- **Land use and Infrastructure:** Development trends that emphasize low to mid-density continue. The building stock is built to the Step Code Efficiency Standards already adopted but most new buildings still use natural gas for heating. Resilience and green design standards are voluntary among developers and retrofit initiatives remain low, leaving a high proportion of both existing and new building stock vulnerable to more frequent and severe extreme temperature, precipitation, weather events, and poor air quality events from more frequent wildfire smoke in the summers. This results in higher maintenance and retrofit costs over time.
- **Urban and Natural Systems: Colwood has lost 24.2% of tree cover in 25 years, between 1986-2011.[23] This trend continues at an accelerated rate into the future; an additional 12% of land cover is converted to non-permeable surfaces by 2030** with implications for the flows of water and stormwater into sub-catchment areas and leading to increases in surface flooding under a rapidly changing climate. Encroachment into natural areas erodes the ecosystem services being provided to the community for free such as flood protection and water filtration services from riparian areas, wetlands, ponds, and permeable surfaces, and temperature moderation services provided by

[23] CRD. (2011). Capital Regional District Land Cover Mapping – 1906, 2005, and 2011 Summary Report. Retrieved from: https://www.crd.bc.ca/docs/default-source/es-watersheds-pdf/crd_2011_land_cover_summary_report_final.pdf

forests, urban tree canopy, and other land cover. As Colwood's natural assets are eroded, residents are required to pay for the infrastructure needed to replace those services. Loss in land cover also leads to rapid biodiversity loss and minimizes resident's connection to the natural assets they once frequented. **Increases in extreme heat events coupled with reduced land cover results in increases in heat-related hospital visits by 2050.**[24] To protect assets worth $25.4 million in the area of Colwood that is projected to be heavily impacted during a 500-year storm surge event by 2100, shorelines will need to be fortified to protect against up to an estimated 1.39m rise in sea levels.[25] Constructing a barrier to protect shorelines will cost taxpayers millions of dollars, devastate intertidal habitat, and contribute **an additional 37,000 tCO_2e in concrete-based embodied emissions to the atmosphere --this is much than the annual emissions from all buildings in Colwood, or about 40% of Colwood's annual emissions.**

- **Waste & Local Economy:** Colwood maintains rates of consumption and a waste rate of 382 kg per capita. **Only 38% of organics** are diverted from the landfill and there are missed opportunities to connect compost and reusable materials with local businesses and agriculture.[26]

RCP 4.5 Scenario Getting Proactive: Reducing Priority Climate Vulnerabilities, Risks, and Emissions

- **Governance:** The City of Colwood undertakes coordinated adaptation and mitigation responses to climate change to support aligned responses and decision-making. Staff and residents understand the initial impacts of climate change, based on the 2021 heat dome, wildfires, and atmospheric flooding that took place across the province. They are motivated to anticipate future impacts and are beginning to understand the importance of responding to these impacts using low emissions strategies. The City undertakes a leadership role by retrofitting its highest-emitting and most climate-vulnerable buildings with heat pumps and green design features that minimize heat and flood risks over time. It continues to gradually convert its fleet to zero-carbon and begins to better understand climate-exposure in the community. The city encourages consideration of key natural assets and the ecosystem services such as flood and heat protection that are being provided to the community for free; provoking a reconsideration of land-uses into the future and an urgency to restore and/or expand natural areas and green space. The City advocates for complete, compact communities and explains cost-effectiveness of density for the consumer (e.g., water and energy costs savings), the advantages for the taxpayer (e.g., lower infrastructure replacement and running costs), and to the local government (e.g., higher tax revenue per parcel).
- **Transportation:** The City continues to identify opportunities to increase density and minimize parking per capita. Capital projects for active transportation create walkable and bikeable paths, connecting different neighbourhoods throughout the City. New, concentrated development hubs ensure that services are within a 15-minute walk of over half of the population. This leads to greater collaborations

[24]Canadian Institute for Climate Choices. (2021). The Health Costs of Climate Change: How Canada can Adapt, Prepare, and Save Lives. Retrieved from: https://climatechoices.ca/wp-content/uploads/2021/06/ClimateChoices_Health-report_Final_June2021.pdf

[25] CRD. (2015). Capital Regional District Coastal Sea Level Rise Risk Assessment. Retrieved from: https://www.crd.bc.ca/docs/default-source/climate-action-pdf/reports/coastal-sea-level-rise-risk-assessment-report.pdf?sfvrsn=c09757ca_0

[26] CRD. (2018). Solid Waste Management Plan Existing Solid Waste Management System. Retrieved from: https://www.crd.bc.ca/docs/default-source/recycling-waste-pdf/2018existingsystemsreport.pdf

between the City and BC Transit on the development of bus rapid transit to Victoria, and alternative transit routes within the city, **reducing commuter vehicle kilometers traveled (VKT) to 70% in SOVs**. EV infrastructure and incentives continue, in alignment with CRD direction. Linking new development to services and promoting alternative mobility options by 2030 **reduces air pollution by 26% from decreases in gas and diesel consumption**, improves access to green space by repurposing existing transportation infrastructure, supports local business, and increases social interactions within the community, thereby supporting the physical and mental health of residents.

- **Land-use:** A greater variety of building stock (e.g., MURBs, laneway houses, and suites) is advanced due to density and infill objectives, creating more housing options for a range of incomes. The City has a policy for new buildings to be outfitted with heat pumps, minimizing energy use despite a growing population, lowering energy costs to the consumer, and providing heating, cooling and developments and air quality protections into the future. **Each year, 3% (~200) of homes are retrofitted per year with improved energy efficiency and 2% (~140) with heat pumps,** creating a strong cumulative impact to minimize emissions in a small, yet growing community. New developments are built solar-ready as the City considers its efforts to mitigate spikes in summer electricity consumption, and opportunities to reduce energy cost burdens and increase energy security for residents by 2030.
- **Urban and Natural Systems:** Colwood's commitment to brownfield development minimizes further losses in land cover and encroachment. **Tree canopy cover is expanded by 109 ha, which helps to reduce stormwater runoff by approximately 2.5%.** The city protects and expands existing natural assets with the understanding that the value of ecosystem services provided will increase over time and require far fewer maintenance costs than gray infrastructure. Green infrastructure is viewed as an opportunity to complement and support these services while providing connected green spaces and habitat. The city plants adaptive street trees to provide shade and habitat, and institutes green policies and bylaws to increase permeable surfaces on public and private lands to prepare now for projected increases in extreme heat and precipitation events. The city emphasizes a naturalized shoreline approach to buffer against storm surges and sea level rise, protecting key assets and biodiversity at the same time. **This reduces taxpayer costs and minimizes the embodied emissions of new shoreline infrastructure from 37,000 tCO_2e (RCP 8.5) to 9,000 tCO_2e.**
- **Waste & Local Economy:** The City of Colwood incentivizes waste retrieval and re-use, reducing landfill waste by 33%, in spite of population growth. **Between 65-80% of organics and compostables are diverted and landfill waste is significantly minimized by 2030.**

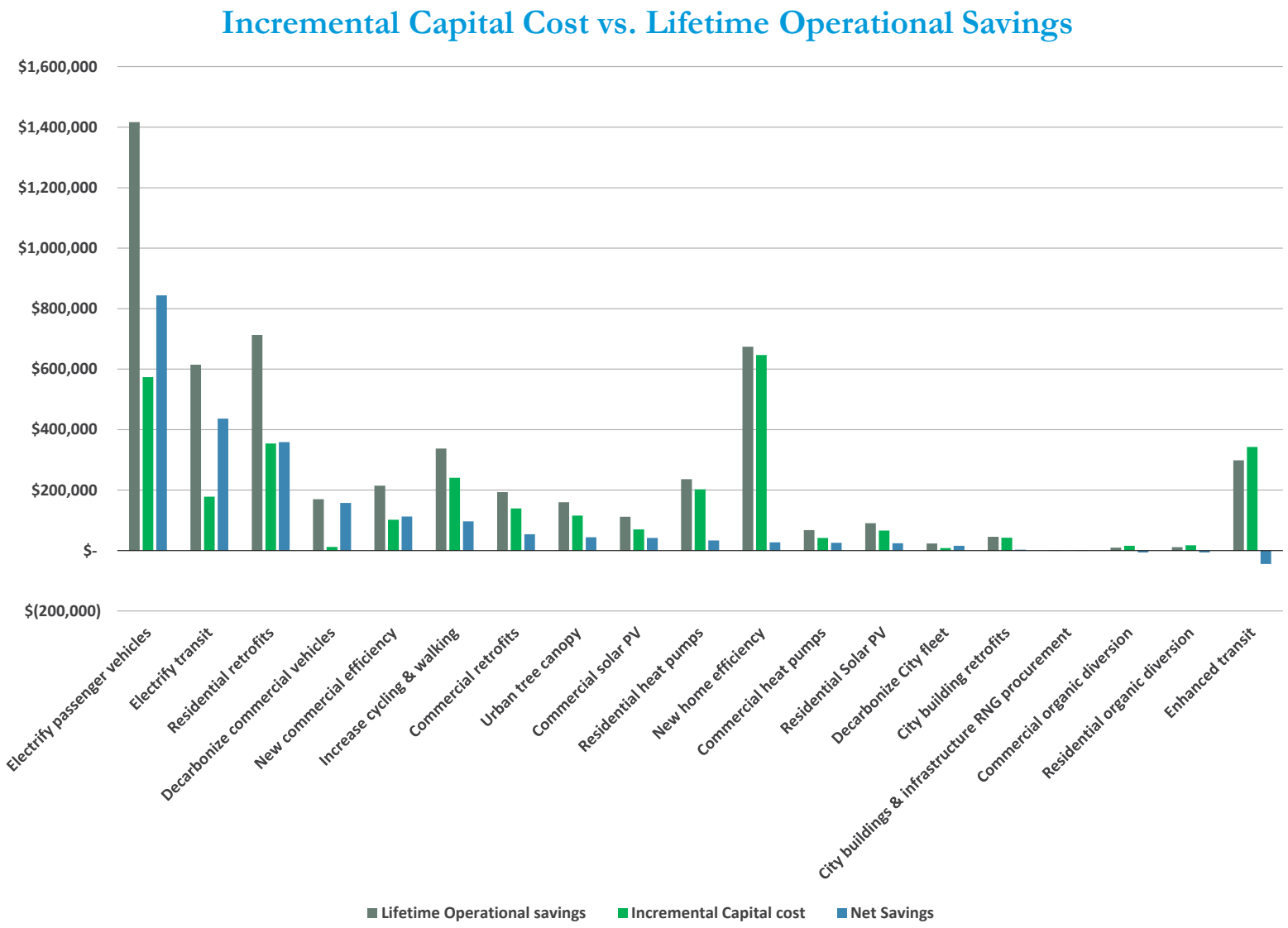
Appendix 9: Incremental Capital Costs and Operational Cost Savings

The following describes the incremental capital costs incurred to implement a particular action, the expected operational savings, and the net lifetime savings. Net savings are the operational savings minus the incremental capital cost.

The incremental capital cost from Electrify Passenger Vehicles would be the additional capital cost to purchase an electric vehicle vs. a conventional gasoline vehicle, while the operational cost savings would represent the cost savings from using electricity vs. gasoline, and any difference in operational costs over the course of the lifetime of the vehicle. Net savings are the difference between these two.

Expected annual emission savings are also shown in the following table to highlight high impact actions.

Action	Annual emission reductions (tCO2e/yr)	Incremental Capital cost	Lifetime Operational savings	Net Savings
Electrify passenger vehicles	3,600	$ 573,402	$ 1,416,991	$ 843,589
Electrify transit	658	$ 178,313	$ 614,488	$ 436,176
Residential retrofits	1,550	$ 353,951	$ 712,795	$ 358,844
Decarbonize commercial vehicles	247	$ 12,320	$ 170,088	$ 157,768
New commercial efficiency	720	$ 101,681	$ 214,589	$ 112,908
Increase cycling & walking	840	$ 240,629	$ 337,118	$ 96,489
Commercial retrofits	720	$ 139,591	$ 193,571	$ 53,980
Urban tree canopy	1,250	$ 116,046	$ 160,014	$ 43,968
Commercial solar PV	30	$ 69,907	$ 112,104	$ 42,197
Residential heat pumps	2,090	$ 202,402	$ 236,178	$ 33,776
New home efficiency	1,850	$ 646,800	$ 673,787	$ 26,987
Commercial heat pumps	810	$ 41,964	$ 67,413	$ 25,449
Residential Solar PV	20	$ 66,374	$ 90,472	$ 24,098
Decarbonize City fleet	120	$ 8,055	$ 23,893	$ 15,837
City building retrofits	80	$ 42,341	$ 45,623	$ 3,282
City buildings & infrastructure RNG procuremer	22	$ -	-$ 152	-$ 152
Commercial organic diversion	1,580	$ 15,963	$ 10,124	-$ 5,838
Residential organic diversion	1,740	$ 17,559	$ 11,137	-$ 6,422
Enhanced transit	420	$ 342,602	$ 298,668	-$ 43,934



Incremental capital costs, lifetime operational savings, and net savings of each action