Township of Langley

Est. 1873

Climate Action Strategy 2020 – 2030

Prepared for:
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1. INTRODUCTION

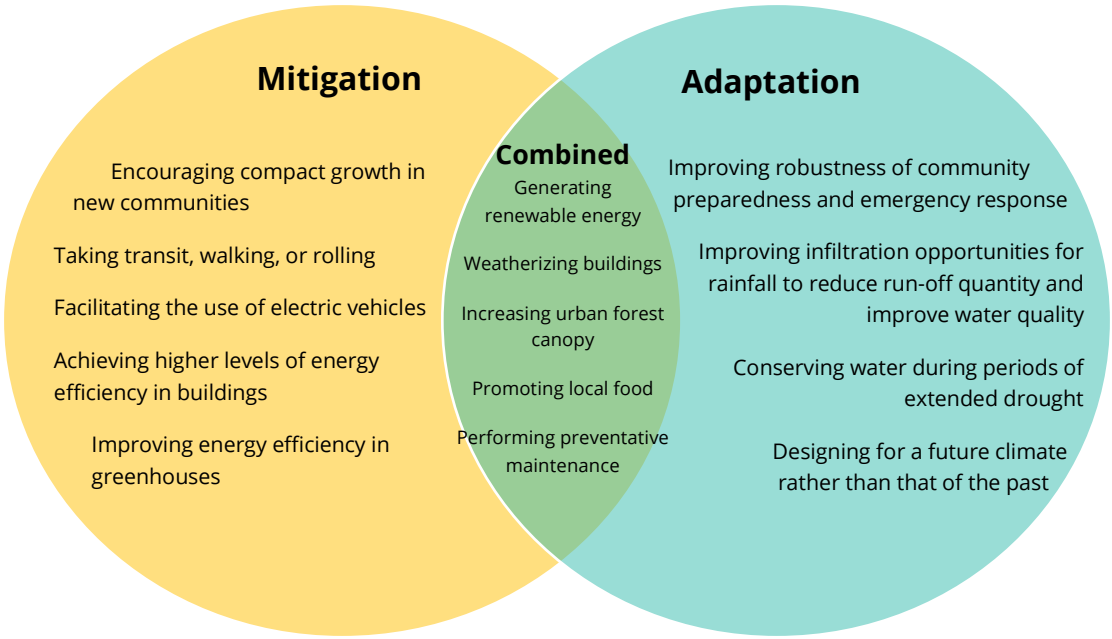
The Climate Change Challenge

Climate change is one of the greatest challenges facing communities around the world today. Warming temperatures associated with greenhouse gas (GHG) emissions are already bringing with them a host of changes, from hotter and drier summers, to wetter winters, changes to growing seasons, and more frequent and severe extreme weather events (e.g. wildfires and heat waves). In turn, these changes will bring both opportunities such as a longer season for food production, and impacts such as increased potential for flooding.

The Township of Langley is rising to meet the climate challenge. In June 2019, Township of Langley Council declared a Climate Emergency, which brought renewed attention and commitment to identifying and implementing actions to both mitigate further emissions and adapt to future impacts[1]. This *Climate Action Strategy* is designed to guide this work from 2020 to 2030 and beyond.

Climate Change Action

Responding to climate change requires both **mitigation**, or the reduction of GHG emissions that contribute to climate change, and **adaptation** to reduce the consequences or take advantage of opportunities associated with a changing climate. This *Climate Action Strategy* includes actions on both sides of the climate change challenge.



[1] Township of Langley. (2019). *Township of Langley Council Declares Climate Emergency.*

Why Do We Need a Climate Action Strategy?

Global temperatures have already increased by 1°C since the 1880's[2], and will continue to rise. The Intergovernmental Panel on Climate Change (IPCC) has emphasized the need to limit global warming to 1.5°C above pre-industrial levels to limit the worst impacts of climate change[3]. This target is especially important for Canada which, because of its northern latitude, is experiencing a rate of warming approximately twice the global average[4].

In fact, the Township of Langley has already experienced several climate-related events such as floods, heavy rainstorms, windstorms and droughts. In 2017, an ice storm in Langley saw 70 park and street trees lost and upwards of $350,000 in recovery costs; the following year, a significant windstorm cost the municipality approximately $250,000 in clean-up and restoration work. River flooding has closed Fort Langley Marina Park several times over the last ten years, and heavy rainfall has closed roads. These and other increases in severe climate-related events (see 'Extreme Weather' below) reveal the climbing financial costs of climate change: in 2018, insured damage for severe weather events in Canada was almost two billion dollars[5].

Extreme Weather

In the past few years alone, Canadians have experienced some of the most disruptive and costly climate-related extreme events ever recorded, each resulting in significant economic losses and human harm:

2017 British Columbia wildfire season: A total of 1.2 million hectares of land burned, the largest area in BC's history at that time, costing over $649 million and leading to the declaration of a provincial state of emergency[6];

2018 Eastern Canada heat wave: The humidex reached 48°C in some locations, with 93 heat-related fatalities reported through Quebec[7];

2018 British Columbia wildfire season: More than 1.3 million hectares of land burned with a total cost over $615 million, coupled with 22 days of air quality advisories in the Lower Mainland[8]

The Township of Langley has pledged to reduce human-caused greenhouse gas emissions by 45% by 2030, and to achieve carbon neutrality by 2050. This target aligns with and will be supported by commitments from other levels of government.

As a signatory to the Paris Agreement, Canada has committed to reducing national emissions by 30% by the year 2030 and 80% by 2050. The Federal Government strengthened this commitment in 2020, targeting carbon neutrality by 2050[9]. Starting in 2023, it will increase the carbon tax each year for the next eight years, to encourage energy users to move away from fossil fuels and onto cleaner energy sources. The Province of British Columbia also committed to reducing provincial emissions by at least 40% by 2030 and 80% by 2050, and is working to develop legislation to ensure BC reaches net-zero emissions by 2050[10]. It has released a province-wide strategy to reduce GHG emissions while creating a stronger economy[11].

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[2] National Aeronautics and Space Administration (NASA). (2019). *2018 Fourth Warmest Year in Continued Warming Trend.*
[3] United Nations Intergovernmental Panel of Climate Change (IPCC). (2018). *Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C Approved by Governments.*
[4] Environment and Climate Change Canada. (2019). *Canada's Changing Climate Report.*
[5] Insurance Bureau of Canada (IBC). (2019). *Severe Weather Causes $1.9 Billion in Insured Damages in 2018.*
[6] Province of BC. (2019). *Wildfire Season Summary.*
[7] Environment and Climate Change Canada. (2019). *Canada's Top Ten Weather Stories of 2018.*
[8] BC Wildfire Service. (2018). *Wildfire Season Summary.*
[9] Government of Canada. (2020). *A Healthy Environment & a Healthy Economy.*
[10] Province of BC. (2020). *CleanBC: 2020 Climate Change Accountability Report.*
[11] Province of BC. (2020). *StrongerBC: BC's Economic Recovery Plan.*

The Township has already started preparing for climate change and is well-positioned to achieve significant emissions reductions. However, there is still much to be done to help avoid further costs while reducing emissions from across the community. Many actions required to reduce emissions rely on decisions made about how we use our land, the design of our buildings, and the way we lay out our transportation networks. As the Township's population is projected to double by 2040, there is an important opportunity to incorporate climate action as the city grows, and ensure that the costs and benefits of that action are spread equitably across the community.

Equity in Climate Action

Applying an **equity** lens to climate action means ensuring that the benefits and burdens of climate change and climate action are distributed fairly throughout a community. This means ensuring that community members who are most **vulnerable** to climate change are protected. For example, isolated seniors, children, pregnant women and those with pre-existing health conditions are among those most vulnerable to heat waves. It also means taking care to reduce any potential costs for those who are already challenged in making ends meet.

The Township of Langley's Climate Action Strategy

This *Climate Action Strategy* has been designed to meet the Township of Langley's 2030 targets, while putting us on course to meet our goals for 2050. To reduce our collective impact on the climate, avoid the worst impacts of climate change, and make the most of opportunities, the Strategy establishes goals for climate action across eight priority areas:

1) **Transportation and Mobility:** Create safe and attractive transportation options that reduce emissions and improve quality of life for all.
2) **Buildings and Land Use:** Demonstrate regional leadership in resilient, low-carbon buildings and communities.
3) **Infrastructure:** Design and upgrade infrastructure to minimize carbon emissions and ensure functionality and climate resilience throughout its lifespan.
4) **Green Space and Ecosystems:** Maintain and enhance natural assets and green space.
5) **Health and Emergency Preparedness:** Maintain and enhance the health and well-being of Township residents in the face of a changing climate and extreme weather events.
6) **Agriculture:** Foster a strong agriculture sector ready to adapt to climate change, reduce emissions and contribute to local food security.
7) **Waste:** Reduce waste and increase the diversion of waste away from the landfill.
8) **Leadership and Integration:** Integrate a climate lens into all Township strategies and processes.

Through collaboration with residents, local businesses, and community organizations, the Township has established realistic targets and practical next steps on the path to 2050, which are presented in Section 3 of this document. The meetings, events, surveys and other engagement initiatives that informed the *Climate Action Strategy* are detailed in the *Engagement Summary* available as a companion to this report.

2. CLIMATE CHANGE IN LANGLEY TOWNSHIP

Climate Impacts and Opportunities

The effects of a warming climate are already being felt in the Township of Langley, including warmer summers, increased heavy rainfall, and more extreme weather events. In the future, these effects are expected to worsen.

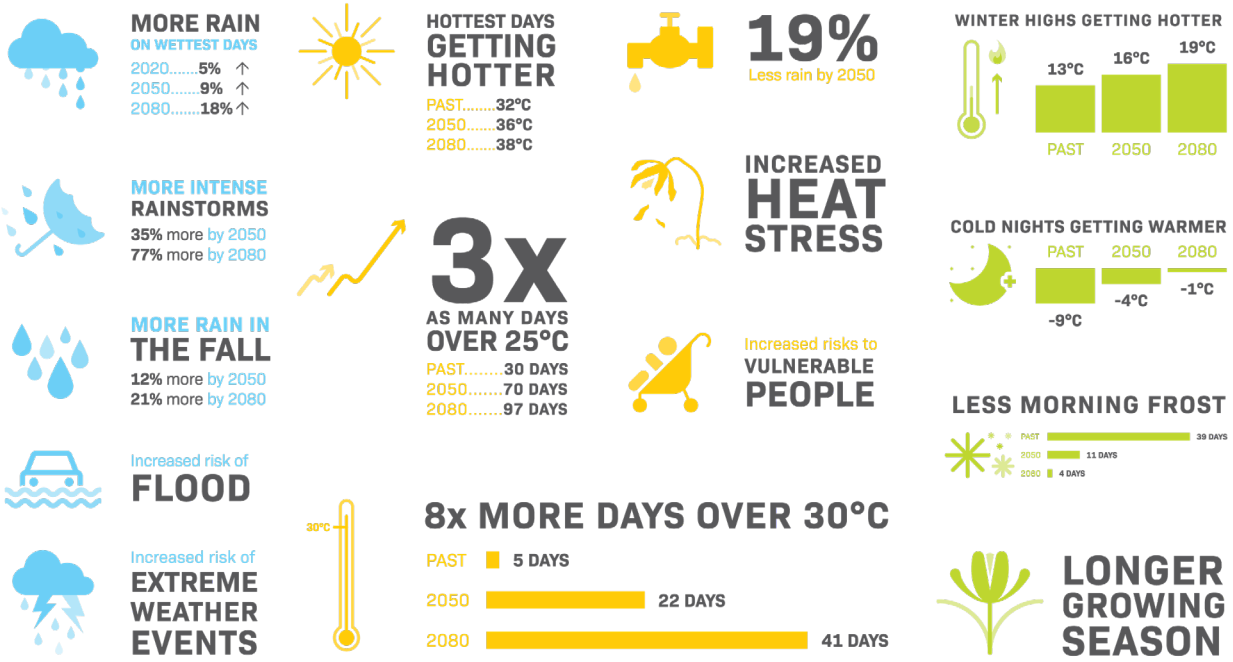

Figure 1: Future climate projection for the Township of Langley

These changes in climate will have dramatic impacts on Township residents, communities, and municipal infrastructure and operations (Figure 1). A risk assessment based on these projections was completed in 2019 and identified the highest risk impacts expected for Langley Township out to 2050. They include:

- Increased health issues from higher summer temperatures, heat waves and poor air quality, especially for the most vulnerable;
- Increased stress on local ecosystems, including the loss of urban trees and vegetation and reduced biodiversity;
- Increased clean-up costs following events and increased resources to maintain current services;
- Increased stress on the water supply and on the ability of municipal infrastructure to meet growing community needs; and
- Disruption and damage due to increases in the incidence of flooding.

The changing climate also presents opportunities, including:

- New agricultural possibilities;
- Decreased need for winter road maintenance;
- Increased days comfortable for active transportation; and
- Reduction in heating costs.

Reducing Energy & Emissions in the Township of Langley

While some change in our climate is almost certain to occur, the Township of Langley still has a responsibility to reduce its contributions to global emissions as much as possible. Not only does this show leadership to other communities, it also helps to reduce impacts both locally and globally, protecting the most vulnerable.

Carbon Neutrality

In this report, **carbon neutrality** is defined as achieving net-zero emissions by balancing the amount of human-caused carbon emissions in the atmosphere with an equivalent amount of human-caused carbon emission removals over a specific time period. This Climate Action Strategy focuses on reducing carbon emissions generated within Langley in the transportation, buildings, energy, waste and agriculture sectors.

Building a path towards carbon neutrality requires an understanding of where and how our community consumes most of its energy, and where emissions come from, both now (Figure 2) and in the future.

Buildings represent the primary energy consumer in the Township, with energy use fairly evenly split between residential and all other building types (e.g. institutional, commercial). 30% of Langley's emissions come from the use of natural gas to provide heat and hot water to our buildings.

Transportation via passenger vehicles and commercial transportation powered by gasoline and diesel represent the majority of energy use and emissions in Langley. Transportation emissions make up 54% of the Township's total, with small contributions from transit use.

Agriculture account for approximately 10% of Township energy use, which includes the energy consumed to operate Township greenhouses.

Solid waste is not a major factor in the Township's energy use, but solid waste decomposition and incineration both produce greenhouse gases that contribute a small portion of the Township's total emissions.

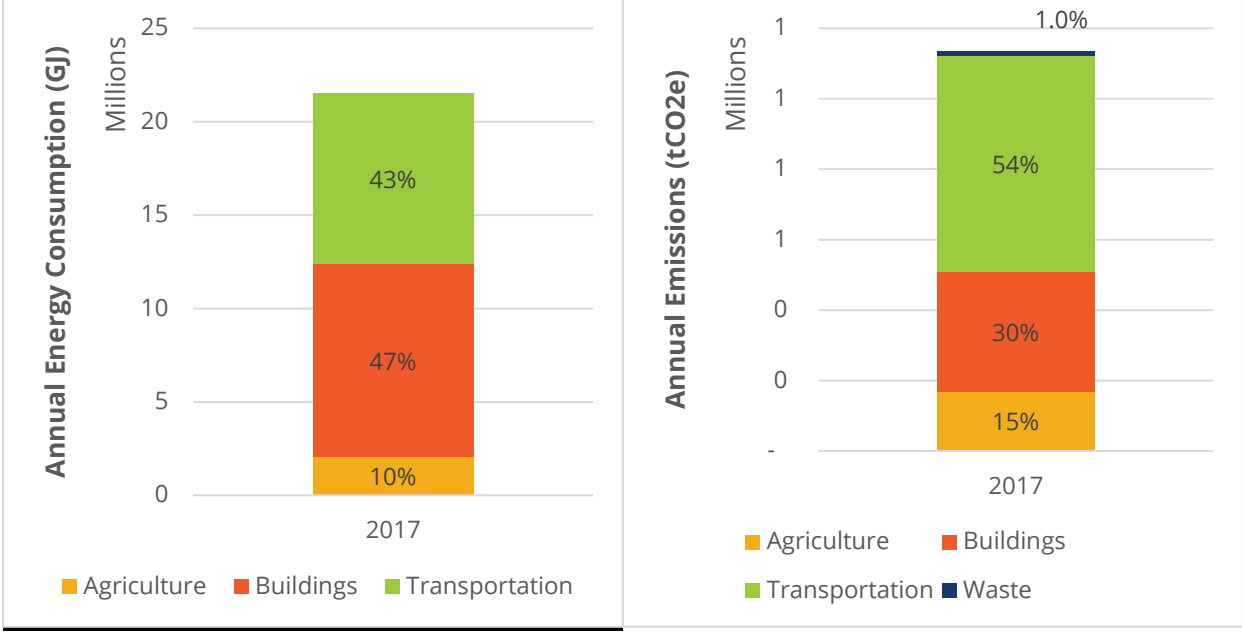

Figure 2: Township energy and emissions in 2017

Looking out to 2050, Langley's "business-as-usual" (BAU) emissions trajectory is actually set to improve due to federal and provincial government strategies and frameworks, such as the implementation of the *BC Energy Step Code* and government support for electric vehicles. Figure 3 below summarizes this forecast, where each coloured wedge shows expected emissions reductions from these federal and provincial initiatives. After accounting for population and employment growth, however, the emissions reductions in this BAU forecast are not enough to meet the Township's emissions targets for either 2030 or 2050. An emissions gap of **954 thousand tonnes of carbon dioxide equivalent** (CO_2e) will still remain in 2050 without further action.

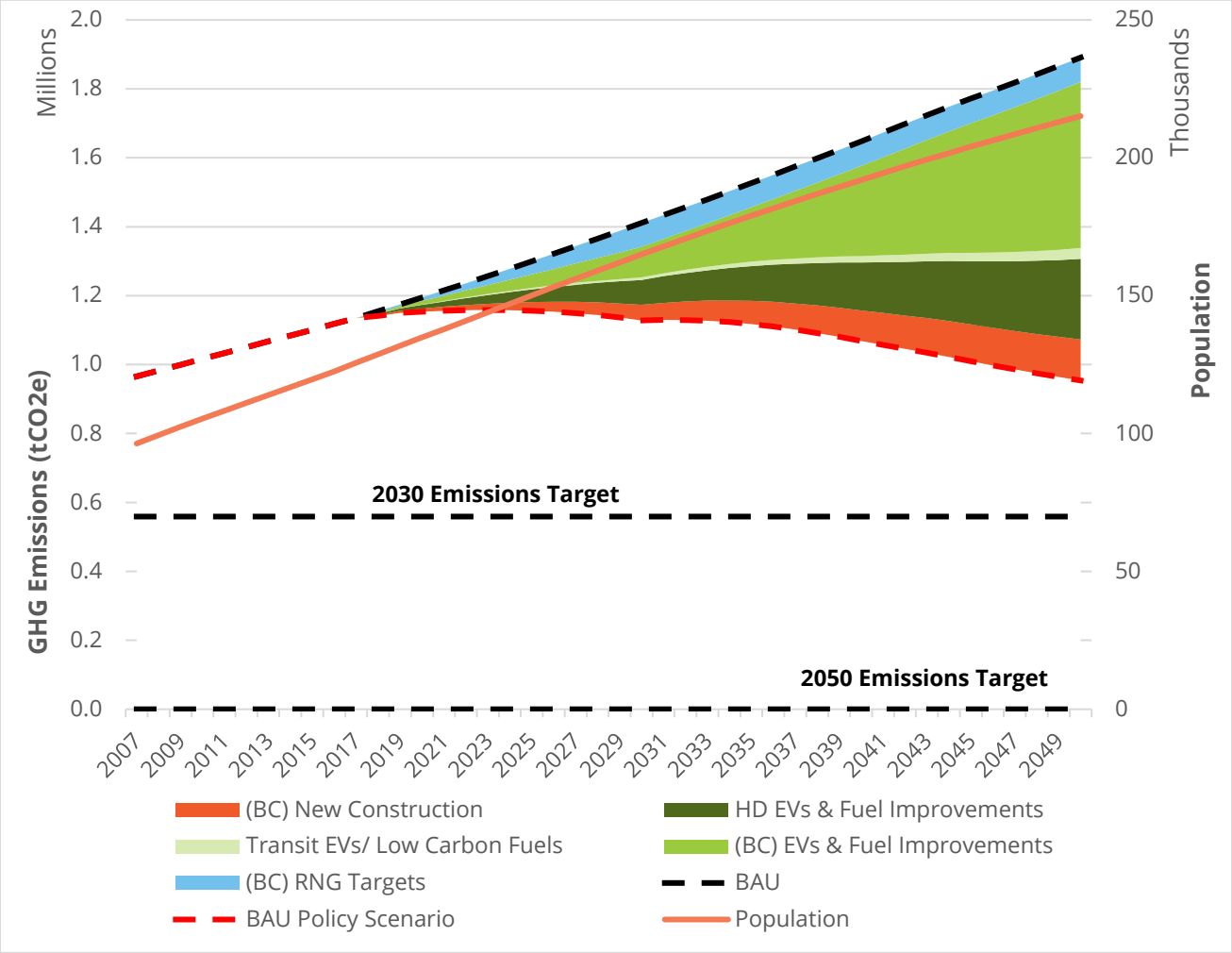

Figure 3: Business-as-usual emissions forecast for the Township of Langley, 2007 to 2050

3. CLIMATE ACTION IN LANGLEY TOWNSHIP

Building on a Strong Foundation

The Township of Langley has a long history of sustainability and climate initiatives that set that stage for further climate action. The following community plans and policies already put Langley on the path to a low-carbon and resilient community, and will act as the foundation for further climate action:

- **Climate Action Charter (2007)[12]:** In signing the *BC Climate Action Charter*, the Township of Langley committed to achieving carbon-neutral corporate operations, and measuring and reporting the community's greenhouse gas emissions.
- **Sustainability Charter (2008)[13]:** The Township adopted the *Sustainability Charter* in 2008, setting a vision to "building a legacy for future generations by leading and committing the community to a lifestyle that is socially, culturally, economically and environmentally balanced" (p.4).
- **Official Community Plan (OCP) (2013)[14]:** The OCP lays out a thirty-year vision for the Township, which includes a vision that highlights the importance of accounting for climate change. It also includes specific objectives to reduce GHG emissions and to integrate climate change adaptation planning into community decision making.
- **Low Carbon Mobility Plan (LCMP) (2019)[15]:** Focusing on electric vehicles, the LCMP will help the Township of Langley to encourage new modes of low-carbon mobility and work towards more sustainable transportation systems.
- **Social Sustainability Strategy (2021):** The Township is developing a *Social Sustainability Strategy* that will guide initiatives related to children and youth, seniors, housing, and community health and wellness. Climate change is a key lens for this work and the three goals of the Strategy are a connected, inclusive and resilient community (prepared to adapt and thrive in the face of change).

Aside from these broad plans, the following examples represent only a portion of the work the Township already has underway:

- Developing a *Corporate Asset Management Plan* with a climate lens to help enhance the durability and lifetime of infrastructure in a changing climate.
- Installing electric vehicle charging stations at key locations around the community.
- Introducing green rebate building programs to support low-carbon retrofits for existing buildings.
- Implementing drinking water bylaws and water conservation education campaigns to prepare for drought.
- Developing numerous integrated stormwater management plans to ensure that land development projects consider environmental values such as water quality.
- Outfitting pump stations with back-up power to prepare for power disruptions from extreme events.
- Choosing local, drought-resistant species for municipal planting projects.
- Creating a winter weather readiness bulletin to support communications about mobility and transportation during snow and ice storms.

[12] Province of BC. (2007). *British Columbia Climate Action Charter.*
[13] Township of Langley. (2008). *Sustainability Charter.*
[14] Township of Langley. (2013). *Official Community Plan.*
[15] Township of Langley. (2019). *Low Carbon Mobility Plan: Electric Vehicles.*

Showing Leadership

The Township of Langley has also spent the past decade implementing several initiatives that support climate action within the Township's own corporate operations. Updated in 2019, the *Strategic Energy Management Plan* (SEMP) outlines a number of actions the Township is taking to improve energy efficiency and reduce emissions associated with its buildings, infrastructure and fleet. The SEMP encompasses all of the energy consumed by the Township in the provision of all municipal services, including recreation, culture and parks; water, storm water and sewer utilities; fire and rescue; community planning and development; local road infrastructure and engineering services; waste and recycling collection; and more.

Examples of actions in the SEMP include:

- Developing a lifecycle costing approach for new buildings and infrastructure
- Developing energy efficiency guidelines for existing building assets and new park infrastructure
- A plan for electric vehicle (EV) infrastructure installation
- Planning, funding and transitioning to LED streetlights
- Identifying opportunities to integrate rainwater harvesting and reuse for new and existing buildings

The Township is showing leadership by working to achieve zero emissions as a corporation by 2040 (Figure 4), 10 years ahead of the community target.

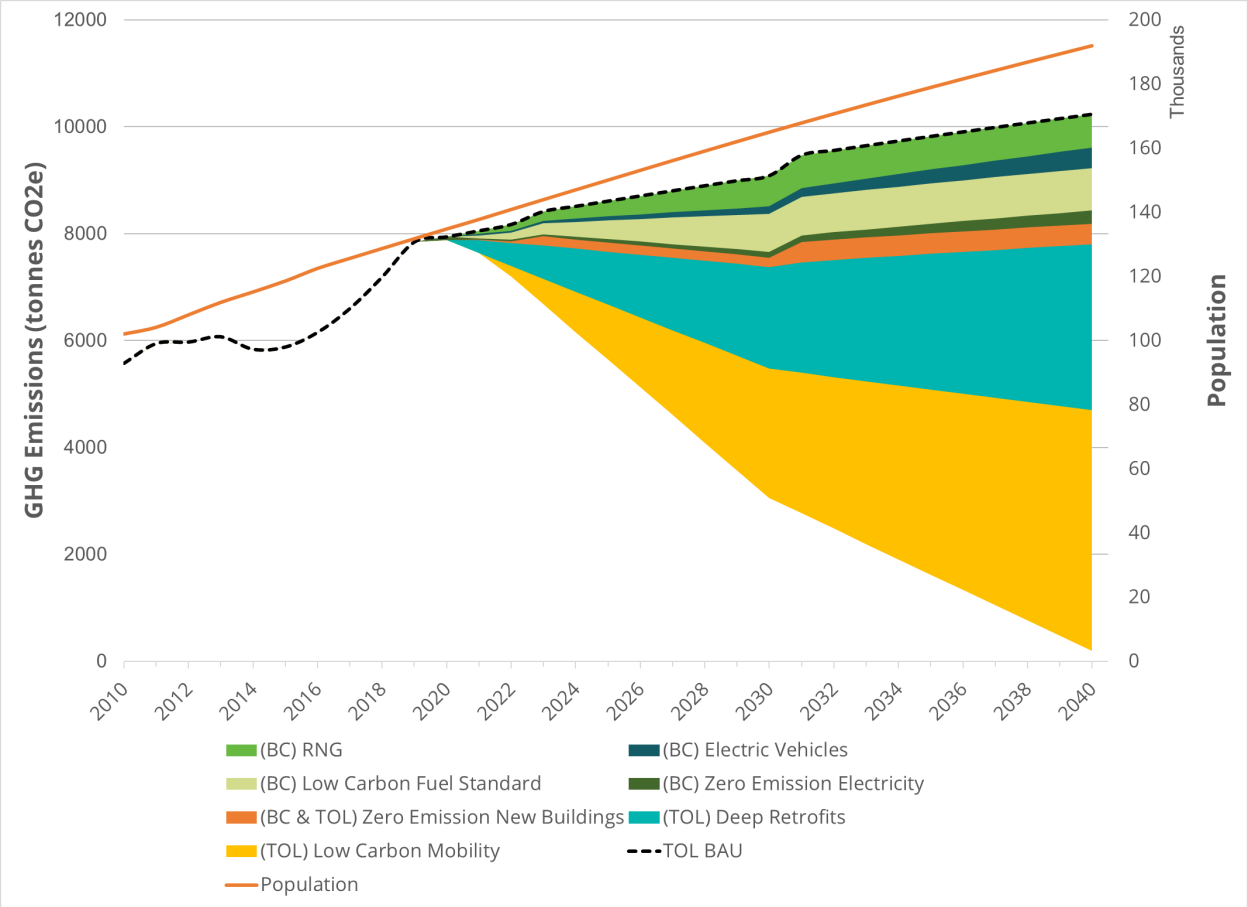

Figure 4: Reduction pathway for the Township of Langley's corporate emissions

A Low-Carbon & Resilient Township

This *Climate Action Strategy* summarizes the key actions that the Township has to focus on in the short term to ensure it will meet its targets. By considering mitigation and adaptation action together, the Township's actions are complementary and not contradictory, and resources are used efficiently.

Low-carbon Resilience

Applying a **low-carbon resilience** lens requires considering mitigation and adaptation to climate change together to harness co-benefits and reduce conflicts. Low-carbon resilience focuses on integrated strategies and actions that reduce emissions and vulnerability to climate change impacts.

The actions below will help ensure Langley is prepared for future climate impacts while putting it on a course to achieving a **45% reduction** in emissions by 2030, and carbon neutrality by 2050 (Figure 5).

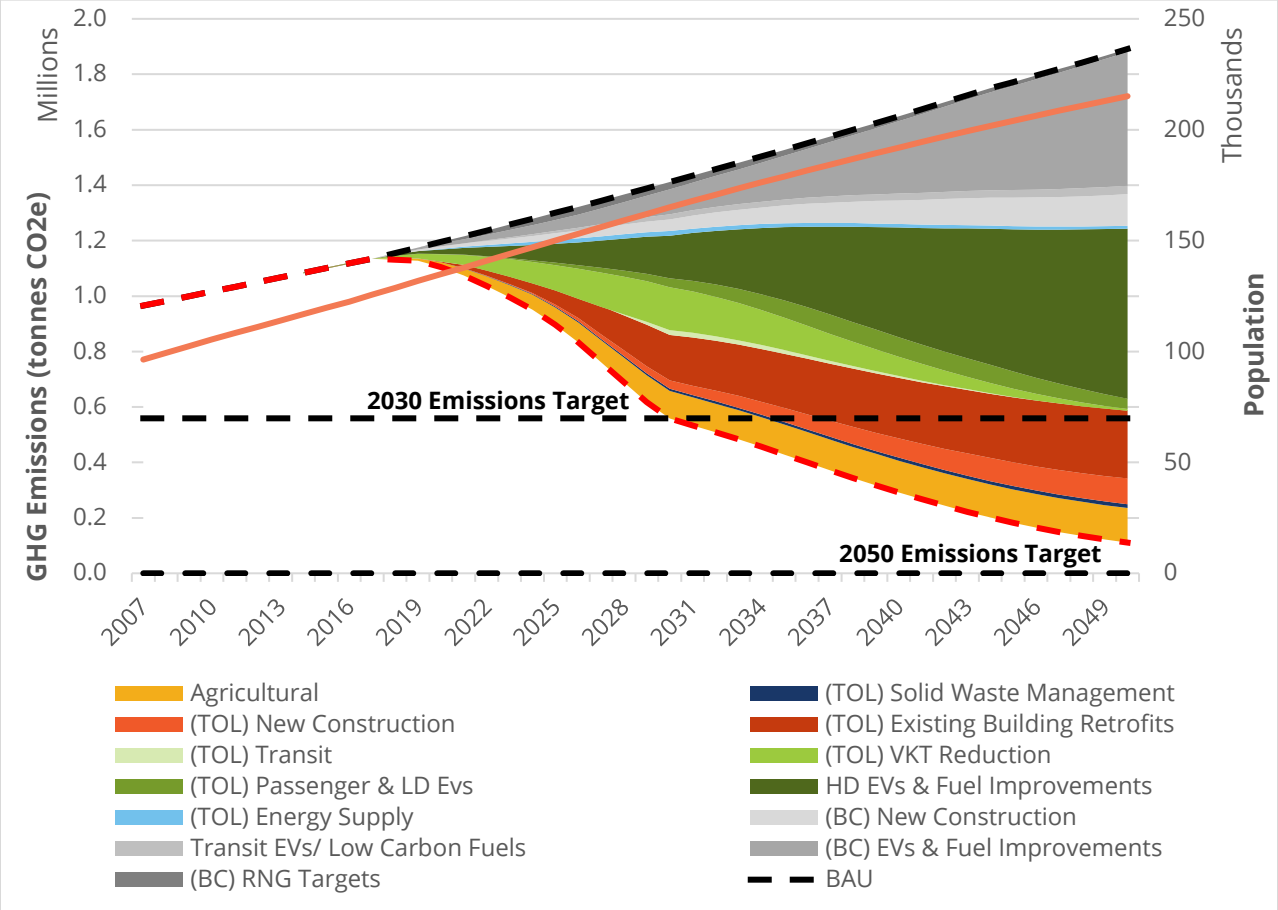

Figure 5: Low-carbon emissions scenario to 2050

Co-benefits of Climate Action

Taking action on climate change is a win-win for the Township of Langley. There are many ways that reducing emissions and preparing for climate change contribute to livability, community, health, and well-being. The actions included in this *Climate Action Strategy* have been designed to help advance these and other community goals to create a community that is strong, healthy and thriving. These include:

- **Ecosystem Health:** Actions that support the integrity of local ecosystems, maintain and enhance vital habitats for native plant and animal species, and encourage overall biodiversity.
- **Air and/or Water Quality:** Actions that reduce air pollutants by reducing sources of contaminants, and/or that improve water quality by limiting sources of runoff and 'cleaning' the water with green infrastructure.
- **Carbon Absorption:** Actions that increase the amount of carbon dioxide absorbed from the atmosphere by increasing vegetation and tree cover, helping to mitigate climate change.
- **Community Liveability and Connectedness:** Actions that improve the quality of the built environment and/or foster social interactions, helping to increase community connectedness and celebrate local culture.
- **Human Health and Wellbeing:** Actions that improve our mental and physical health or wellbeing through the creation of high-quality community spaces, opportunities for recreation, and improved access to healthy local food.
- **Affordability:** Actions that reduce the everyday cost of living for Langley residents, including utility bills and transportation costs.
- **Local Economy:** Actions that create high-quality local jobs in emerging industries, increase economic productivity, and increase local spending by putting more money in the pockets of Langley residents.
- **Climate Governance and Accountability:** Actions that foster good governance within the Township itself, including establishing proper processes and structures for implementing this Climate Action Strategy, while increasing transparency and accountability.

The eight priority areas of the *Climate Action Strategy* will help to advance these community goals in many different ways, but typically have a few areas of greatest impact (Table 1).

Table 1: Interactions between the priority areas of the Climate Action Strategy and other community goals

	Ecosystem Health	Air & Water Quality	Carbon Absorption	Community Livability	Health & Wellbeing	Affordability	Local Economy	Climate Governance
Transportation & Mobility								
Buildings & Land Use								
Infrastructure								
Green Space & Ecosystems								
Health & Emergency Preparedness								
Agriculture								
Waste								
Leadership & Integration								

Big Moves & Priority Actions

To reach its adopted emissions reductions targets, the Township is focusing on five "Big Moves". These will help to focus municipal efforts and resources, and track progress towards 2030 and 2050 targets (Figure 6).

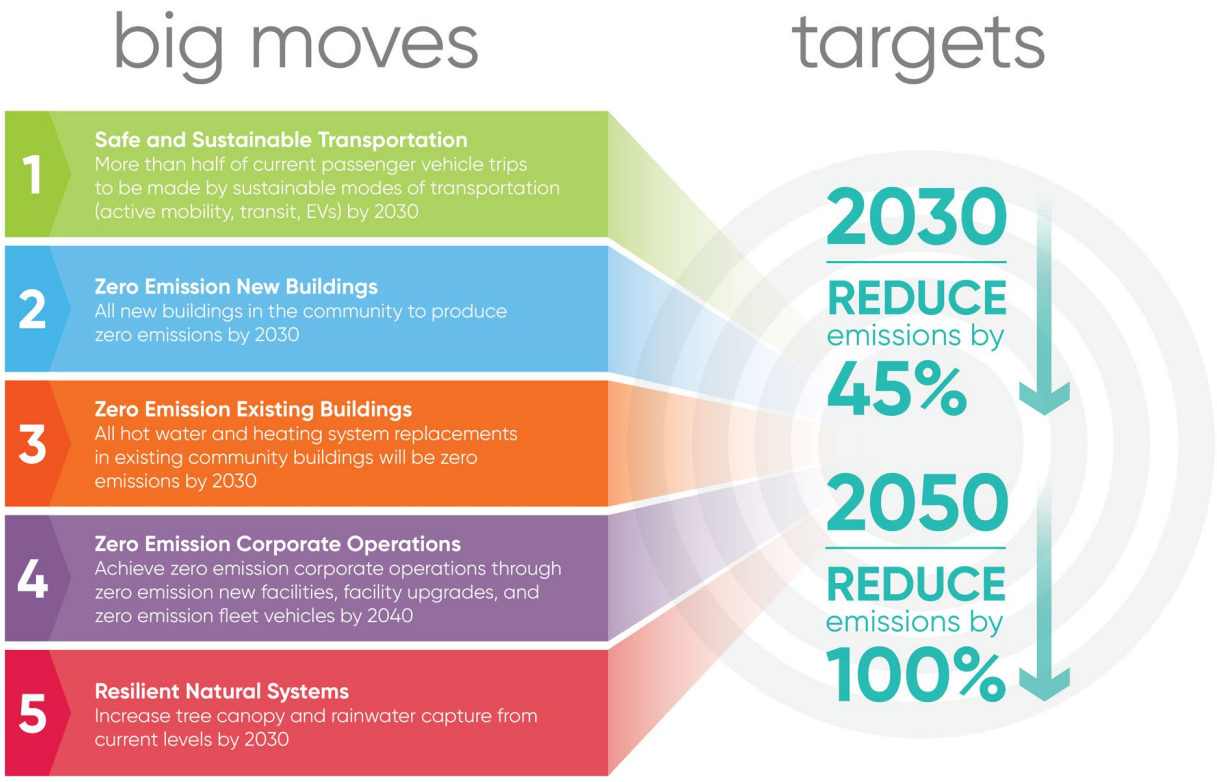

Figure 6: The Township of Langley's Big Moves for climate action

Based on engagement conducted for the Strategy, all Big Moves received significant support from the general public and stakeholder groups. The Top Big Moves for the public were:

1) Resilient Natural Systems (Big Move 5)
2) Zero Emission New Buildings (Big Move 2)
3) Safe and Sustainable Transportation (Big Move 1)

The top priority areas for the public were:

1) Green Space and Ecosystems
2) Transportation and Mobility
3) Health and Emergency Preparedness

Full engagement results are detailed in the *Engagement Summary* available as a companion to this report.

The *Climate Action Strategy* has over 140 actions across the eight priority areas. In the following pages, this report highlights select, high-impact actions for each priority area that the Township has identified for implementation in the near future. See the full action list here.

Transportation & Mobility

Goal	Create safe and attractive transportation options that reduce emissions and improve quality of life.
Objectives	**1)** Expand access to and ownership of zero-emissions vehicles **2)** Prioritize safe, convenient and multi-modal options for active mobility (walking, cycling, rolling, etc.) **3)** Support transit network expansion

Targets	• Passenger trips made by sustainable modes of transportation (active mobility, transit, EVs) (%):
	  ○ **2030:** 53%
	  ○ **2050:** 99%
	• Passenger and light-duty vehicles that are electric or zero-carbon (%):
	  ○ **2030:** 19%
	  ○ **2050:** 98%
	• Heavy-duty vehicles that are electric or zero-carbon (%):
	  ○ **2030:** 25%
	  ○ **2050:** 97%

Co-benefits	Air and/or Water Quality Community Liveability & Connectivity Human Health & Wellbeing Affordability Local Economy

The Township's low density and role as a commercial transportation hub for the region has shaped transportation patterns in the community. In Metro Vancouver, 72% of trips are made in private vehicles. In comparison, 88% of trips in the Township are made by private vehicles, ranging from cars and SUVs to heavy-duty vehicles, and community energy and emissions from transportation are relatively high[16]. In addition to their environmental consequences, local reliance on private vehicles has also limited the development of public transit and active transportation options.

The Township has been working to make local transportation more sustainable, and achieved reductions between 2010 and 2017 in both energy and emissions from transportation, but there is still work to be done. Reducing emissions from private vehicle is a top priority, which will be helped in part by the Province's mandate that all new light-duty vehicles sold by 2040 need to be electric or another zero-emissions option[17]. At the same time, it will be important to help people get out of their cars by expanding the transit network and improving the ease with which residents can move about the community.

Priority Strategies & Actions

SHARED & ACTIVE MOBILITY		TIMEFRAME
TM-1	Develop a Transportation and Mobility Strategy	Short
TM-2	Enhance and expand the existing multi-use trail network to connect neighbourhood centres and transportation corridors	Short
TM-5	Improve bike and e-bike network	Short

[16] Metro Vancouver. (2011). *Metro Vancouver's Mode Share.*
[17] Province of British Columbia. (2019). *Bill 28 – 2019: Zero-Emission Vehicles Act.*

COMMUTER TRIP REDUCTION		TIMEFRAME
TM-4	Create a Township-wide Transportation Demand Management (TDM) Program	Medium
TRANSIT NETWORK		**TIMEFRAME**
TM-7	Advocate for expansion of the transit network	Short
TM-8	Implement measures to prioritize transit in traffic	Short
TM-9	Improve transit stops and accessibility	Short
EV ADOPTION & READINESS		**TIMEFRAME**
TM-16	Ensure new developments are 'EV Ready'	Medium
TM-17	Incentivize EV charging installations for businesses and residents	Short
TM-29	Advocate for EV leadership from other levels of government and utilities	Short
TM-30	Advocate for zero-emission vehicles (ZEV) for shared mobility (e.g. ride hailing, taxis) and future driverless vehicles	Short
FLEET INITIATIVES		**TIMEFRAME**
TM-37	Convert 100% of passenger corporate fleet to zero-emissions vehicles	Short
GENERAL		**TIMEFRAME**
TM-26	Educate and encourage the electrification of trucks, off-road vehicles and equipment (e.g. tractors, lawn-equipment)	Medium
TM-36	Advocate for the regional collection and analysis of vehicle kilometres travelled (VKT) data	Short
TM-33	Advocate for zero-emissions requirements for medium-duty and heavy-duty vehicles	Short

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Walk or cycle for short trips and take transit whenever possible

Encourage your children to walk, cycle, take transit, or use the school bus to travel to school

Consider an electric vehicle and/or e-bike for your next purchase

Carpool to work wherever possible

Buildings & Land Use

Goal	Demonstrate regional leadership in resilient, low-carbon buildings and communities
Objectives	**1)** Showcase leadership in low-carbon resilient Township facilities **2)** Maximize energy and water efficiency, emissions reductions and resilience in all new and existing buildings **3)** Facilitate best practices in compact, livable, and resilient developments
Targets	• 100% of hot water and heating system replacements in existing community buildings will be zero-emissions by 2030 • All new construction will be zero-emissions by 2030 • *Note that these targets exclude industrial and agricultural buildings*
Co-benefits	Air and/or Water Quality Community Liveability & Connectivity Human Health & Wellbeing Affordability Local Economy

In the Township of Langley, buildings account for a significant portion of energy and water use, as well as the community's GHG emissions. Of the over 18 million square metres of floor area in the Township, almost two-thirds are residential buildings, with this number steadily growing. Ensuring that new buildings are constructed to high standards – both residential and otherwise – is essential for the Township to meet its climate goals. Retrofitting existing buildings can also help to reduce energy use and emissions, while simultaneously enhancing building resilience to future climate conditions. Land use patterns and density also play an important role in climate action. Promoting compact development can influence how people move about the community, reduce the need for new municipal infrastructure, and help promote community connections and overall resilience.

Priority Strategies & Actions

NEW BUILDING CONSTRUCTION		TIMEFRAME
BL-1	Develop a Step Code implementation plan for applicable building types	Short
BL-2	Create one comprehensive set of energy and emissions guidelines for new construction	Short
BL-24	Construct new corporate facilities to be zero-carbon in operation	Short
EXISTING BUILDING PERFORMANCE		**TIMEFRAME**
BL-5	Reduce energy and emissions and increase resilience in existing buildings	Short
BL-6	Pilot a retrofit program to upgrade existing single family homes	Short
BL-7	Explore options to require energy benchmarking and home energy labelling for existing buildings	Short
BL-19	Develop low-carbon retrofit plans for all existing corporate facilities	Short
BL-22	Develop and implement a Building Tune Up program at all major corporate facilities	Short
BL-23	Ensure major corporate facility renovations are zero-carbon in operation	Short

GENERAL		TIMEFRAME
BL-10	Advocate for and support development of a climate resilient building code	Short
BL-12	Advocate to the provincial government to expand regulations for energy and emissions in new and existing buildings	Short
LAND USE		**TIMEFRAME**
BL-27	Pilot a complete street to create a space where people can safely walk, cycle, drive, take transit, and socialize	Medium

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Identify ways to improve your home's energy efficiency and reduce utility bills by arranging an energy audit

Ask your realtor to prioritize energy efficiency and low-carbon heating and cooling systems when purchasing a new home

Upgrade your boiler to a high-efficiency heat pump

Install low-flow fixtures and find and address any leaks in outdoor irrigation systems

Infrastructure

Goal	Design and upgrade infrastructure to minimize carbon emissions and ensure functionality and climate resilience throughout its lifespan.
Objectives	**1)** Source local and resilient energy sources for an increasing percentage of Township energy needs **2)** Demonstrate leadership in regional water conservation by lowering per capita water use as demand increases **3)** Manage Township infrastructure to anticipate increases in rainfall and changes in flood risk **4)** Maintain and improve water quality run-off to receiving bodies by employing best management practices in community green infrastructure
Targets	• Electricity supplied from local renewable generation (%): ○ **2030:** 15% ○ **2050:** 25% • 23% of natural gas used will be renewable natural gas by 2030
Co-benefits	Ecosystem Health Air and/or Water Quality Human Health & Wellbeing Climate Governance and Accountability

The Township of Langley operates a vast array of municipal infrastructure, including water distribution networks, sewer and drainage systems, energy systems, and community facilities. These systems have been shaped by the community's rapid population growth over time, and were not always designed with climate change and sustainability in mind. The result is a local infrastructure network that leads to more GHG emissions than necessary, and that may lose some functionality as the climate changes.

Moving forward, the Township will need to make infrastructure decisions and investments that consider both climate change mitigation and adaptation. These considerations range from investing in renewable energy systems that reduce emissions and improve energy security, to preparing for future droughts and water shortages, and ensuring that water infrastructure can address the climate conditions of decades to come.

Priority Strategies & Actions

FLOODING, DRAINAGE & SEWER		TIMEFRAME
IN-1	Complete a full review of all rain water systems using future climate change and growth projections	Short
WATER SUPPLY & QUALITY		**TIMEFRAME**
IN-3	Review green infrastructure design guidelines and develop an education and maintenance program for staff and the public	Short
IN-5	Ensure existing and future detention ponds are functionally optimized and climate resilient	Short
IN-6	Create a strategic plan for long-term water supply that specifically addresses future climate change and growth projections	Short
ENERGY		**TIMEFRAME**
IN-19	Explore feasibility of renewable district energy systems	Short
IN-20	Explore opportunities to recover energy from waste	Medium

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Help reduce water consumption by planting drought tolerant lawns and gardens, installing water saving appliances and equipment, and using rain barrels

Improve the permeability of surfaces on your property to decrease runoff into storm drains

Help maintain green infrastructure such as rain gardens in your neighbourhood

Green Space & Ecosystems

Goal	Maintain and enhance natural assets and green space.
Objectives	**1)** Support community partnerships for the improvement of riparian area health **2)** Improve preparedness for current and anticipated invasive species **3)** Maintain and expand a healthy tree canopy that will continue to thrive under future climate conditions **4)** Future-proof natural and built park assets to provide maximum community benefits
Co-benefits	Ecosystem Health Air and/or Water Quality Carbon Absorption Community Liveability & Connectivity Human Health & Wellbeing

The Township of Langley boasts over 4,400 acres of green space, including parks and open spaces, natural terrestrial areas, and rivers, creeks and streams. These lands provide countless environmental services, such as wildlife habitat and carbon absorption by trees, and are also essential for our physical and emotional health. When considering climate change, natural areas can also serve as a tremendous buffer against climate shocks and stressors.

As the normal ranges of our climate change, local ecosystems and species ranges are likely to change too. At the same time, these natural areas will face rising development pressure as the Township continues to grow. With this in mind, climate action moving forward needs to carefully consider how to protect and enhance green space and ecosystems, for the good of the environment and the community.

Priority Strategies & Actions

HEALTHY TREE CANOPY		TIMEFRAME
GE-1	Complete a Tree Canopy Study/Strategy	Short
NATURAL ASSETS & BIODIVERSITY		**TIMEFRAME**
GE-4	Develop a Biodiversity Conservation Strategy	Short
GE-6	Evaluate natural assets and incorporate into the asset management program	Short
GE-7	Use a climate lens to assess all assets in the asset management program	Medium

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Join or support a local clean-up or ecological restoration group to help improve natural areas

Avoid planting invasive species, such as morning glory, holly, or non-native grasses and know and report invasive species

Maintain trees on your property so they stay healthy, and plant new, drought-tolerant native species

Health & Emergency Preparedness

Goal	Maintain and enhance the health and well-being of Township residents in the face of a changing climate and extreme weather events.
Objectives	**1)** Enhance Township emergency response, readiness and communications **2)** Develop a proactive response to support community well-being during extreme weather events **3)** Improve climate preparedness throughout the community
Co-benefits	Air and/or Water Quality Human Health and Wellbeing Community Liveability and Connectivity Climate Governance and Accountability

The Township of Langley faces growing risk from climate change impacts, and it is important to prepare for these in order to not only maintain but enhance community health and wellbeing. More specifically, residents of Langley Township can expect hotter, drier summers that lead to heat-related illnesses, increased wildfire smoke events and compromised air quality, flooding and an increase in extreme wind and rainstorms.

Fortunately, these risks can be reduced by increasing social resilience throughout the community and enhancing emergency response. At the neighbourhood-scale, this means building connections between residents so that they are aware of who might need help and better prepared to assist during extreme events. For municipal operations, this involves reviewing and enhancing emergency response and communications measures, and ensuring that support is available for community members who might need it. Through the process of adapting to climate change, the Township of Langley will become stronger as a whole.

Priority Strategies & Actions

PREPAREDNESS		TIMEFRAME
HP-1	Update Langley's Emergency Response Guidelines for extreme heat events	Short
HP-8	Develop business continuation plans for prolonged extreme weather events and disruptions to the energy supply	Short
HP-11	Expand emergency preparedness education	Short

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Host gatherings for your floor, building or block to get to know your neighbours

Participate in local celebrations and with places to connect, such as buddy boards, community libraries, tool shares, and community gardens

Offer to help seniors or others in your community who might need assistance, and check in on them during power outages or extreme events (e.g. heat waves, storms)

Plan for emergencies with your family – have an emergency kit, communication plan, and meeting place

Agriculture

Goal	Foster a strong agriculture sector ready to adapt to climate change, reduce emissions and contribute to local food security.
Objectives	**1)** Increase knowledge within the Township agriculture sector on causes, impacts and opportunities to address climate change **2)** Increase the number of "climate-friendly" best management practices and innovative farm practices that are implemented within the Township **3)** Continue to improve local food production and accessibility within the Township
Targets	• 100% of greenhouses will be heated with renewable natural gas by 2030
Co-benefits	Ecosystem Health Air and/or Water Quality Carbon Absorption Human Health & Wellbeing Local Economy

The Township of Langley was built on agriculture. The Township has a land mass of almost 80,000 acres, approximately 75% of which is within the Agricultural Land Reserve (ALR), and almost half of the farms in Metro Vancouver are located within its borders.

The changing climate will have serious implications for local agriculture. The Township's farms face growing challenges from increased heat waves and droughts, severe storms, and potential flooding of the Fraser River. At the same time, shifting temperatures and reduced frost days will extend the growing season and potentially allow the cultivation of new crops. Agriculture also has serious impacts on the climate, accounting for 15% of GHG emissions in the Township, with most of them coming from agricultural infrastructure (e.g. greenhouses) and fuels for farming equipment. On top of these emissions, farming and food production negatively impact the environment through pesticide and fertilizer use, and food packing and transport.

Priority Strategies & Actions

FOOD SECURITY		TIMEFRAME
AG-1	Develop a requirement for food growing space in new multi-family buildings to encourage urban agriculture	Medium
AG-2	Continue and enhance local food promotion and education	Short
AG-3	Continue to expand the community garden program	Short
GENERAL		**TIMEFRAME**
AG-4	Continue and expand the Ecological Services Initiative (ESI)	Short
AG-7	Partner with the BC Agriculture and Food Climate Action Initiative (BCAGFCAI) to support climate action in the Township's agricultural industry	Short

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Support local farmers by asking for locally grown produce and other farm products

Choose organically grown produce wherever possible

Participate in community gardening initiatives

Waste

Goal	Reduce waste and increase the diversion of waste away from the landfill.
Objectives	**1)** Encourage waste reduction **2)** Ensure waste collection services are sustainable, convenient and harmonized across the community **3)** Maximize the adoption of best practices in waste diversion across sectors

Targets	• Waste diverted from residential sector (%):
	  ○ **2030:** 95%
	  ○ **2050:** 97%
	• Waste reduction in ICI sector (%):
	  ○ **2030:** 29%
	  ○ **2050:** 32%

Co-benefits	Air and/or Water Quality Local Economy Climate Governance and Accountability

Solid waste management (i.e. the disposal of garbage, compostable organic materials, recycling, and debris from construction and demolition) is one of the key municipal services that the Township of Langley offers to its residents. Waste makes up a relatively small portion (approximately 1%) of local GHG emissions and does not directly consume energy. However, solid waste decomposing in landfills produces methane, a short-lived but very potent GHG emission, and waste incineration results in emissions of methane, carbon dioxide, and nitrous oxide. For this reason, it is important to consider waste management in the Township's climate actions.

The Township has already made progress on reducing waste in the community and has strong momentum in this area. In 2017, the Township produced 11,721 tonnes of solid waste, a 2% reduction from 2010 that was achieved despite its growing population. Looking to 2030 and beyond, the Township will need to encourage further waste reduction in all sectors, while making waste management procedures as sustainable as possible.

Priority Strategies & Actions

GENERAL		TIMEFRAME
WS-2	Explore feasibility of a municipal recycling depot	Short
RESIDENTIAL URBAN SOLID WASTE		**TIMEFRAME**
WS-4	Ensure all residential properties have disposal options for recycling and organics	Short
WS-10	Explore alternatives to burning green waste	Short
ICI SOLID WASTE		**TIMEFRAME**
WS-5	Ensure all ICI properties have disposal options for recycling and organics	Short
CONSTRUCTION DEMOLITION & LAND CLEARING		**TIMEFRAME**
WS-6	Explore development of a bylaw to increase recycling from demolition, construction, and land clearing	Medium

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Switch from single-use items (i.e. diapers, plastic utensils, disposable razors) to reusable options

Separate out your waste (if you don't already) to minimize garbage in the landfill

Leadership & Integration

Goal	Integrate a climate lens into all Township plans and processes.
Objectives	**1)** Review and improve operational processes and practices for climate agility **2)** Ensure Township staff are educated and able to respond to the climate change challenge **3)** Integrate carbon budgets and climate preparedness and recovery into financial planning
Co-benefits	Climate Governance and Accountability

Leading the way on climate change mitigation and adaptation actions will require the Township of Langley to integrate climate-related information across its processes, procedures and decision-making. The federal government now requires the application of a "climate lens" prior to funding any infrastructure projects, and the Township can be proactive by making sure to ask key climate-related questions prior to large investments.

The next steps for the Township will be to improve awareness and capacity of staff, partners and the community, and to support great work that is already taking place. Climate champions and leaders will be key to continuing the successful implementation of climate action through the organization and community.

Priority Strategies & Actions

GENERAL		TIMEFRAME
LI-1	Review and align strategic policy documents and bylaws to support climate action	Short
LI-2	Develop a climate impact assessment tool to improve decision-making	Short
LI-3	Establish a funding mechanism to support the implementation of the Climate Action Strategy	Short
LI-5	Develop a climate action policy to ensure key actions are implemented consistently across the organization	Short
LI-7	Provide education and data to support staff, management and Council to implement the Climate Action Strategy	Short
LI-8	Provide ongoing public education on climate change	Short

Start timeframe: Short (1-2 years), Medium (3-6 years), Long (7-10 years)

What Can You Do?

Share your voice at Township events or in community surveys on climate action

Look for and support climate-related considerations in future Council reports

4. IMPLEMENTING THE STRATEGY

The Township of Langley needs to implement bold climate action today in order to become a carbon neutral, resilient community by 2050. The *Climate Action Strategy* sets out the broad goals, objectives and strategies necessary to guide the Township to 2030, along with lessons that will carry over for the rest of the century. However, actions also need to be responsive to community needs, market conditions, and innovations in technology. Changing information, technologies, and community priorities will influence the nature and number of actions that should be taken. With this in mind, the Township of Langley will review and update actions on an annual basis to assess progress and identify new priorities.

Getting to Carbon Neutral

This *Climate Action Strategy* identifies the actions necessary to reduce Langley's emissions by more than **906 thousand tonnes of CO_2e**, or an **89% reduction** from 2010 levels. These actions are within the Township's current powers to implement, and take into consideration the current information, capacity, and technologies at our disposal.

However, a further **111 thousand tonnes of CO_2e** have to be addressed before Langley can achieve carbon neutrality in 2050. Fortunately, there are a number of options that the Township can explore that can be used to offset these remaining emissions, many of which continue to evolve. The Township will monitor the feasibility and effectiveness of these tools and technologies as we move towards 2050 and the carbon neutral target. Example tools to monitor include:

- **Biosequestration**: quantifying how many emissions are captured by measurable increases in tree cover, plants and algae within the Township's boundaries
- **Carbon Offsets**: the purchase of credits that represent reductions in other locations that can be put towards reducing emissions in Langley Township
- **Renewable Energy Credits:** purchasing certificates that represent one megawatt hour of clean, renewable energy to put towards emissions reductions, often focused on offsetting emissions associated with municipal operations
- **Negative Emissions Technologies:** exploring mechanisms that sequester carbon by way of capturing and storing carbon emitted from direct sources, such as industrial or biofuel facilities.

Collaborating for Success

The Township of Langley will act as both a leader and a partner in the implementation of the *Climate Action Strategy*. As a leader, the Township will be responsible for implementing mitigation and adaptation actions into its own internal policies, programs and facilities. As a partner, the municipality will continue to work alongside local businesses, community organizations, institutions and other levels of government to share resources and lessons learned, and to refine climate action strategies over time.

The success of the *Climate Action Strategy* relies on individual efforts made by everyone in the community. While this Strategy has listed some high-impact actions for community members to take, there will be many other opportunities that Langley residents and businesses can take to reduce their climate impact. The Township will continue support local residents and businesses in implementing their own climate actions by providing the information and resources that they need to make climate-smart decisions.

Improving Equity

Not everyone in the community will experience the impacts of climate change in the same way, and some individuals will have an easier time implementing the actions in this Strategy than others. Marginalized groups or those most vulnerable to climate change impacts who may be disproportionately affected and in need of additional assistance in this Strategy's implementation include:

- People experiencing systemic inequity, including racialized groups;
- New Canadians, including recent immigrants and refugee communities;
- Those with lower incomes;
- Older adults;
- Pregnant women and young children; and
- Those with disabilities and pre-existing health concerns.

Moving forward, the Township of Langley will work to address underlying causes of inequity in the community and move forward on climate actions that benefit everyone. It will work to ensure the costs and benefits of climate action are distributed fairly, and that Langley residents are empowered to share their perspectives as the Strategy is implemented.

Tracking Progress

Monitoring performance is key to the success of the *Climate Action Strategy*, with indicators providing a picture of the community's climate performance over time. Table 2 lists the priority action areas and their associated targets, which are followed by potential indicators and likely data sources. These are based on data that is currently collected by the Township and should be thought of as a starting point for tracking progress. Indicators can be refined and new ones added over time as appropriate.

For the sake of transparency, and to encourage ongoing discussion, the Township will provide a progress update to Council on an annual basis outlining:

- Action progress;
- Updates on key performance indicators (KPIs);
- Successes and lessons learned;
- New actions; and
- Annual and total investments.

A more comprehensive review will be conducted every five years (approximately), including:

- A full emissions inventory;
- A progress update on emission targets and the Big Moves;
- A full review of the actions to ensure we are on track for the 2030 and 2050 targets; and
- Targeted internal and external stakeholder dialogues on new and existing actions.

Table 2: Targets and indicators by priority action area

INDICATORS BY PRIORITY AREA	
TRANSPORTATION & MOBILITY	
Targets:	• **53% of passenger trips are made by sustainable modes of transportation (active mobility, transit, EVs) by 2030, with 99% by 2050** • **19% of passenger and light-duty vehicles are electric or zero-carbon by 2030, with 98% by 2050** • **25% of heavy-duty vehicles are electric of zero-carbon by 2030, with 97% by 2050**
• Kilometres of sidewalk installed per year	
• Kilometres of cycling infrastructure installed per year	
• Number of participants in a shared bike/e-bike pilot	
• Number of traffic calming measures implemented per year	
• Average transit wait times	
• Number of car shares and shared vehicles available	
• Number of ZEVs in corporate fleet	
• Number of fleet vehicles converted to dual fuel	
• Fuel consumption for corporate vehicles	
• Change in parking metrics for developments	
BUILDINGS & LAND USE	
Targets:	• **100% of hot water and heating system replacements in existing community buildings will be zero-emissions by 2030** • **All new construction will be zero-emissions by 2030** • ***Note that these targets exclude industrial and agricultural buildings***
• EnerGuide reports and ratings for new and existing buildings	
• Annual energy use reductions from industrial and light industrial buildings	
INFRASTRUCTURE	
Targets:	• **15% of electricity comes from local renewable generation by 2030, with 25% by 2050** • **23% of natural gas used will be renewable natural gas by 2030**
• Data from rainwater collection	
• Number of catch basins adopted	
• Condition assessments of stormwater infrastructure	
• Data from groundwater monitoring wells	
• Asset IDsUtility Billing	
• GBRP applications	
• Street light inventory	
GREEN SPACE & ECOSYSTEMS	
• Tree canopy coverage by neighbourhood	
• Number of trees planted per year	
• Establish baseline for green and natural assets	
• All plant species and year planted	
• Number of work orders related to tree maintenance	

INDICATORS BY PRIORITY AREA	
HEALTH & EMERGENCY PREPAREDNESS	
• Number of public drinking fountains	
• Number of grants and/or total funding provided through community grants for sustainability initiatives	
AGRICULTURE	
Targets	• **100% of greenhouses will be heated with renewable natural gas by 2030**
• Number of development permits issued where garden plots are included	
• Number of farms that have completed or implemented Environmental Farm Plans (EFP)	
WASTE	
Targets	• **95% of waste is diverted in the residential sector by 2030, with 97% by 2050** • **29% of waste is diverted in the ICI sector by 2030, with 32% by 2050**
• Overall waste volumes	
• Number of properties using recycling and organics collection programs	
• Fuel consumption for waste collection vehicles	
• Business licenses for ICI properties to ensure they have disposal options for recycling and organics	
• Number of burning permits issued	
LEADERSHIP & INTEGRATION	
• Climate impact assessment tool reports	
• Annual budget sheets	

5. CALL TO ACTION

The Township of Langley's residents and businesses are already feeling the impacts of climate change, and investing in action now will help to make wise investments for the years to come. This *Climate Action Strategy* is the Township's path to becoming a strong, resilient and leading community in climate action. The actions it contains are the steps that we collectively have to take to make sure our community remains safe and healthy in the decades to come.

The *Climate Action Strategy* builds on the many things we have already accomplished in making the Township a great place to live and do business, and sets us up for a future in which we continue to thrive and celebrate what makes Langley Township unique. Together with our utilities, our community partners and industries and other levels of government, the Township of Langley can lead the transition to a low-carbon and resilient future that benefits everyone.

6. APPENDIX A: ACKNOWLEDGEMENTS

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Township of Langley Council

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Polaris Strategy + Insight

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Peter Chevrier
Ramin Seifi
Richard Welfing
Rob Baker
Rob Stare
Robert Knall
Rod Shead
Roeland Zwaag
Russel Nelson
Russell Jenkins
Ryan Coad
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Sarah Regehr
Sarah Maleska
Stephen Gamble
Stephen Richardson
Steve Scheepmaker
Tab Buckner
Teresa Hanson
Val Gafka
Wyatt Babcock

7. APPENDIX B: ACRONYMS & GLOSSARY

Acronyms

ALR: Agricultural Land Reserve

BAU: Business-as-usual

BCAGFCAI: BC Agriculture and Food Climate Action Initiative

CO_2e: Carbon dioxide equivalent

EFP: Environmental Farm Plans

ESI: Ecological Services Initiative

EV: Electric vehicle

GHG: Greenhouse gas

ICI: Industrial, commercial or institutional buildings

LCMP: Low Carbon Mobility Plan

LED: Light-emitting diode

OCP: Official Community Plan

RCP: Representative Concentration Pathways

RNG: Renewable natural gas

SEMP: Strategic Energy Management Plan

TDM: Transportation demand management

VKT: Vehicle kilometres travelled

ZEV: Zero-emissions vehicle

Glossary

Adaptation: Adjusting decisions, activities, and actions based on observed or expected climate conditions, with the goal of moderating the negative impacts of climate change and capitalizing on beneficial opportunities.

Agricultural Land Reserve (ALR): A provincial zone in which agriculture is recognized as the priority use.

BC Energy Step Code: The BC Energy Step Code is performance-based energy efficiency building code for new construction.

Carbon absorption: The process of capturing and storing atmospheric carbon through biological, chemical, and physical processes to help slow or reverse the impacts of carbon dioxide emissions.

Carbon neutral: A state where the net effect of human activity is zero, after accounting for carbon emissions and carbon removal.

Carbon offset: a credit for emissions reductions given to one party that can be sold to another party to compensate for its emissions.

Climate: Longer-term trends in atmospheric conditions over years or decades.

Climate change: Variations in climate over long time periods that have been observed and are projected to occur in the future (30-year periods typically).

Co-benefits: Positive spinoffs of climate change mitigation and adaptation actions that improve the community, such as cleaner air, improved public health from active travel, and expansion of green space

Complete street: Streets designed to be safe and accessible for people of all modes, ages, and abilities.

Extreme weather: Unpredictable, unexpected, and severe weather for a given location, including occurrences such as heat waves and droughts.

Equity: With respect to climate change, ensuring that the burdens of climate impacts and actions are fairly shared across the community, and that the benefits of action are enjoyed by all, including future generations.

Greenhouse gas (GHG): Gases that trap heat in the atmosphere and contribute to climate change by absorbing infrared radiation (e.g. carbon dioxide, chlorofluorocarbons, methane).

Greenhouse infrastructure: Greenhouse infrastructure includes all required structures and systems needed to operate a greenhouse.

Low-carbon resilience (LCR): An approach to climate action planning that considers mitigation and adaptation together to highlight synergies and avoid conflicts.

Mitigation: Actions taken to prevent or reduce the cause, impact and consequences of events. For climate change, measures taken to limit GHG emissions and associated global warming.

Natural assets: Ecosystem features that provide beneficial services to the community.

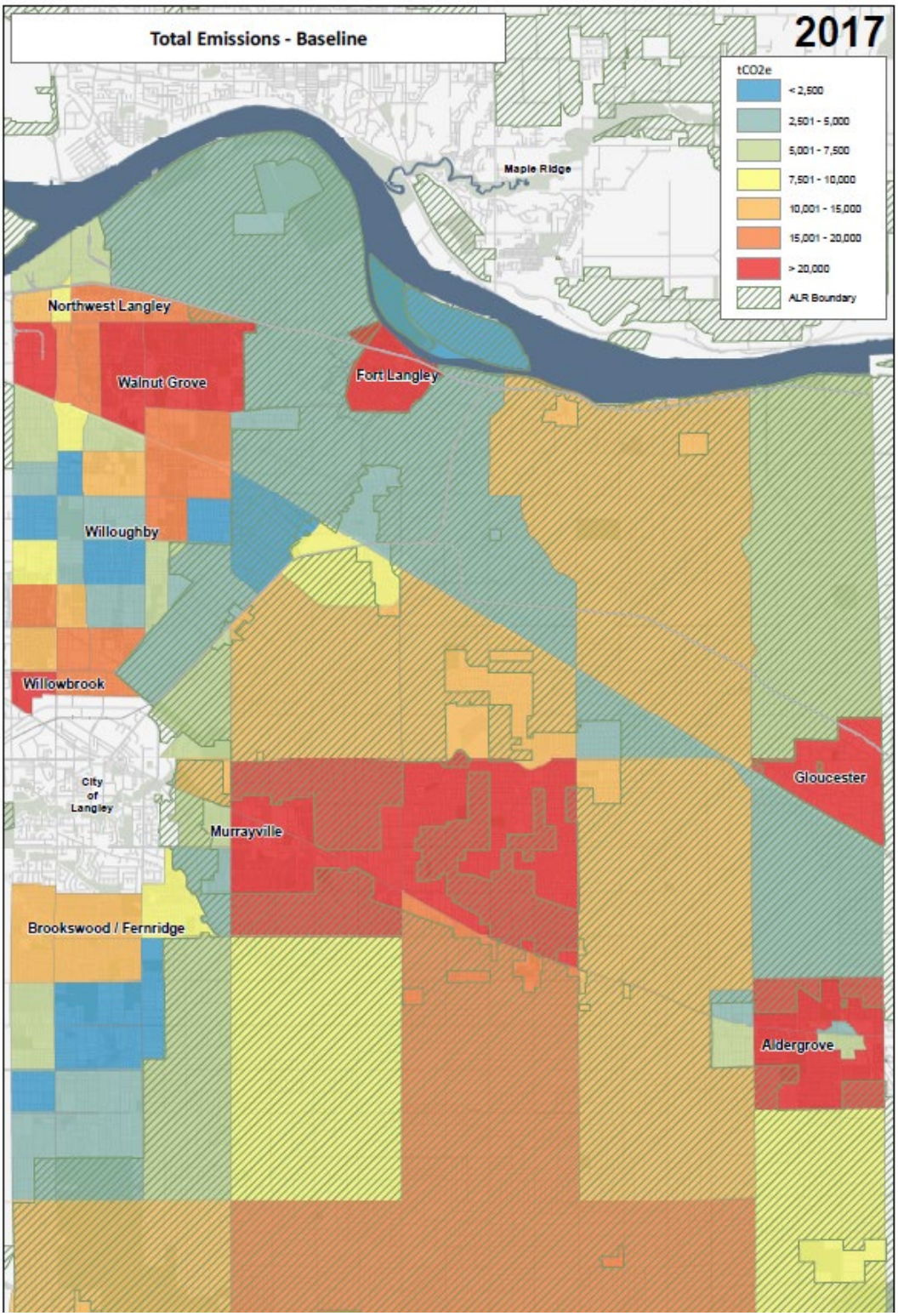
Representative Concentration Pathways (RCP): Internationally recognized scenarios that describe a number of possible GHG emissions scenarios for the 21st century, based on factors that drive human-caused emissions.

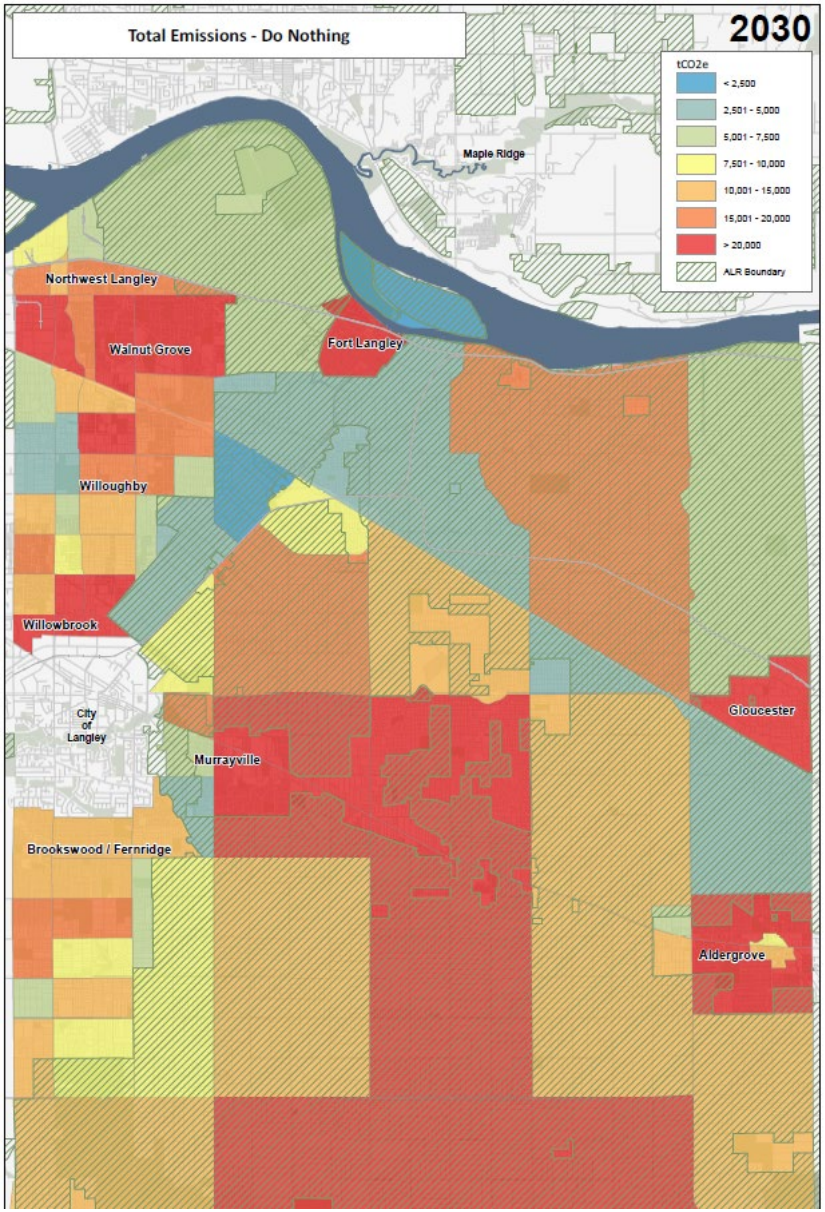
Resilience: The capacity of a social, environmental, or economic system to cope with a hazardous event, trend, or disturbance, and rebound after an event occurs.

Vulnerable: In respect to community members, those who may be more susceptible to the impacts of climate change for a variety of reasons (e.g. pre-existing health conditions, inadequate housing) and who may have fewer resources to help them cope.

Weather: The atmospheric conditions at a specific location at a specific time, which generally occur over a short time period and change frequently.

8. APPENDIX C: TOTAL EMISSIONS MAPS

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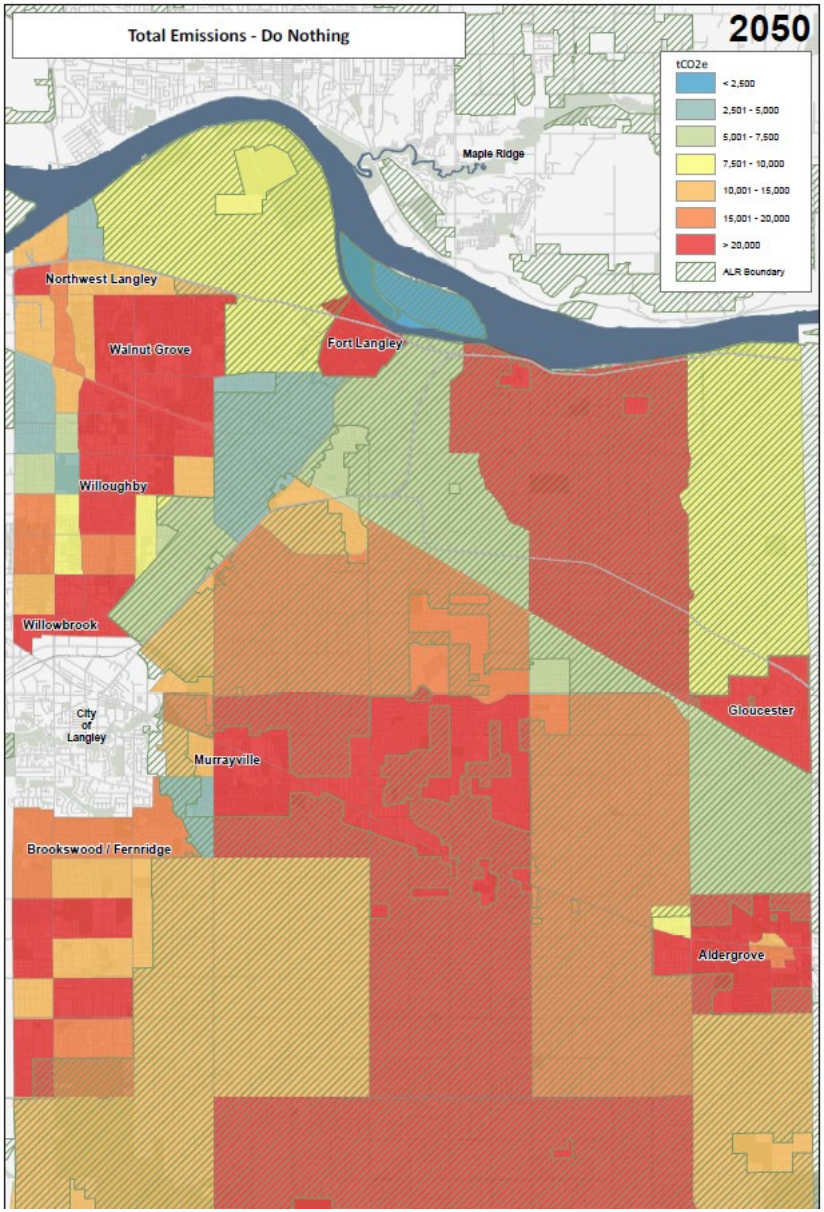
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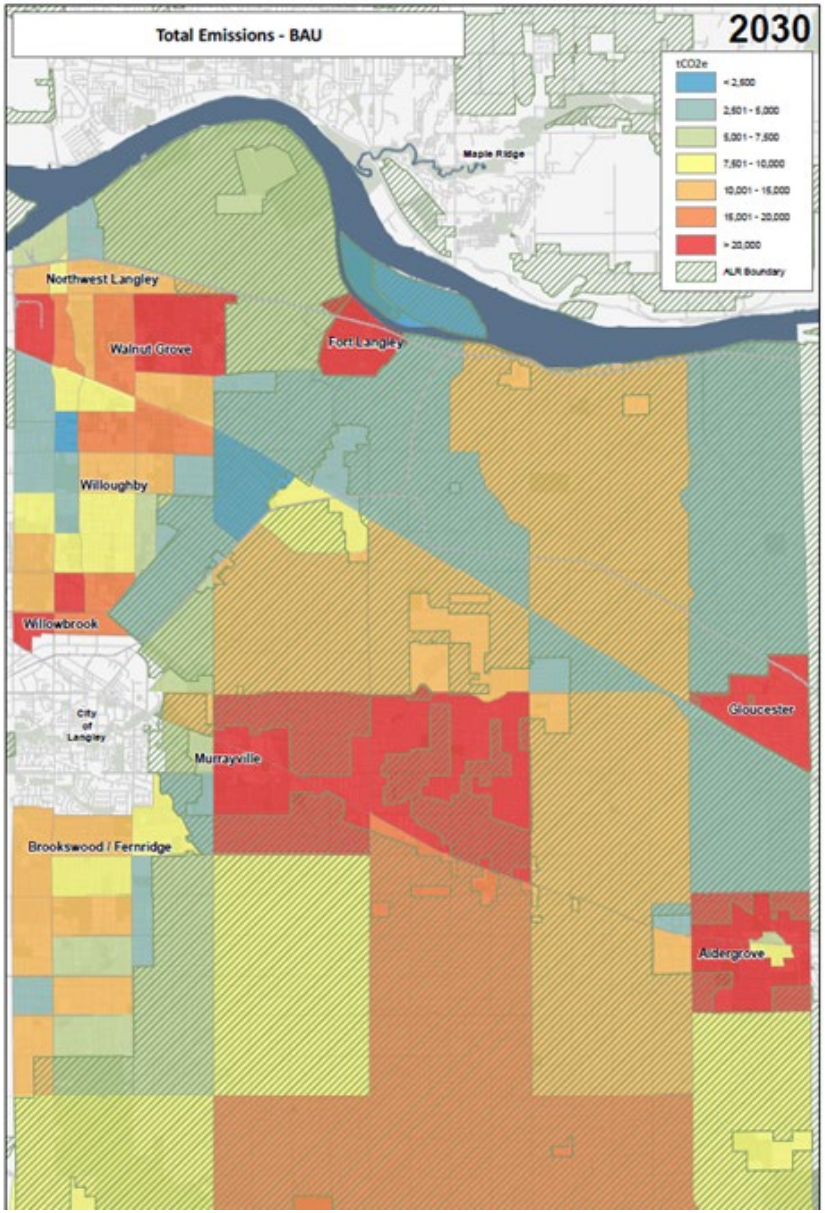
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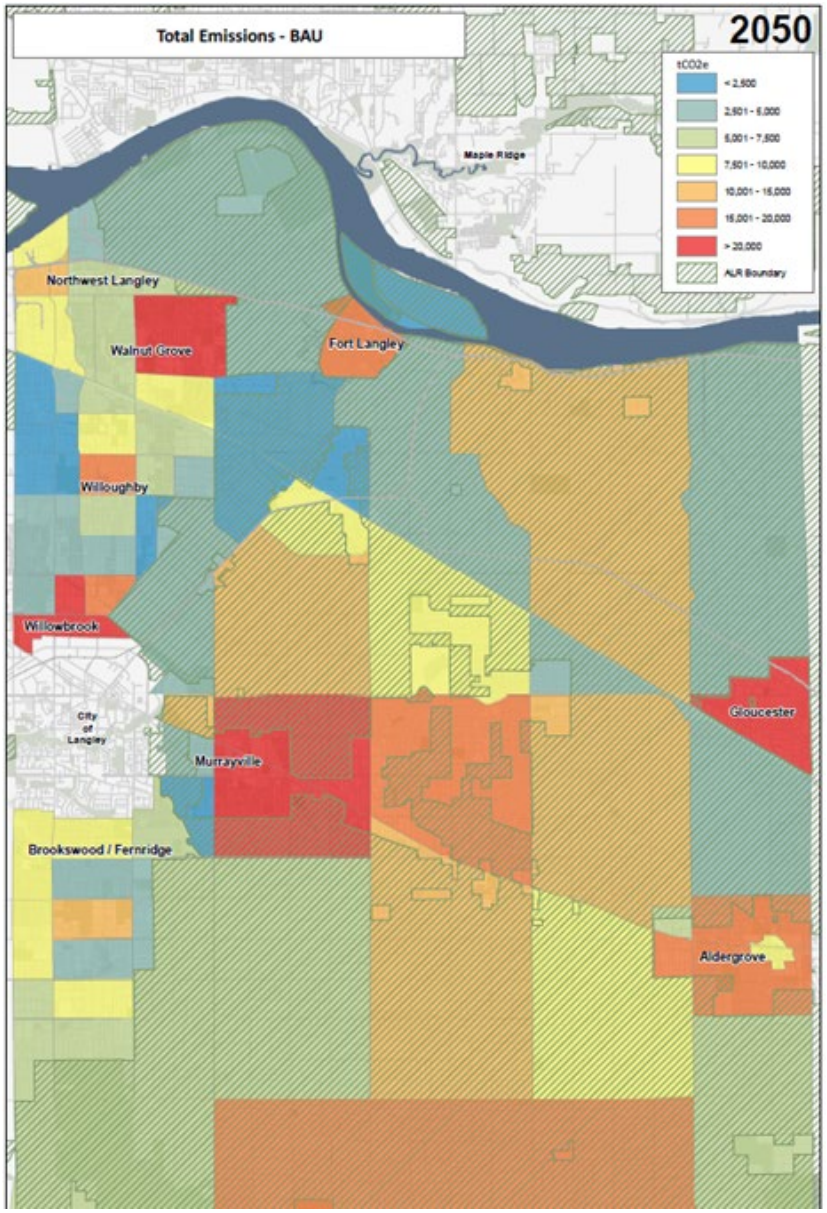
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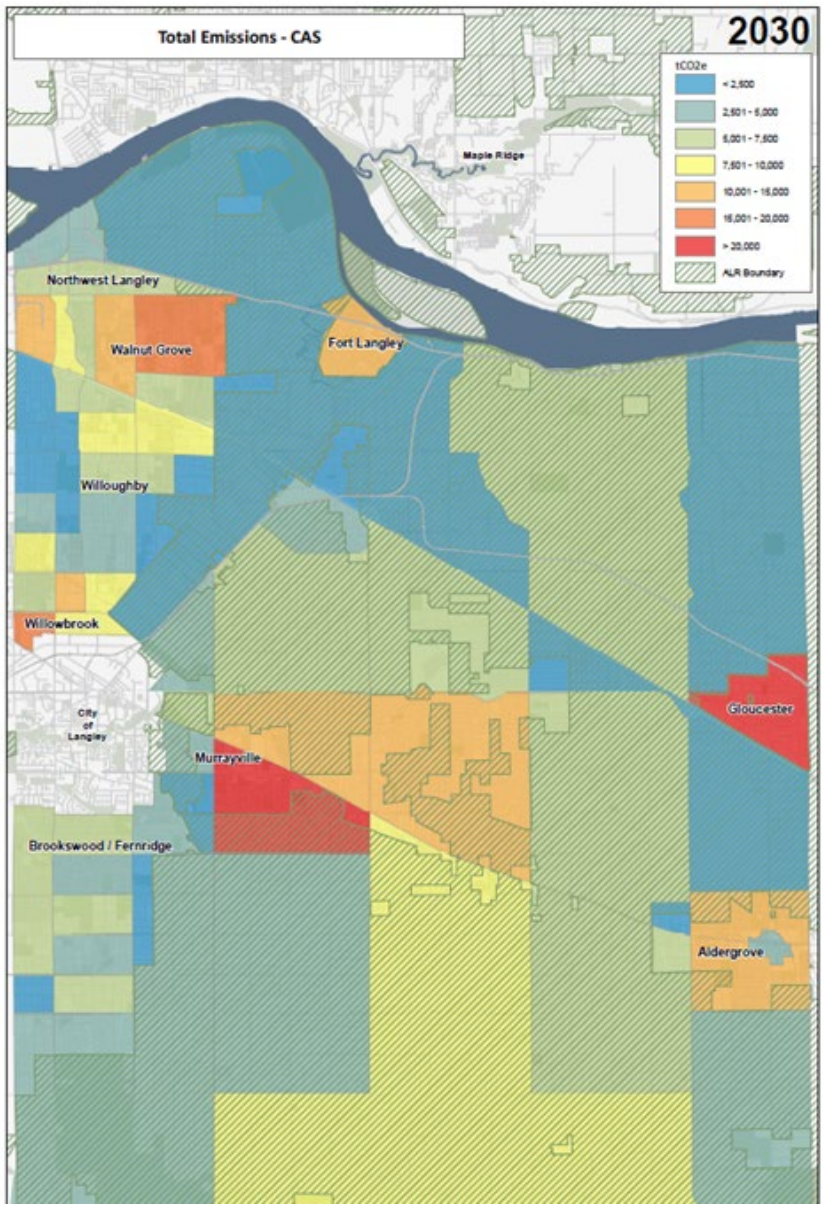
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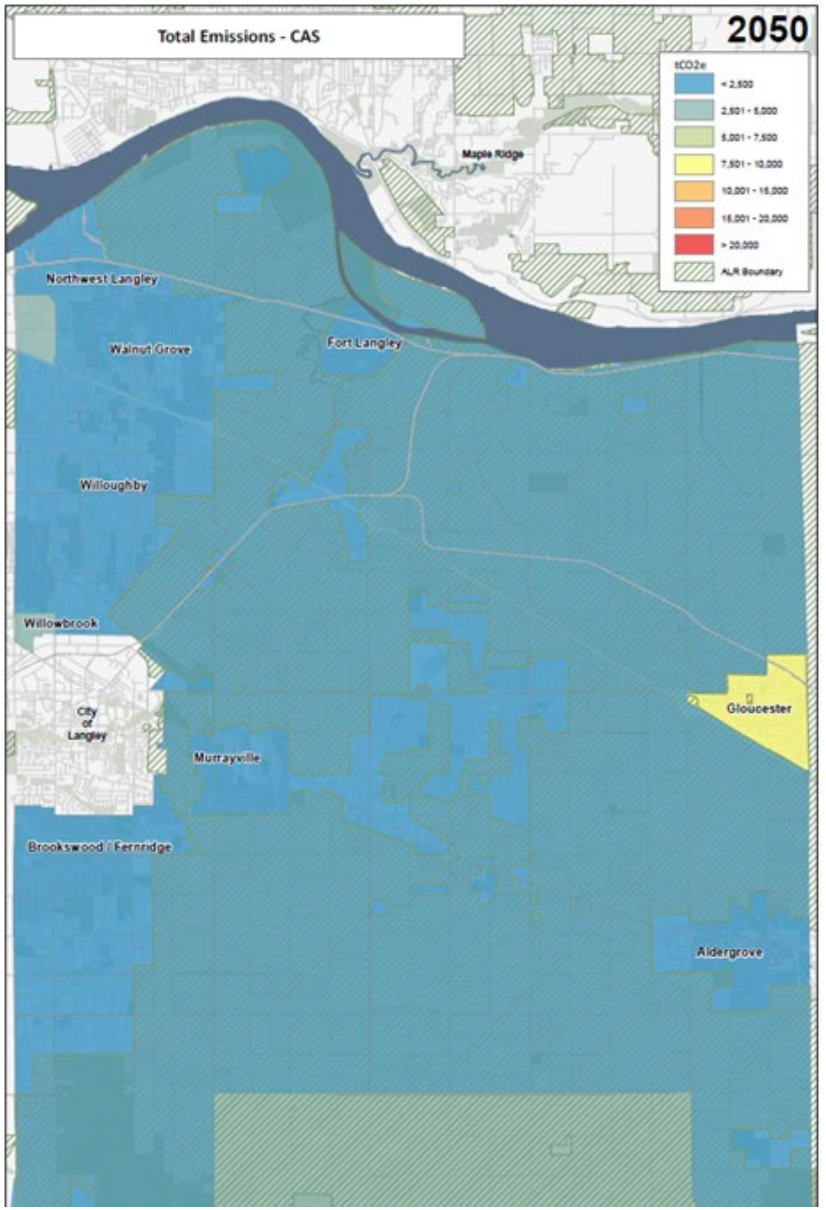
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9. APPENDIX D: MODELLING PROJECTIONS

Population & Employment Projections

Population projections and employment projections (and 2051 population) were taken from Metro Vancouver 2016 Regional Population Growth Projections 2021-2050.

Table D1: Population and employment projections for the Township of Langley (source: Metro Vancouver)

Year	Population	Employment
2016	122,537	63,900
2017	125,663	65,120
2018	128,740	66,340
2019	131,794	67,560
2020	134,817	68,780
2021	137,796	70,000
2022	140,905	71,200
2023	143,973	72,400
2024	147,026	73,600
2025	150,055	74,800
2026	153,100	76,000
2027	156,123	77,200
2028	159,108	78,400
2029	162,068	79,600
2030	165,002	80,800
2031	167,881	82,000
2032	170,714	83,000
2033	173,501	84,000
2034	176,244	85,000
2035	178,943	86,000
2036	181,605	87,000
2037	184,229	87,800
2038	186,828	88,600
2039	189,396	89,400
2040	191,938	90,200
2041	194,451	91,000
2042	196,905	91,800
2043	199,321	92,600
2044	201,689	93,400
2045	204,022	94,200
2046	206,312	95,000
2047	208,562	95,600
2048	210,779	96,200
2049	212,967	96,800
2050	215,127	97,400

BAU Energy Consumption & GHG Emissions Forecast

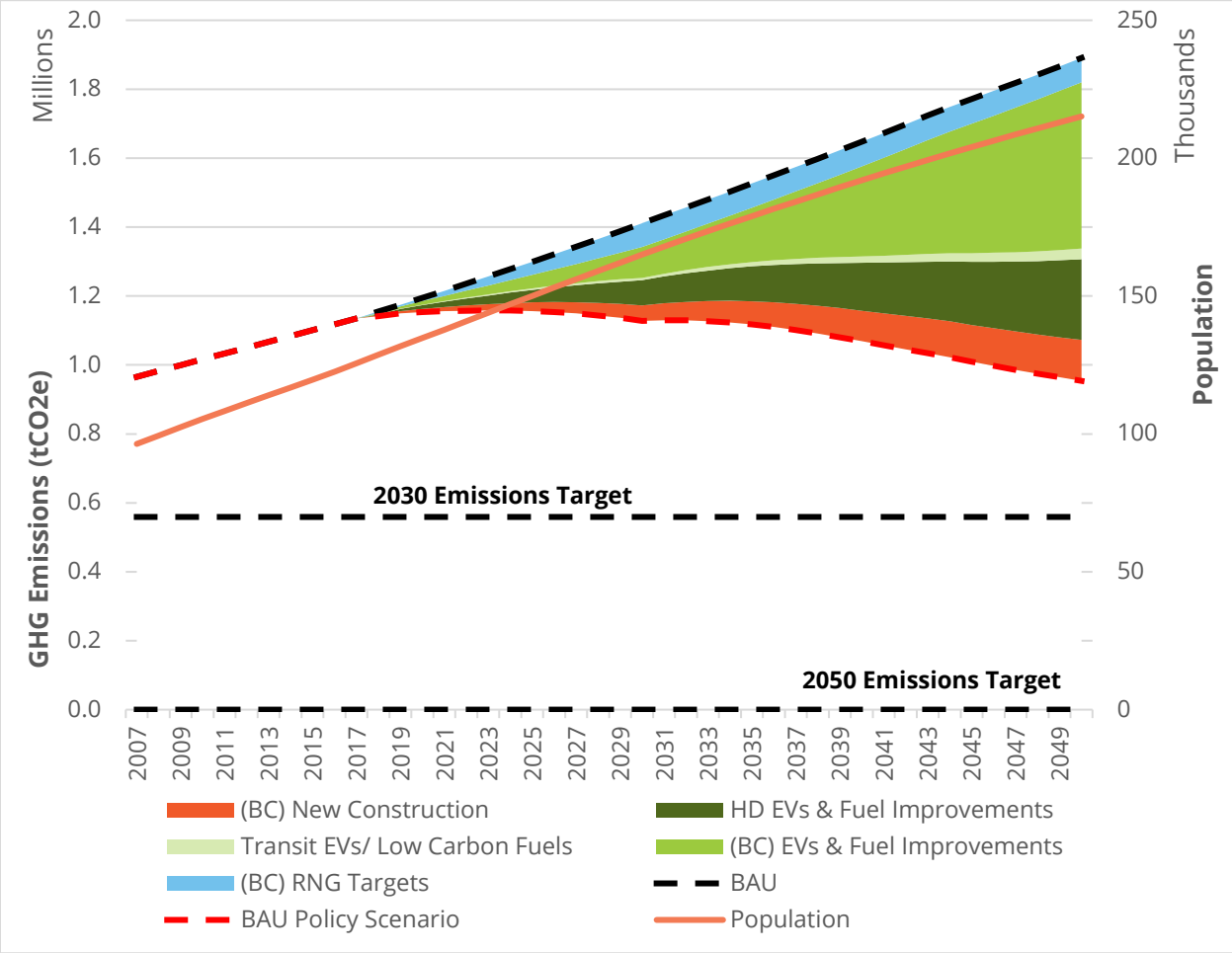


Figure D1: Business-as-usual emissions forecast for the Township of Langley, 2007 to 2050

Table D2: BAU energy use Forecast by sector and fuel type

Row Labels	2017 Energy Consumption (GJ)	2030 Energy Consumption (GJ)	2050 Energy Consumption (GJ)
Buildings	10,293,293	12,147,744	12,845,392
Transportation	10,418,820	10,557,809	7,361,767
Agriculture	2,079,602	2,113,852	2,163,971
Waste	-	-	-
Grand Total	**22,791,716**	**24,819,405**	**22,371,130**

Table D3: BAU emissions forecast by sector and fuel type

Sector	2017 Emissions (tCO_2e)	2030 Emissions (tCO_2e)	2050 Emissions (tCO_2e)
Buildings	339,106	341,834	360,540
Transportation	615,189	627,030	435,675
Agriculture	168,958	146,464	140,723
Waste	11,721	14,127	17,673
Grand Total	**1,134,974**	**1,128,236**	**953,838**

Policy Energy Consumption & GHG Emissions Forecast

Figure D2 shows the projected policy scenario emissions for Langley Township through to 2050. Coloured wedges show the estimated reductions from the BAU forecast. Policy forecasted energy use and emissions are also summarized by sector and fuel type in Table D4 and Table D5 below.

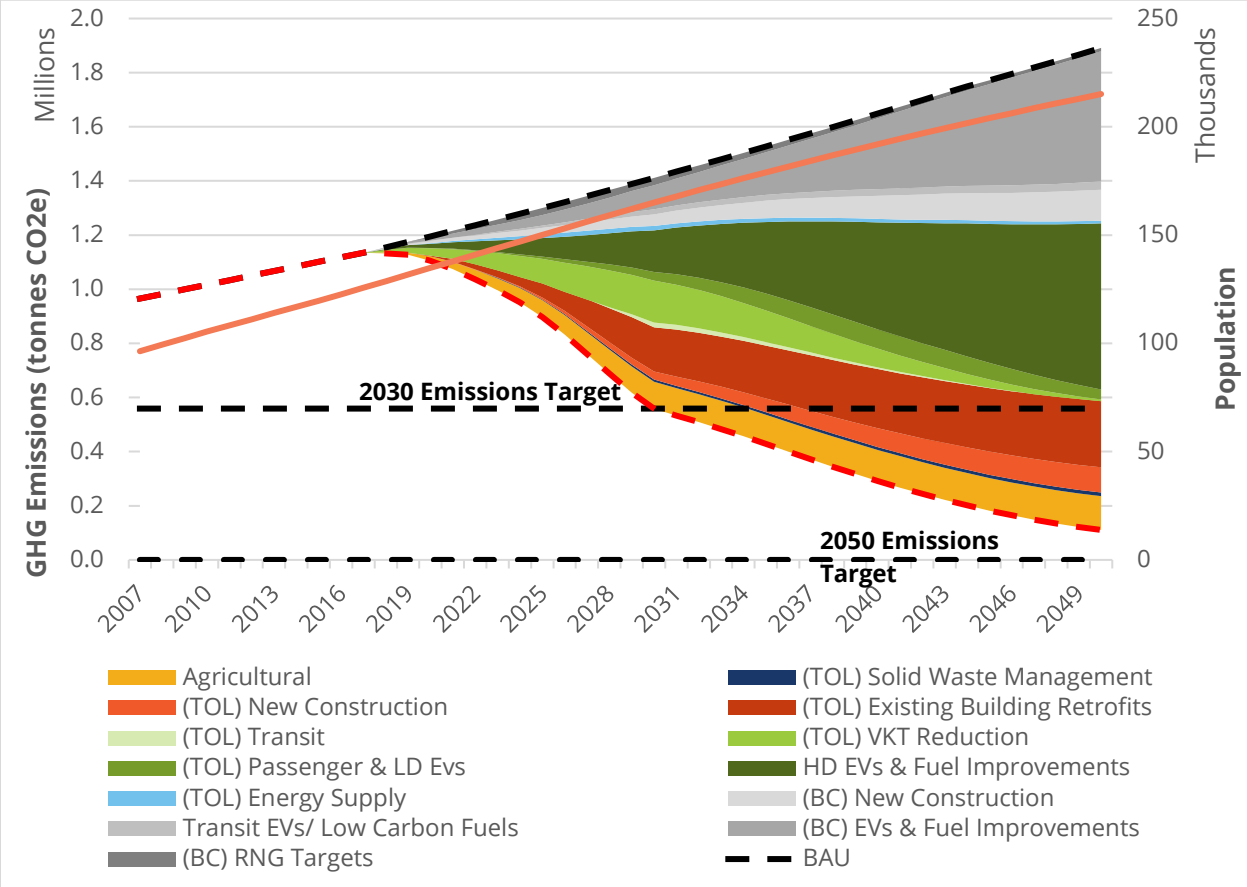


Figure D2: Low-carbon emissions scenario to 2050 (policy emissions forecast)

Table D4: Policy energy use forecast by sector

Row Labels	2017 Energy Consumption (GJ)	2030 Energy Consumption (GJ)	2050 Energy Consumption (GJ)
Buildings	10,293,293	9,966,976	8,049,275
Transportation	10,418,820	13,389,460	12,521,143
Agriculture	2,079,602	2,040,968	1,890,056
Waste	-	-	-
Grand Total	**22,791,716**	**25,397,404**	**22,460,474**

Table D5: Policy emissions forecast by sector

Sector	2017 Emissions (tCO_2e)	2030 Emissions (tCO_2e)	2050 Emissions (tCO_2e)
Buildings	339,106	161,991	63,078
Transportation	615,189	330,059	15,676
Agriculture	168,958	60,050	26,940
Waste	11,721	6,922	5,028
Grand Total	**1,134,974**	**559,023**	**110,723**

Table D6: Policy action emissions savings forecast

Wedge	2030 Emissions Savings (tCO_2e)	% of 2030 Emissions Savings	2050 Emissions Savings (tCO_2e)	% of 2050 Emissions Savings
Emissions with no action	*1,411,368*		*1,891,467*	
(BC) New Construction	42,574	5%	114,385	6%
(BC) RNG Targets	26,924	3%	11,639	1%
(BC) EVs & Fuel Improvements	89,059	10%	481,910	27%
Transit EVs/ Low Carbon Fuels	18,452	2%	30,373	2%
(TOL) Existing Building Retrofits	163,209	19%	246,358	14%
(TOL) New Construction	30,139	4%	93,268	5%
(TOL) Energy Supply	16,736	2%	10,120	1%
(TOL) Passenger & LD EVs	32,576	4%	36,738	2%
HD EVs & Fuel Improvements	153,767	18%	613,536	34%
(TOL) VKT Reduction	153,882	18%	6,403	0%
(TOL) Transit	18,000	2%	-2,199	0%
(TOL) Solid Waste Management	7,872	1%	13,255	1%

Agricultural	99,154	12%	124,958	7%
Grand Total Annual GHG Savings	*852,345*	*100%*	*1,780,745*	*100%*
Remaining GHGs in Climate Action Scenario	***559,023***		***110,723***	
Percent Reduction in Climate Action Scenario	***-60%***		***-94%***	

Table D7: Cumulative policy action emissions savings forecast

Wedge	2020-2030 Cumulative Emissions Savings (tCO_2e)	% of 2020-2030 Cumulative Savings	2020-2050 Cumulative Emissions Savings (tCO_2e)	% of 2020-2050 Cumulative Savings
(BC) New Construction	271,289	6%	1,962,382	6%
(BC) RNG Targets	237,005	5%	589,137	2%
(BC) EVs & Fuel Improvements	478,877	10%	6,053,891	19%
Transit EVs/ Low Carbon Fuels	95,012	2%	588,985	2%
(TOL) Existing Building Retrofits	777,446	16%	5,103,590	16%
(TOL) New Construction	116,668	2%	1,491,936	5%
(TOL) Energy Supply	131,683	3%	387,370	1%
(TOL) Passenger & LD Evs	134,992	3%	1,309,678	4%
HD EVs & Fuel Improvements	821,136	17%	8,832,377	28%
(TOL) VKT Reduction	1,011,068	21%	2,415,013	8%
(TOL) Transit	7,497	0%	141,585	0%
(TOL) Solid Waste Management	38,645	1%	253,079	1%
Agricultural	675,770	14%	2,967,012	9%
Grand Total	***4,797,086***	***100%***	***32,096,036***	***100%***

10. APPENDIX E: 2017 EMISSIONS INVENTORY DATA, METHODOLOGY & RESULTS

Inventory Data Sources

The profiles that support the CAS analysis were created by developing a current inventory and a forecasts of energy use and emissions from key Township sectors, including transportation, buildings, agriculture and waste. The inventory was developed using data and information from several sources, including:

Table E1: Inventory data sources

Buildings	Transportation	Agriculture	Waste
• BC Ministry of Environment (electricity, natural gas, oil, propane, and wood utility data)	• BC Ministry of Environment (vehicle classes, VKT, energy, and GHGs) • Metro Vancouver (vehicle classes, VKT, energy, and GHGs) • Current population and population projections provided by Township	• Animal populations and population trends for select livestock types provided by the Township • Metro Vancouver (GHGs of agricultural equipment)	• Tonnages for residential solid waste provided by the Township • BC Ministry of Environment (ICI sector waste tonnages, waste emissions factor) • Current population and population projections provided by Township

The specific data sources used to generate the figures presented in this report are further outlined in Appendix A and Appendix B of the *Technical Memo Update* available as a companion to this report. These appendices detail the emissions inventory (Appendix A) and forecast (Appendix B) methodology. A report card has also been prepared evaluating Township climate action since the release of their 2010 Community Energy and Emissions Plan (CEEP). The report card results are included in Appendix C of the *Technical Memo Update*.

Buildings

Table E2: Community Energy and Emissions Inventory utility data

Data Source	Data Used	Fuel Type	Emissions Factor Units (Mass Unit/Activity Unit)	Emissions (g CO_2e)	2017 Activity Data	2017 Emissions (t CO_2e)
BC Ministry of Environment 2017 Community Energy and Emissions Inventory	• Electricity (BC Hydro) • Natural gas (Fortis BC) • Oil • Propane • Wood • Energy use and emissions for all fuel types	Electricity	g/kWh	10.670	1,231,732,928 kWh	13,138
		Natural Gas	g/GJ	49,870	7,742,479 GJ	386,142
		Oil	g/GJ	61,150	63,792 GJ	6,452
		Propane	g/GJ	68,370	94,361 GJ	3,901
		Wood	g/GJ	19,070	38,027 GJ	726

Methodology for Community Energy and Emissions Building Utility Data

- Activity data for each of the five fuel types consumed in the Township were obtained from 2017 CEEI data (Table E2).
- The emissions factor for each of the five fuel types was obtained from the BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions[18].
- Activity data from each fuel type was multiplied by its emissions factor to derive 2017 building emissions for each fuel type.

[18] BC Ministry of Environment. (2017). *B.C. Best Practices Methodology for Quantifying Greenhouse Gas Emissions.*

Transportation

Table E3: CEEI transportation data and emissions

Data Source	Data Used	Vehicle Class	Energy Use (km/MJ)	g CO_2e /MJ	2012 VKT	2017 VKT	2017 Emissions (t CO_2e)
BC Ministry of Environment 2012 Community Energy and Emissions Inventory[19]	• Heavy duty trucks (gas & diesel) • Medium-duty trucks (gas, diesel, & propane) • Light-duty trucks (gas & diesel) • Motorhomes (gas & diesel) • SUVs and vans (gas & diesel) • Large passenger cars (gas & diesel) • Small passenger cars (gas & diesel) • Motorcycles and mopeds (gas & diesel) • Vehicle counts, VKT, energy use, and emissions for all vehicle classes	Heavy Duty Truck - Diesel	0.06	68.5	179,133,000	205,107,285	218,145
		Medium Duty Truck - Diesel	0.09	68.5	80,401,800	92,060,061	70,298
		Light Duty Truck - Diesel	0.16	68.5	14,570,000	16,682,650	7,270
		Motorhomes - Diesel	0.13	68.5	1,637,600	1,875,052	982
		SUV / Van – Diesel	0.16	68.5	3,141,600	3,597,132	1,547
		Large Passenger Cars - Diesel	0.24	68.5	1,983,600	158,971,228	645
		Small Passenger Cars - Diesel	0.25	68.5	8,959,800	10,258,971	2,789
		Heavy Duty Truck - Gas	0.06	66.3	1,125,300	1,288,469	1,343
		Medium Duty Truck - Gas	0.11	66.3	46,617,800	53,377,381	31,567
		Light-duty Truck - Gas	0.17	66.3	131,853,700	150,972,487	57,681
		Motorhomes - Gas	0.21	66.3	5,394,600	6,176,817	1,993
		SUV/Van - Gas	0.21	66.3	265,108,900	303,549,691	95,404
		Small Passenger Cars - Gasoline	0.30	66.3	243,048,000	278,289,960	2,789
		Motorcycles, Mopeds - Gas	0.53	66.3	6,633,800	7,595,701	941
		Medium-duty Truck - Propane	0.09	66.3	1,718,100	1,967,225	1,571
		Light-duty Truck - Propane	0.11	68.5	529,000	605,705	382

[19] BC Ministry of the Environment. (2019). *Community Energy and Emissions Inventory.*

Table E4: Lower Fraser Valley transportation data and emissions

Data Source	Data Used	Vehicle Class	Energy Use (km/MJ)	g CO_2e /MJ	2015 VKT	2017 VKT	2017 Emissions (t CO_2e)
Metro Vancouver 2015 Lower Fraser Valley (LFV) Air Emissions Inventory and Forecast[20]	• Transit buses (gas, diesel, & CNG) • Passenger cars (electric) • Vehicle counts, VKT, energy (when available), and emissions for all vehicle classes	Transit Bus - Diesel	0.09	69.8	5,351,008	5,661,367	4,248
		Transit Bus - Gas	0.10	73.2	400,909	424,162	311
		Transit Bus – CNG	N/A[21]	NA[6]	350,620	370,955	286
		Passenger Car - Electric	0.05	0.0	1,013,687	1,072,481	0[22]

Methodology for Community Energy and Emissions Inventory Transportation Data

- The decision was made by Township staff and the consultant team to exclude transit vehicle emissions from the 2012 CEEI data, as reported emissions for transit vehicles were determined to be inaccurate and much lower than actual transit emissions.
- Energy consumption (km/MJ) and emissions (g CO_2e/MJ) were backed out of 2012 CEEI Township transportation data for each vehicle class and fuel type (Table E3).
- These values were multiplied by VKT for each vehicle class and fuel type to get 2012 emissions.
- Emissions from each vehicle class and fuel type were then scaled from 2012 to 2017 using population data provided by Township planning staff. The Township's population grew by an average of 2.9% per year from 2012 to 2017. Therefore, 2012 transportation emissions were multiplied by 1.145 to derive 2017 emissions.

Methodology for Metro Vancouver Transportation Data

- Metro Vancouver data as well as mode share information from TransLink were used to estimate transit vehicle emissions.
- Metro Vancouver data provided the fuel split for transit buses. TransLink's 2017 Trip Diary was used to determine the overall mode share transit should have versus other passenger modes of transportation. Mode share VKT was adjusted to account for transit efficiency (i.e. 1 km travelled on a bus replaces several passenger VKT because the passengers travel together).
- Energy consumption intensity (km/MJ) was backed out of the data for gas and diesel transit busses and electric passenger cars. No energy consumption data was available for CNG transit buses (Table E4).
- Emissions (g CO_2e/MJ) were backed out of the Inventory data for each vehicle class and fuel type.
- These values were then multiplied by total VKT to derive 2017 emissions for each vehicle class.

[20] Data provided by Metro Vancouver.
[21] No energy data was provided for CNG transit buses, therefore, g CO_2e/VKT was used to calculate emissions. Transit CNG buses were calculated to have emissions of 772.3 g CO_2e per VKT.
[22] Emissions from electric passenger cars are included in the buildings emissions sector.

Agriculture

Table E5: 2015 Metro Vancouver agricultural data

Data Source	Data Used	Emissions Source	2015 emissions (t CO_2e)
Metro Vancouver 2015 Lower Fraser Valley (LFV) Air Emissions Inventory and Forecast	• Agricultural equipment • Greenhouses • Fertilizers & pesticides • Cattle • Pigs • Sheep • Poultry • Horses • Miscellaneous animals • Emissions from all agricultural sources	Agricultural equipment	74,151
		Greenhouses	70,922
		Fertilizers & pesticides	5,124
		Cattle	18,220
		Pigs	81
		Sheep	547
		Poultry	1
		Horses	3,093
		Miscellaneous animals	347

Table E6: Agricultural trends in the Township

Data Source	Emissions Source	Projected Change 2015 to 2017	2017 emissions (t CO_2e)
Agricultural Production in the Township – Selected Farm Indications, Crops, and Livestock[23]	Agricultural equipment	N/A	74,151
	Greenhouses	0.4%	71,254
	Fertilizers & pesticides	-22.2%	4,553
	Cattle	-13.8%	15,732
	Pigs	-51.8%	39
	Sheep	2.8%	563
	Poultry	28.0%	2
	Horses	-24.8%	2,326
	Miscellaneous animals	N/A	347

Methodology for Township and Metro Vancouver Agricultural Data

- 2015 emissions totals were provided for each of the nine agricultural emissions sources in the Township (Table E5).
- For all emissions sources except agricultural equipment and miscellaneous animals (no data), 2015 emissions totals were scaled to 2017 using agricultural production in the Township data, which was provided by Township staff and is displayed in Table E6 above.

[23] Data provided by the Township.

Waste

Table E7: Township of Langley Residential Waste Data and Emissions

Data Source	Data Used	2016 Total Residential Tonnage (Inc. LIPU)	2017 Total Residential Tonnage (Inc. LIPU)	2017 Residential Emissions (t CO_2e)
2017 Township of Langley residential solid waste and large item pick-up (LIPU) tonnages[24]	• 2017 residential solid waste and large item pick-up (LIPU) tonnages	9,799	8,909	3,479

Table E8: Community Energy and Emissions Inventory Waste Data and Emissions

Data Source	Data Used	2016 Total Tonnage (ICI + Residential)	2016 Total ICI Tonnage	2017 Total ICI Tonnage	Emissions Factor (t CO_2e/tonne)	2017 ICI Emissions (t CO_2e)
BC Ministry of Environment 2016 Community Energy and Emissions Inventory	• 2016 Township solid waste tonnage • 2016 Emissions factor for Township solid waste	30,310	20,511	21,106	0.39	8,242

Methodology for Township and Community Energy and Emissions Inventory Waste Data

- 2016 ICI tonnages were calculated as total 2016 Township solid waste from the CEEI data, minus 2016 Township residential solid waste, which was provided by Township staff (Table E7 and Table E8).
- 2016 ICI tonnage was then scaled to 2017 using population data provided by the Township. The Township grew at a rate of 2.9% between 2016 and 2017, therefore, 2016 ICI tonnage was multiplied by 1.029 to derive 2017 ICI tonnage.
- The emissions factor for solid waste was backed out of the 2016 CEEI waste data and used for both ICI and residential solid waste. Total Township solid waste tonnages were multiplied by this factor (0.39) to derive total waste sector emissions.

[24] Data provided by the Township.

Inventory Results Summary

Buildings

Residential buildings make up approximately 64% of the Township's total 18 million square meters of floor area (198 million square feet). *Single family detached* housing alone represents 47% of the total floor area, making it an important target for Langley's *Climate Action Strategy*. Agricultural facilities are another important building archetype comprising 18% of the total building area. The remaining 19% of the Township's buildings are institutional, commercial, and industrial buildings (ICI).

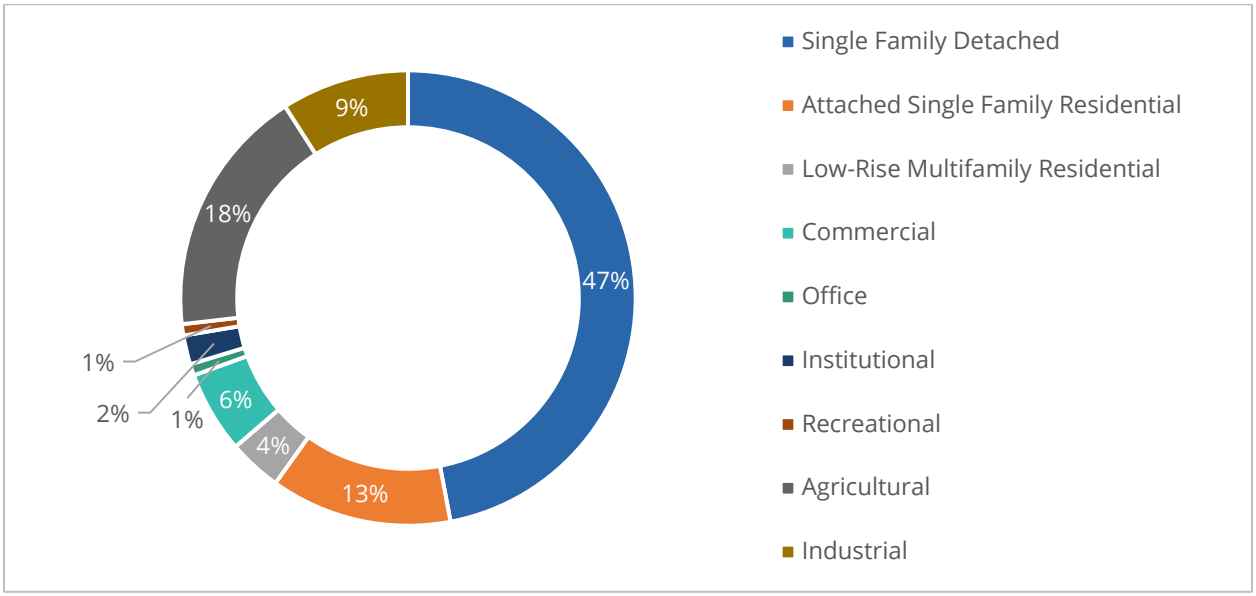
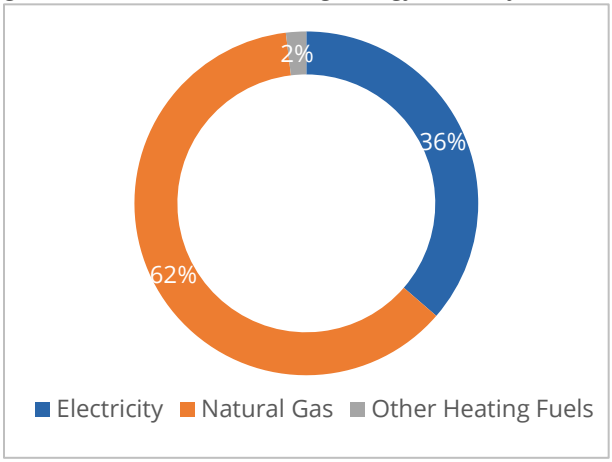


Figure E1: Breakdown of 2017 Township building area by category

Looking at the building sector by fuel type, the importance of reducing or eliminating natural gas as a fuel source for Township buildings becomes evident. In 2017, natural gas accounted for 62% of building energy use and 93% of building sector emissions. Electricity, due to the low carbon intensity of British Columbia's electrical grid, uses 36% of the building energy, but only accounts for 3% of the sector's emissions.



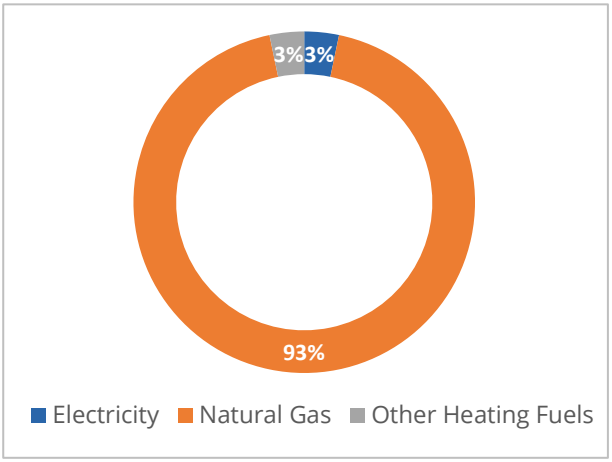


Figure E2: 2017 building energy consumption by fuel type *Figure E3: 2017 building emissions by fuel type*

Transportation

Transportation in the Township of Langley is characterized by two main factors – high passenger vehicle use (typically single occupancy[25]) and the presence of a commercial transportation hub. As a transportation hub, Langley has a higher percentage of transportation energy use and emissions come from heavy-duty vehicles.

Figure 8 shows Township passenger vehicles as the class with the majority of vehicle kilometers travelled (VKT) in 2017 at 58%, with heavy-duty vehicles and light-duty vehicles accounting for 27% and 13%, respectively. Transit vehicles travelled 2% of total VKT in the Township in 2017.

Regarding energy use, heavy-duty vehicles represented the largest share of the transportation sector's energy consumption at 46%, with passenger vehicles using 30% of total transportation energy. Light-duty and transit vehicles consumed 9% and 15% of the sector's energy, respectively (Figure 10). Township vehicles' energy consumption by fuel type is 44% diesel, 43% gasoline, and 13% compressed natural gas (Figure 11).

Turning to emissions, heavy-duty vehicles were responsible for the majority of transportation emissions in the Township with 53%, followed by passenger, light-duty, and transit vehicles at 34%, 11%, and 3%, respectively (Figure 12). The emissions share of heavy-duty vehicles is substantially higher than the VKT for this vehicle class, as the fuel economy of this class is much lower than passenger and light-duty vehicles.

[25] Metro Vancouver (2017.) *Metro2040 Dashboard – Mode Share Township of Langley*. Retrieved from: http://www.metrovancouver.org/metro2040/sustainable-transportation/vehicle-use/mode-share/Pages/default.aspx

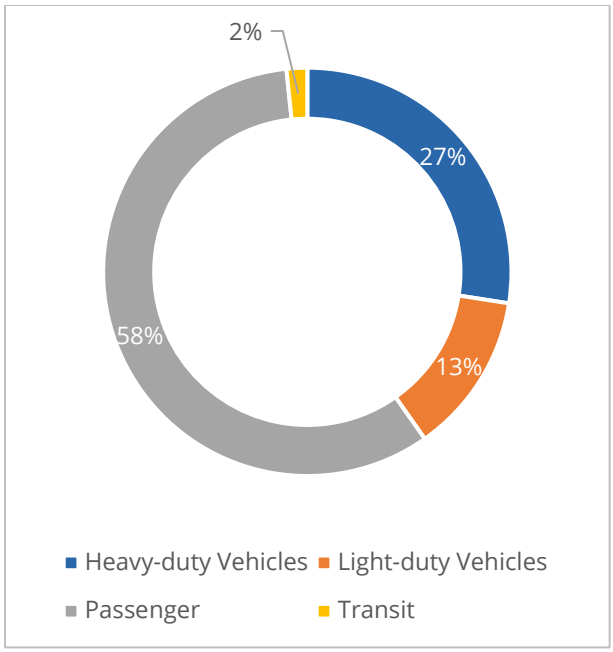


Figure E4: 2017 VKT by vehicle class

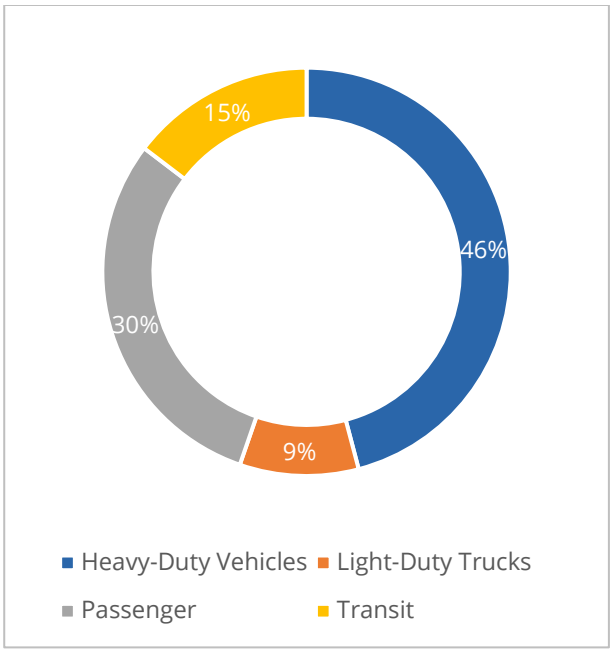


Figure E5: 2017 energy consumption by vehicle class

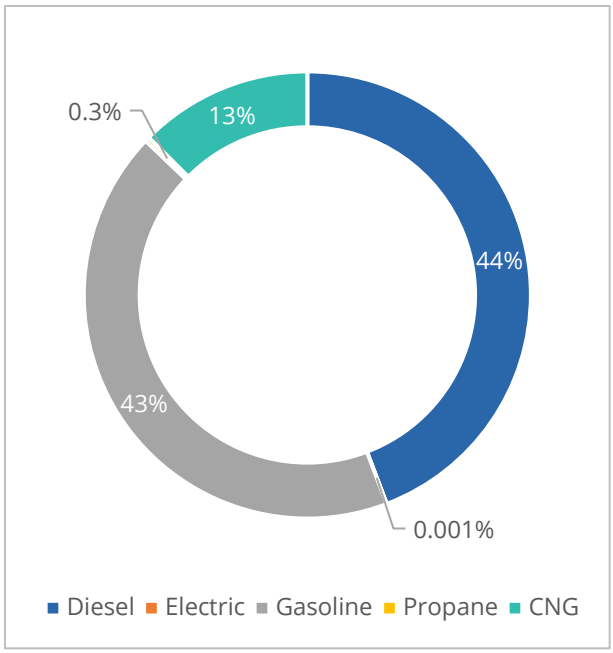


Figure E6: 2017 energy consumption by fuel type

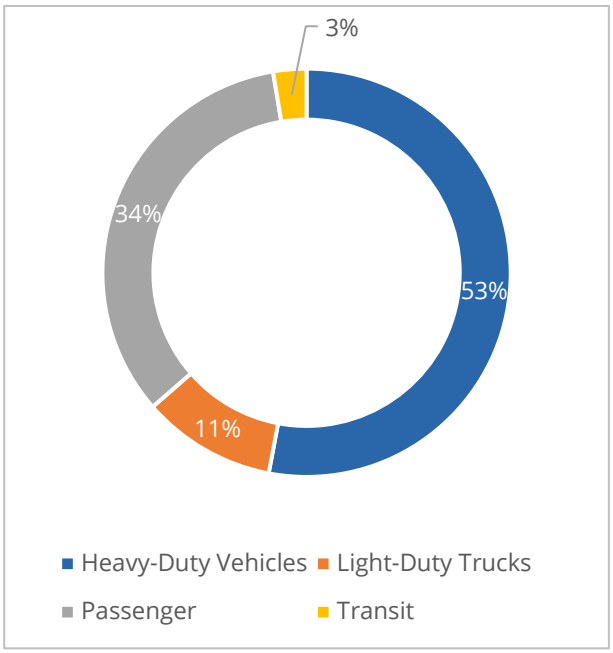


Figure E7: 2017 emissions by vehicle class

Agriculture

Energy use for greenhouse operation is shown in Figure E8 below. Natural gas for space heating accounts for 67% of the energy usage for this sector. Note that agricultural equipment would also have associated energy use via various vehicle fuels, primarily diesel and gasoline, but data was not available to define this when completing the GHG inventory.

The vast majority (86%) of 2017 Township agricultural emissions were generated by agricultural infrastructure, which includes both greenhouses and agricultural equipment. Livestock emissions accounted for 11% of total agricultural emissions, with fertilization making up the remaining 3% (Figure E9). It should be noted that the Township's 2007 inventory did not include agricultural equipment or greenhouses in the accounting methodology; as such, the 2017 agricultural emissions total is nearly four times larger than reported in the 2007 inventory. Greenhouse emissions are assumed to have been accounted for in the building sector in 2007.

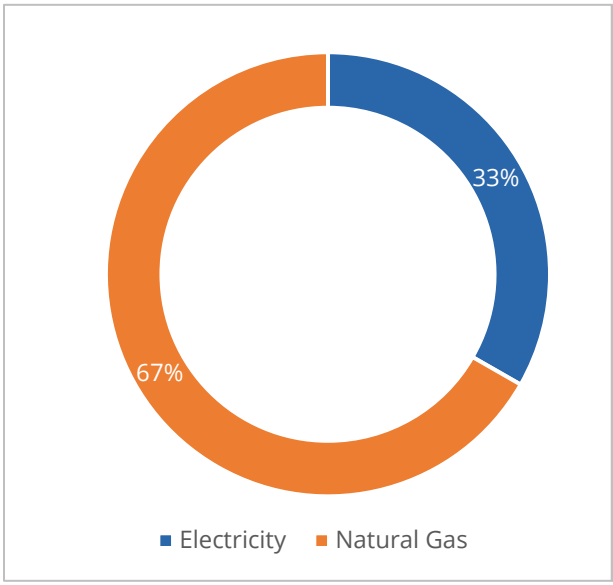


Figure E8: 2017 greenhouse energy use

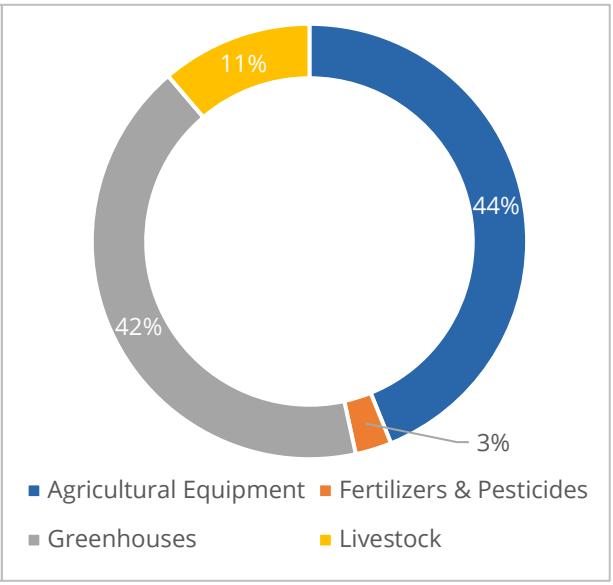


Figure E9: 2017 agricultural emissions by sub-sector

Solid Waste

Solid waste decomposing in landfills produces methane, a shorter-lived but more potent GHG emission, while waste incineration (including for energy generation, as in this case) results in emissions of carbon dioxide, methane, and nitrous oxide. Waste does not directly consume energy and the energy required to handle Township solid waste is covered under the transportation and buildings sectors; therefore, an energy use profile was not developed for this sector.

As shown in Figure E10, 70% of emissions from Township solid waste were produced by the industrial-commercial-institutional (ICI) sector, while residential solid waste accounted for the remaining 30%. The Township produced a total of 11,721 tonnes of solid waste in 2017, a reduction from the 2007 inventory. This was achieved despite an increase in population of more than 35,000 from 2007 to 2017.

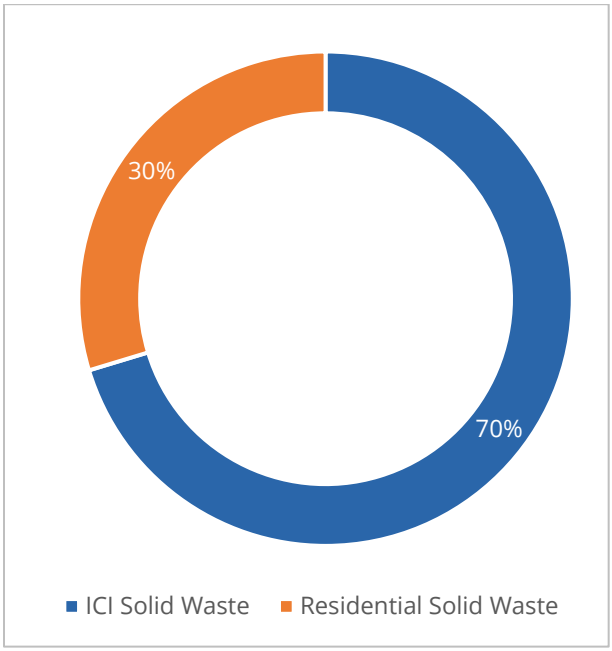


Figure E10: 2017 solid waste emissions