# CLIMATE CHANGE ACTION PLAN

APRIL 2022

OUR CLIMATE FUTURE
climate change action plan

The City of SPRUCE GROVE

# Overview

Spruce Grove strives to be a city that is a resilient, safe and attractive place to live, work and play.

As part of this vision, we have created this Climate Change Action Plan, which provides a roadmap of actions we can take from 2022–2033.

As part of this project, we worked with community members to identify their goals for the future and their suggestions of how to help create a city that they want to live in. Actions suggested below were also guided by core principles of:

- Considering the entire community in this plan
- Making use of the latest climate research and data
- Considering principles of equity in the actions that our city takes; and,
- Prioritizing approaches that have multiple benefits to our community.

This plan has helped us to identify what some of the most important risks that our community will face over the upcoming decades due to a changing local climate.  The highest priority risks that we face are increased frequency of drought and heat waves as well as more frequent hailstorms and freezing rain. This plan also identifies several potential benefits to our community from these changes. One potential benefit of changes to our local climate is that a longer frost-free period in the summer could help to increase the amount of construction work that could easily be done in any given year. This plan identifies 38 different actions we can take to address these risks and opportunities.

Our City has taken a number of steps over the last few decades to reduce its greenhouse gas (GHG) emissions. We have already significantly reduced our 'per person' GHG emissions over that time, with 'per person' GHG emissions falling from 19 $tC0_2eq$/person in 1996 (the year that we first measured our GHG emissions) to 12 $tC0_2eq$/person in 2019. However, Spruce Grove's total population has almost tripled since 1996, and our city's total GHG emissions have increased by 67% since that time.

This plan has developed a GHG emissions reduction target that takes into account internationally recommended science, existing national goals, and our own community's preferences in terms of GHG reduction ambition. In our GHG Emissions Reduction Plan, GHG emissions will fall to 5.4 $tC0_2eq$/person by the end of this plan in 2033 and to net-zero $tC0_2eq$/person by 2050.

In order to achieve these GHG reduction goals, 61 different actions have been identified for further investigation and action. Some of these actions can be taken directly by community members. Some require action by the city, and other actions require assistance from other levels of government.

We know that we can create the future that we want if all of us work together to create it.

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# Purpose and Direction


This Climate Change Action Plan (CCAP) describes how Spruce Grove will prepare for the impacts of a changing local climate while also contributing to our collective goal of limiting future climate change. The direction to complete this plan was set out in the 2021 Corporate Plan for the City. The CCAP provides a roadmap for the city between now (2022) and 2033.

Climate change is a reality. Our climate is changing, and we are already seeing the effects—heatwaves, floods, droughts and wildfires have all gotten more extreme. These changes are best explained by rising concentrations of carbon dioxide and other greenhouse gases.

In terms of climate impact, cities globally are **responsible for 60-70% of carbon dioxide emissions.** Cities are also at high risk from many of the negative impacts of climate change. Weather and climate extremes can be very disruptive to the interconnected systems of a city where most of us live, work and raise our families, affecting our health and everyday lives.

Climate change does not affect all of us equally, however. Underserved, marginalized and vulnerable groups are more negatively affected. As well, these groups are both less able to adapt to these effects or to take advantage of opportunities. An inclusive and equitable response to climate change will reflect the needs of our most vulnerable.

Cities like Spruce Grove both contribute towards climate change and are also a key part of the solution. But time is running out if we are to avoid the worst impacts of climate change—we must act now.


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# Vision and Principles

## Our Vision

We want to do our part to help Spruce Grove be a resilient, safe and attractive place to live, work and play, both now and into the future.

Spruce Grove recognizes the threat and opportunity climate change poses to our economy, public health and safety, natural environment, and quality of life.

This plan provides a roadmap to a carbon-neutral and climate resilient Spruce Grove. This plan identifies actions that will make our communities safer; current and future generations of residents healthier and more secure; our economy more vibrant and stable; our environment more sustainable; and our society more inclusive and equitable.

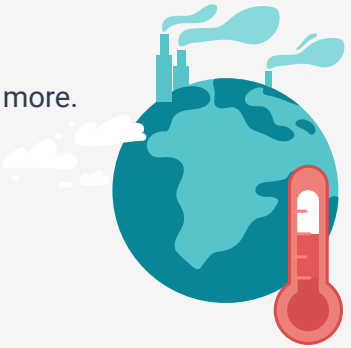
## Important Principles

This plan is guided by the following core principles:

- Comprehensive: Considers the role that both the City and wider community can play in reducing greenhouse gas (GHG) emissions and enhancing resilience to climate change.
- Science-based: Makes use of the latest climate research and data.
- Co-benefits: Promotes actions that have many economic, social and environmental benefits for the community.
- Equity: Ensures an inclusive, just and equitable transition to a climate resilient and low carbon future.
- Public engagement: Meaningfully engaged the public during plan development.

### What is Climate Change?

- Persistent, long-term changes to the normal patterns of weather in a region, typically over 30 years or more.
- Caused mostly by greenhouse gases (GHGs) produced through human activity (e.g., the burning of coal, gasoline, and natural gas)
- Unabated, changes in climate will continue to negatively impact many aspects of our lives, including our health, economy and the natural environment



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# Scope of This Plan

## Climate Mitigation and Adaptation

Even if we dramatically reduced emissions soon, some level of further climate change is unavoidable due to past GHG emissions. This is because GHGs like carbon dioxide stay in the atmosphere for hundreds of years once arriving there, so increased concentrations of GHGs that are already in the atmosphere will continue to affect our climate in the decades to come. Since we are already committed to some level of global warming, responding to climate change requires a two-pronged approach:

1. Reducing emissions of and levels of greenhouse gases in the atmosphere to limit future climate change (climate "mitigation"); and
2. Building resilience and adjusting to climate change already in the pipeline (climate "adaptation").

## The Whole Community

This plan identifies climate mitigation and adaptation actions to be taken both by City of Spruce Grove operations as well as by residents and local businesses.

## Focus on Local Impacts

This plan focuses on how to adapt to and reduce the direct effects of climate change to people, buildings, infrastructure and services, and the natural environment within the current boundaries of Spruce Grove (the City). It does not examine how social, economic, environmental or political changes that happen outside the city could affect our city, either positively or negatively.

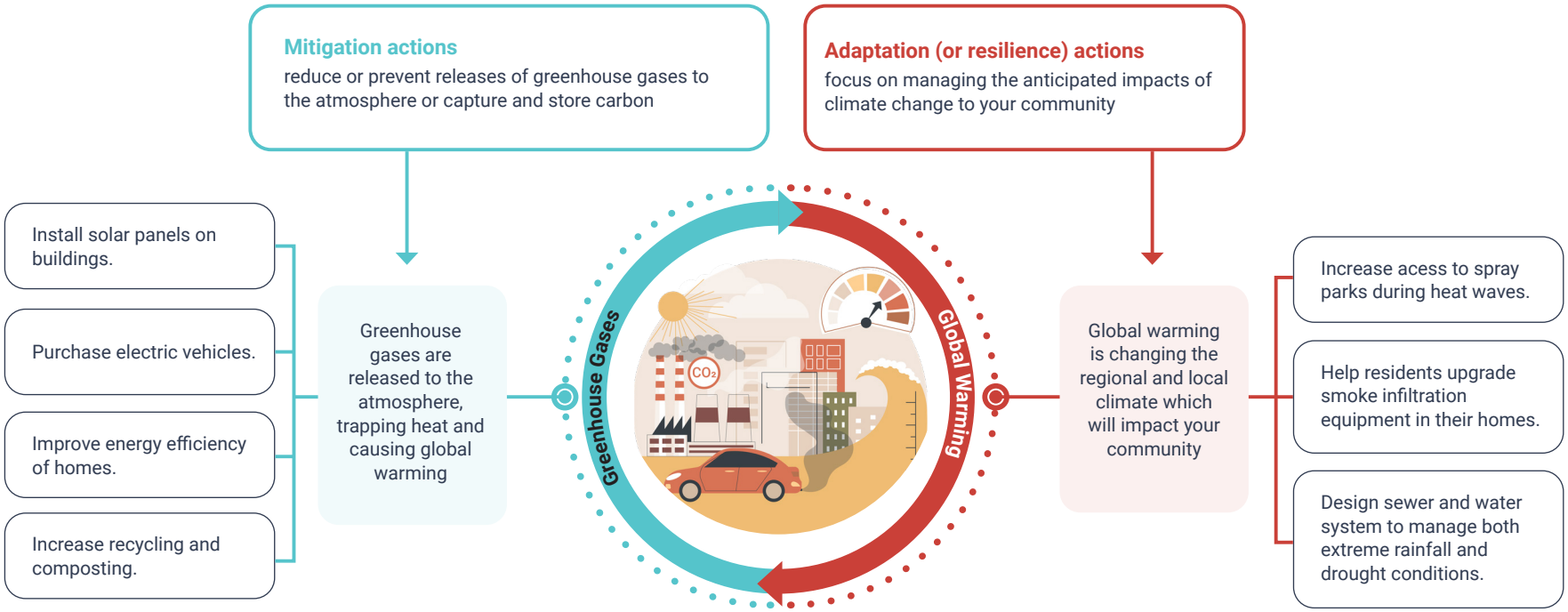
## Climate Change Scenario

Since our future climate depends on future human behaviour, which is inherently difficult to predict, scenarios are used to characterize a range of plausible climate futures. In order to help prepare Spruce Grove for the largest likely changes to our climate, the assessment of risks in this report are based on a "high" climate change scenario. This scenario assumes that cumulative GHG emissions continue to increase at current rates through the end of the century. This scenario results in more severe warming than will be the case if strong global action is taken to reduce GHG levels in the coming decades. This enables us to adopt a precautionary approach and plan for more extreme climate impacts. If global action is taken to reduce GHG levels, we can expect to see smaller changes to the local climate in the second half of the century than are described in this plan.

## Timelines

This plan is designed with a vision for the future of Spruce Grove. The actions described in this plan—to be taken between 2022 and 2033—are designed to build resilience to changes in the local climate anticipated in the 2060s and to set the City on a trajectory to be carbon neutral by 2050.

This plan addresses both these two important responses to climate change.




## Greenhouse Gases Addressed in the Plan

This plan seeks to reduce GHG emissions produced by activities that take place directly in the City, as well as to reduce emissions from the generation and transmission of electricity purchased from the provincial grid for use in the City. So, for example, this plan includes GHGs from the use of your car or truck. However, it does not address GHGs from the plane flight that someone living in Spruce Grove takes to another part of the world, because the airport is located outside the city. Similarly, it does not include the GHGs caused by the manufacture in another country of a cellphone purchased by someone living in Spruce Grove.

### What are Greenhouse gases?

- Greenhouse gases (GHGs) are gases that trap heat inside the atmosphere.
- They allow sunlight to pass through to the Earth's surface, but they prevent the heat generated from escaping the atmosphere.
- The most common GHGs related to human activities are carbon dioxide, methane and nitrous oxide

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# Our Future Climate

Under a high climate change scenario, we could see the following changes to the climate in Spruce Grove by the 2060's relative to the recent past[1].



## Hotter Summers

Warmest maximum temperature of 36°C
(historically: 31°C)

3 heat waves per year
(historically: none)

24 days in a year above 30°C
(historically: 3 days)

## Water Stress

A 168-day long frost-free season per year
(historically: 128 days)

Increased drought risk due to hotter summers and invariable summer precipitation

## Warmer Winters

One day per year below -30°C
(historically: 8)

88 winter days (where temperatures drop below -5°C)
(historically: 130 days)

An average of 68 freeze-thaw cycles per year
(historically: 89)

## More Extreme Weather

Increase in high intensity rainstorms
(20% increase in days with >10 mm rain)

More extreme wind and lightning

[1]Strictly speaking, the recent past or "historical" values are the annual average values over the 30-year period 1976-2005 (the 1990's) and the values for the 2060s are the average annual values over the 30-year period 2051-2080. To identify changing conditions across time, climate scientists work with 30-year averages to smooth out the effects of year-to-year variations in weather.

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# Prioritizing Climate Change Actions

## Action Scoring Process

Many possible actions were identified during the development of this plan to help the City achieve its climate adaptation and mitigation goals and vision. To help identify the most promising of these actions for implementation, the relative costs and benefits of each action were evaluated on a 1-5 scale.

For each potential action, the average 'benefit' score was divided by the average 'cost' score. If the benefit score of an action was equal to or higher than its cost score, the City will investigate taking action on it over the next 12 years. Any action described in this plan meets this threshold.[2]

To help prioritize these climate change actions, the relative expected benefit of a given action is also described. The expected benefits of actions described in this plan are ranked as either Very High, High or Moderate.

| Action Benefits | |
|---|---|
| **Effectiveness** | How large of an impact will the action have? |
| **Co-benefits** | For adaptation actions – are there any GHG mitigation 'co-benefits' from the action?<br><br>For GHG mitigation actions – are there any climate adaptation 'co-benefits' from the action? |
| **Additional Benefits** | Does the action provide any other co benefits? |
| **Equity** | Does the action benefit all residents and businesses? Can it specifically target disadvantaged or underserved people or areas? |
| **Flexibility** | Can we easily adjust the action in the future, or are we locked in? |

| Action Costs | |
|---|---|
| **Upfront Costs** | What are the 'start-up' costs of the action? |
| **Ongoing Costs** | What are the annual recurring costs of the action? |
| **Negative Side Effects** | Are there negative side effects from the action? |
| **Feasibility** | Are there technological, human resource or budgetary barriers to the action? |
| **Acceptability** | Is public and political support in favour of, or against, the action? |

[2]For additional details see the City of Spruce Grove Climate Change Adaptation & Greenhouse Gas Mitigation Actions: Review & Prioritization Technical Report (2022)

# Action Types

Actions are organized into the following types and subtypes:

## Governance

- **Assessment:** analysis or research to gather information about potential climate changes, impacts or solutions
- **Plan:** plans or strategies to either establish new direction, or embed climate resilience into existing plans or strategies
- **Policy:** establishing or updating rules and regulations to provide direction for projects, initiatives, or programs

## Ventures

- **Operations:** new or modified operational procedures or practices
- **Project:** implementation to advance climate resilience, such as the purchase or upgrade of an asset or infrastructure
- **Program:** new or updated program with ongoing implementation
- **Resourcing:** establish new positions, hire new staff, and/or modify job descriptions or roles

## Outreach

- **Engagement:** conduct public outreach or educate residents about climate risks and adaptation
- **Partnership:** establish new or strengthen existing partnerships with external stakeholders
- **Advocate:** encourage other groups or other levels of government to take a particular action

All actions may require some amount of engagement with the public.

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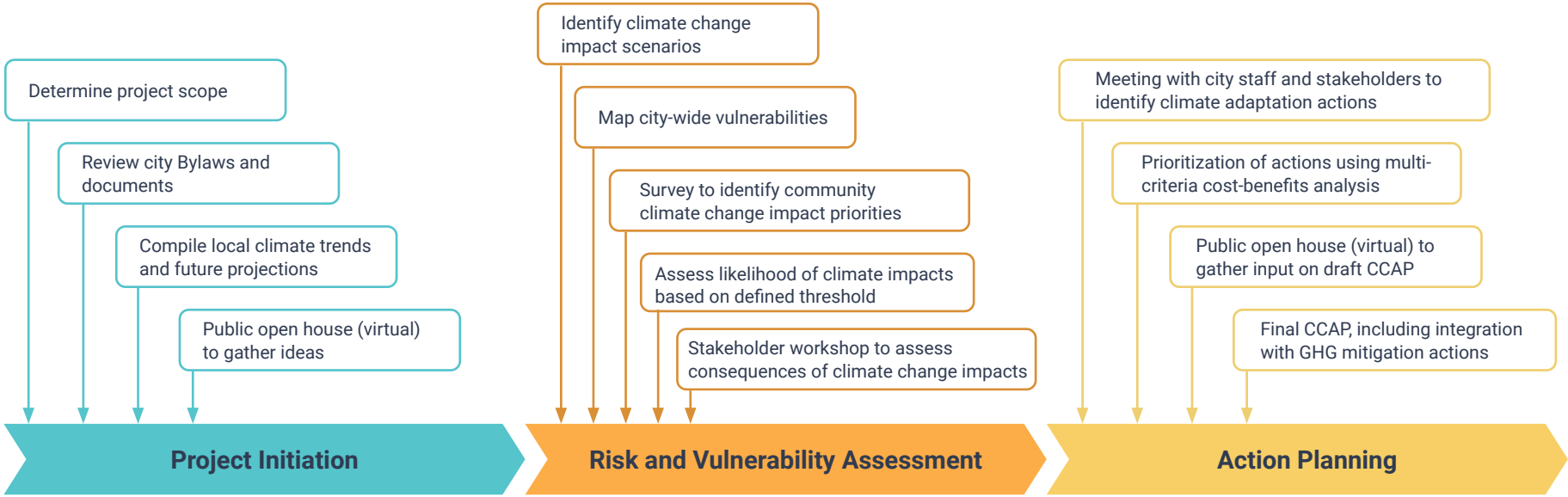
# Adapting to the Future Climate

The climate adaptation planning process sought to help us identify the most pertinent risks and opportunities facing our city as a result of climate change.

## Process

A risk-based approach was used to identify and prioritize climate change risks and opportunities. The process followed recognized best practices for climate change risk assessment, notably the newly released ISO 14092 Standard which provides guidance on community climate adaptation planning, including climate change vulnerability and risk assessments in a community context. A summary of the methodology is provided below.




For additional details see the City of Spruce Grove Climate Change Vulnerability and Risk Assessment – Technical Report (2021)

# Priority Climate Change Risks and Opportunities

The table below provides a summary of the climate change impacts and what priority level each impact was assessed at within the VRA process. Climate impacts relating to temperature and rain/snow have more detailed future predicted changes than other impacts, which are more complicated to model. Potential benefits are shown with an asterisk (*):

| Climate Impact | Underlying change to the climate | Predicted change from the 1990's to the 2060's | Priority Level |
|---|---|---|---|
| Multi-year drought | Less rain in summer and increased summer temperatures from year to year | 70% increased likelihood of drought, defined as a Palmer Drought Severity Index value of -2 or less | High |
| Heat wave | Hotter summer temperatures and more extreme heat | Increase from 0.4 to 3.2 heat waves/year | High |
| Longer construction season* | Warmer spring and fall temperatures | Increase in the length of the frost-free season from 128 to 168 days/year | High |
| Freezing Rain | Increased average temperatures and rain or snow in fall, winter and spring | Somewhat increased likelihood of at least one freezing rain event per year | High |
| Hailstorm | Increased summer storm intensity | Similar future likelihood of hailstorms | High |
| Water supply shortage | Reduced winter snowpack in the mountains leading to lower river water levels | Slightly increased chance of low flow volumes in the North Saskatchewan River | Medium |
| High winds | Increased summer storm intensity | 23% higher probability of an intense windstorm in a year | Medium |
| Increased water demand | Hotter summer temperatures, more extreme heat and drier summer conditions | 20% predicted increase in water demand over summer, due to warmer summer temperatures | Medium |
| Invasive tree species outbreaks | Fewer cold days in winter allow invasive species to survive year to year | The coldest temperature in a year increases from 35°C to 28°C | Medium |
| Reduced winter recreation | Warmer winter temperatures | The number of days in a year that are -5°C or colder drops from 130 days/year to 88 days/year | Medium |
| Lightning | Increased summer storm intensity | Slightly increased likelihood of high levels of local lightning activity (60 hours per year or more) | Medium |
| Increased space cooling demand | Increase to both average and extreme summer temperatures | 464% increase in the demand for air conditioning and other forms of air cooling: increase in the number of annual | Medium |
| Wildfire smoke | Reduced rain in summer and increased summer temperatures | Somewhat increased likelihood of more than 9 days a year of wildfire smoke with poor air quality due to wildfire | Medium |
| Freeze-thaw cycles | Warmer average temperatures in fall and spring lead to fewer freeze/thaw cycles | Reduction in the number of annual cycles from 89 to 68 | Medium |

| Climate Impact | Underlying change to the climate | Predicted change from the 1990's to the 2060's | Priority Level |
|---|---|---|---|
| Ground level ozone | Increases in the likely maximum summer temperature | Slightly increased likelihood of increased air pollution due to higher average summer temperatures, leading to | Medium |
| Urban flooding | Increased extreme rainfall events | 4% increase in the annual likelihood of a 1:100 year rainfall | Medium |
| Heavy snowfall | Increased quantities of snowfall in winter | 8% lower change of a 50 cm accumulation of snow in a year | Medium |
| Increased summer recreation* | Warmer weather in spring and fall | Increase in the length of the frost-free season from 128 to 168 days/year | Medium |
| Increased agricultural productivity* | Warmer spring, summer and fall temperatures | 53% increase in the number of annual 'corn heat units' (temperatures between 10 and 30°C) | Medium |
| Reduced space heating demand* | Higher average temperatures in fall, winter, and spring | 24% reduction in the need for winter space heating (drop from 5473 to 4171 heating degree days/year) | Medium |
| Cold stress | Warmer winter temperatures, fewer extreme cold days | A reduction in the number of days in a year that are -30°C or colder from 8 days/year to 1 day/year | Low |
| Tornado | Increased summer storm intensity | Similar (low) likelihood of tornados | Low |
| River flooding | Increased amounts of rain/snow in spring and increased heavy rainfall events | Slightly increased chance of river flooding | Low |
| Wildland fire | Reduced amounts of summer rainfall and increased summer temperatures | Slight increase in the risk of local fire frequency | Low |

Actions are identified in the next section to reduce the impact of high and medium priority risks, and to take advantage of the high and medium priority opportunities.  No actions are identified in this report relating to the risks identified as low priority.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# Climate Adaptation Actions

## Action Themes

Climate adaptation actions for the City are organized into the following themes:

- City Buildings and Infrastructure (CBI)
- City Programs and Outreach
- Homes, Businesses and Local Economy (HBE)
- Water Management and Natural Infrastructure (WN)

## Adaptation Area 1: City Buildings and Infrastructure

The buildings owned by Spruce Grove help the city offer services to residents, including recreation, road maintenance, and utilities. The city also owns or has influence over important infrastructure such as roads, trails, water and sewage infrastructure, and public parks. The actions described below help to improve resilience for both buildings and infrastructure.

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 1 | **Consider increasing freezing rain risk in snow and ice management policies**<br>Consider incorporating considerations of freezing rain into the existing snow and ice control (SNIC) policy for City roads and walkways, considering options for improved materials and technologies to manage ice, including asphalt, sanding and salting strategies, and public communications. Include consideration of areas such as transit stops (both permanent and 'virtual' stops) | Governance | Policy | Very High |
| 2 | **Incorporate climate risk assessment in building inspections**<br>Include analysis of climate risks such as extreme heat, smoke, and extreme weather events into the scope of building inspectors when they assess new developments. | Ventures | Operations | Very High |

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 3 | **Install and distribute information from a local weather and climate monitoring station**<br>Install a permanent weather and climate monitoring station in Spruce Grove. Capture real-time data and monitor over the long-term for air quality, smoke, precipitation (sub-hourly), wind, hail, etc. This station and other existing stations (eg city hall station and/or city building air quality monitors) would be linked to the City website for public access in a comprehensive and easy to understand way. Also work with the Capital Airshed to address gaps in Spruce Grove air quality monitoring coverage. | Ventures | Project | High |
| 4 | **Ensure appropriate budget and staff for inspections, maintenance and repair of public infrastructure exposed to climate risks**<br>Review and ensure, where appropriate, staff and budget for inspections, maintenance and repair of infrastructure. This could include road clearing and maintenance; maintenance of storm drains; freezing rain management such as sand and calcium chloride; the installation of heated sidewalks at critical public works acces locations; and post-storm and post heat wave inspections of roadways and pedestrian pathways for debris, trees, or buckled sidewalks and roads. | Ventures | Resourcing | High |
| 5 | **Ensure appropriate budget and staff for inspections, maintenance and repair of public buildings and facilities exposed to climate risks**<br>Review and ensure, where appropriate, staff and budget for inspections, maintenance and repair of public building and facilities, taking into account risks of extreme heat, smoke, and extreme weather events | Ventures | Resourcing | High |
| 6 | **Install shade and extreme weather shelters in public areas**<br>Install shelters in local parks and other public locations around the City, to be used primarily for shade protection and secondarily for protection during extreme weather events. Increase the resiliency of these shelters by designing them to be resilient to hail, lightning, and high winds. Implement through a submission to the corporate plan. | Ventures | Project | High |
| 7 | **Develop climate resilience design standards for city buildings and infrastructure**<br>As needed, create or enhance City corporate design standards for climate resilience. Consider signage design relating to wind resilience; road and sidewalk resilience for extreme heat, ice and water absorption; and resilience of mechanical systems, electrical systems and building envelopes to extreme heat. | Governance | Policy | Moderate |
| 8 | **Construct additional outdoor cooling stations and water fountains**<br>Construct additional outdoor cooling station(s) such as a splash park, splash pad, and/or misting station that uses recycled water and can be used during watering restrictions and drought. Ideally, integrate elements of universal design to increase it's accessibility to all residents. Also consider additional locations for the installation of public water fountains. | Ventures | Project | Moderate |

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 9 | **Continue lightning protection installation on city buildings**<br>This will increase protection from power outages and potential data loss or disruption during storms | Ventures | Project | Moderate |
| 10 | **Develop a covered storage area for corporate vehicles**<br>This will help ensure that, similar to public works vehicles, these vehicles are protected from adverse weather such as hail, wind and extreme heat. | Ventures | Project | Moderate |
| 11 | **Increased the size and connectivity of the active transportation network**<br>Increase investment in the active transportation network to take advantage of a longer summer season, including more multi-use pathways, bike lanes, and continued investment in the in-progress and planned pathways to Spruce Grove to Stony Plain. | Governance | Plan | Moderate |
| 12 | **Install back-up power at critical city buildings and facilities**<br>Install back-up power supplies at all critical facilities in the City if they are not already installed, in sectors such as emergency services, operations/public works, Information technology (IT) locations, etc. Consider the need for transfer switches, mobile generators, fueling stations, and permanent back-up power supplies, and consider including renewable energy options such as wind and solar. Reduces the risk of both city service response limitations and data loss (re IT server locations) | Ventures | Project | Moderate |
| 13 | **Pilot Climate Resilience Retrofits on City Buildings**<br>Retrofit one or more City buildings with enhanced climate resilience measures, through incorporation into the corporate business plan planning process. Possibly a pilot project and educational tool. Include measures such as: replacement of old air conditioners with newer more efficient options, increased insulation, ventilation, reflective surfaces (roof), shading, and efficient doors and windows to protect from extreme heat; hail resistant roofing and siding materials; and/or permeable pavement and other stormwater management upgrades. Enact by incorporating into the Corporate Business Planning process. | Ventures | Project | Moderate |

# Adaptation Area 2: City Programs and Outreach

City Programs and Outreach refers to the ways that Spruce Grove can educate or provide support to local residents. This ranges from health and safety related responses such as the Winter Emergency Response Program to education and recreation-based services. The actions described below are services the city can offer to build climate resilience for the City and for local residents.

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 1 | **Encourage residents to create climate resilient home gardens**<br>Educate residents on how to design climate resilient home gardens, considering factors such as drought, water supply shortage, and extreme heat, as well as how to manage pests and invasive species. Similar to the Edmonton in Bloom program, create an Edible Yard award in coordination with the award to create front yards with native species (a separate action) | Ventures | Engagement | Very High |
| 2 | **Enhance existing neighbourhood social resilience programs**<br>Support and empower neighbourhood social resilience programs including the Spruce Grove Neighbour Network and Block Party Program which help residents create connections with their neighbours and within their neighbourhood, and help neighbours to work together more effectively during extreme weather events. Make sure to include programs targeting more vulnerable neighbourhoods and populations such as the elderly, isolated and low income. | Ventures | Engagement | Very High |
| 3 | **Create an Urban Agriculture Plan**<br>Create an Urban Agriculture Plan to provide guidance on local urban agriculture development and resiliency in Spruce Grove. The plan could consider how to increase local food production at both a local and commercial idea. This could include ideas such as more or better supported community gardens, urban bee and chicken keeping, greenhouses, indoor gardens, irrigation, etc. The Plan would consider future climate changes and identify how the City can support the growing, processing, and distribution of food and food products in and around the City, by residents, private entities, and potentially by the City itself. This plan should also consider the risk of increased invasive species in the future. | Governance | Plan | Very High |
| 4 | **Investigate how to effectively increase opportunities for indoor recreation activities and programming during times of extreme heat and poor air quality**<br>This would include increased hours and availability of services during these times | Governance | Policy | Very High |

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 5 | **Develop a City Climate Policy for requiring consideration of climate adaptation and mitigation in all budget decisions, procurements and projects**<br>Potentially implement alongside a social procurement policy. | Governance | Policy | Very High |
| 6 | **Increase monitoring of outdoor rinks and ice conditions and provide real-time updates to residents.**<br>This will help to improve ice conditions and improve access conditions in winters with more variable and overall warmer temperatures. | Ventures | Operations | Very High |
| 7 | **Increased shoulder season outdoor recreation programs and opportunities**<br>Take advantage of a warmer frost-free period by increasing spring and fall outdoor recreation programs and opportunities for residents. For example, re-purpose outdoor rinks for other recreational activities such as tennis, soccer, basketball, etc. | Ventures | Operations | High |
| 8 | **Educate and award residents for increasing use of native ground cover**<br>Educate citizens about the benefits of native ground cover (pollination, biodiversity, carbon sequestration, etc.). Create an awards program, similar to the Edmonton in Bloom award, celebrating residents who use native ground covers | Ventures | Program | High |
| 9 | **Improve the climate resilience of locations used for refuge during states of local emergency by assisting with the installation of climate resilience features**<br>Help to improve the climate resilience of locations used for refuge during states of local emergency (public facilities, malls, churches, schools, etc.) by assisting with the installation of climate resilience features such as air filtration systems, air conditioning, and electricity backups, etc. | Ventures | Project | High |
| 10 | **Update the Winter Emergency Response Program to assist unsheltered people during extreme weather events**<br>This would include heat waves, extreme forest fire smoke events, etc. Ideally, the facility should be outfitted with air filters, a cooling system, back up power supply, and emergency provisions such as food, water, clothing and beds. | Ventures | Program | High |
| 11 | **Education program on public climate resilience measures**<br>Develop a climate resilience education program for residents to build awareness and improve communications about local climate change impacts and climate resilience measures for residents, including both low-or no cost as well as higher cost items. This includes measures such as resilient roofing and siding, painting flat roofs white, better lot grading, shading, insulation, snow and ice removal, stormwater management, air filters, flood risks, back-water valve installation, water conservation measures, water-aware gardening, xeriscaping, air filter installation,, etc. This could include reference to the Climate Resilient Home Guide. Use multiple channels and tools including the website, print materials, community events, and social media. | Ventures | Engagement | High |

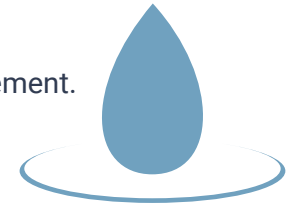
# Adaptation Area 3: Home and Businesses

These actions involve interaction between the city and either homes or businesses. At a larger scale, this involves the whole economy. These actions are focused on bylaws, policies, procedures, and interaction with other levels of government.

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 1 | **Allow watering of privately owned trees during water restrictions**<br>in order to avoid untimely death/damage to trees | Governance | Policy | Very High |
| 2 | **Encourage construction companies to build to better than code regarding climate resilience**<br>Encourage construction companies to construct local homes that use 'better than code' levels of construction. This would include better lot grading, climate resilient building materials, backflow preventions valves, lightning rods and grounding controls, passive solar, etc. | Outreach | Advocate | High |
| 3 | **Provide climate resilience grants**<br>Provide grants or other incentives to residents, businesses and non-profits to implement climate resilience measures at the home and property level. For example, the installation of climate resilient building features, such as hail resistant roofing and siding, heat pumps, backflow prevention valves, air filters, increased insulation, window glazing, shading, etc. Implement through the City of Spruce Grove Community Grant Program. Incorporate social equity considerations during incentive design (eg lower income housing, people living in apartments and mobile homes in addition to single family homes, etc.) | Ventures | Program | High |
| 4 | **Regional Lobbying for more climate resilient building codes**<br>Work with with other local communities through organizations such as the EMRB to advocate for improved design standards for new home construction, to go beyond the Building Code requirements. This would include better lot grading, climate resilient building materials, backflow preventions valves, lightning rods and grounding controls, passive solar, etc. | Outreach | Partnerships | High |

# Adaptation Area 4: Water Management and Natural Infrastructure

One key city service is management of water flow throughout the city. This includes potable and stormwater management. These services can be provided either through traditional engineering methods or through incorporation of natural infrastructure considerations into local policies.



| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 1 | **Plant climate resilient tree species**<br>Update recommendations on what type of trees the City should plant. Plant more climate resilient tree species (pest resistant, drought tolerant, wind resistant). Consider 'shading' as a key element of planting. | Governance | Plan | Very High |
| 2 | **Incorporate climate change consideration into the Water Network Master Plan**<br>make a plan to determine future requirements for water storage, including the need to understand and plan for changes to water supply and demand. Results should be used to inform future planning and development, and long-term growth of the City, including the need for increased reservoir capacity and pumping. | Governance | Plan | High |
| 3 | **Enhance management of plant diseases as well as both invasive and desirable insect and plant species**<br>Reduce the risk of tree death or damage and the risk of increased pests and invasive species by increasing increase staff and budget for management of plant diseases as well as invasive and desirable insect and plant species management. Regarding invasive species management, plan for and deal with pests, conduct community and staff education, and control invasives. Regarding desirable species, include a strategy for sustaining local bee populations, for example by planting flower populations that help bees, locating and protecting hives, and using appropriate pesticides. | Ventures | Resourcing | Moderate |
| 4 | **Increase City participation in watershed protection planning**<br>Increase City participation in watershed protection planning (staff time and funding). Work with regional partners, communities, Provincial Government and non-profits such as the North Saskatchewan Watershed Alliance to develop and implement source water quantity and quality protection actions. | Ventures | Operations | Moderate |
| 5 | **Increase funds for tree planting and management:**<br>Focus on climate resilient trees and the provision of co-benefits (e.g. shade). | Ventures | Resourcing | High |

| Action No. | Action | Action Type | Action Sub-Type | Score |
|---|---|---|---|---|
| 6 | **Update the Parks and Open Space Master Plan**<br>Update this 2007 plan by completing the natural areas inventory, and considering actions to manage climate risks by appropriately managing natural infrastructure and ecosystem services. For example, incorporate drought management techniques such as allowing turf grass to grow longer to increase its survival/health during these times; consider the ability of natural areas to provide shade, recreation, improved air quality, and stormwater management | Governance | Plan | High |
| 7 | **Update flood mapping and develop a stormwater management plan**<br>In addition to the storm capacity study that is currently underway, conduct/ update local flood mapping and a stormwater management plan that considers projected changes in extreme rainfall. Provide public access to these maps for increased transparency. Build policy guidance and regulations around the plan and update the Land Use Bylaw based on the results to require development restrictions in high risk areas. The plan should also identify needs and options for increasing storm pond capacity, including methods such as the protection of wetlands and natural water bodies. | Governance | Plan | High |
| 8 | **Increase inspections, maintenance and management of the stormwater system and asset management program**<br>Increase staff and budget for inspections, maintenance and management of the City's stormwater system, and overall asset management program. Include funding and resources for asset management software to record and analyze storm infrastructure condition and performance. | Ventures | Resourcing | Moderate |
| 9 | **Expand natural drought and flood reduction measures:**<br>Increase City budget for xeriscaping, the use of bio-swales and mulches, and the use of native and drought resistant species in place of turf grass, as both a drought management and flood reduction measure. | Ventures | Operations | Moderate |
| 10 | **Replace paved ground coverings with permeable ground coverings**<br>Update the Municipal Development Standards and design guidelines to reduce the amount of run-off from paved surfaces by increasing on-site water retention requirements, for example through more permeable ground coverings. This will help to reduce local flood risk and also reduce extreme heat buildup in paved areas | Governance | Plan | Moderate |

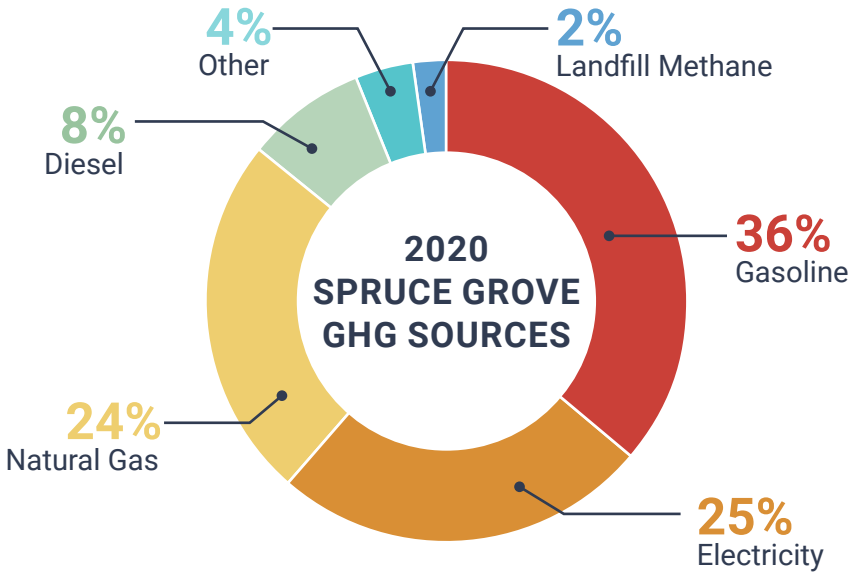

# 8

# Our Greenhouse Gas Emissions: Where are we now?

## Where do GHGs come from?

In our current way of living, all of us participate in activities that produce GHGs. When carbon-based fuels like coal, natural gas, gasoline or diesel are burned to produce energy – either directly (such as in car or our home furnaces) or indirectly to produce the electricity we consume - GHGs are released into the atmosphere. The most important GHGs associated with human activities are carbon dioxide, methane and nitrous oxide.

Below you can see the contribution of different GHG sources to estimated total energy consumption in Spruce Grove in 2020:




### Ways to describe GHGs

| | |
|---|---|
| $tC0_2eq$ | Tonnes of carbon dioxide equivalent – a way to measure the total amount of all GHGs released to or removed from the atmosphere<br><br>For larger quantities of GHGs, tC02eq can also be expressed as :<br>• kilo-tonnes (ktCO2eq = 1,000 tonnes) or<br>• mega-tonnes (Mt CO2eq = 1,000,000 tonnes). |
| $tC0_2eq/p$ | Tonnes of carbon dioxide equivalent per person |

## Sources of GHG Emissions in Spruce Grove

The City completed its first inventory of GHG emissions in 1996 and has been generating a city-wide GHG inventory annually since 2015. Total GHG emissions in 2020 were estimated at 458.3 kt $CO_2eq$. This works out to about 12 $tCO_2$ per person, which is equivalent to you driving an average passenger car 1.2 times around the world.

**1.2x**
around the world
(48,535 km)

The vast majority — **98%**— of Spruce Grove's GHG emissions come from community activities: homes, businesses, road transportation, and solid waste disposal.

The remaining 2% of total GHG emissions come from "corporate" operations – from operating city-owned buildings and parks, operating city-owned vehicles and equipment, the movement of water and sewage throughout the city, and powering streetlights and public signs.

The main sources of Spruce Grove's GHG emissions in 2020 are shown in the table below; arranged in descending order. The largest source of GHG emissions is road transportation—the consumption of gasoline and diesel by vehicles registered in the City.

Home and business use of primarily electricity and natural gas is the second largest source. In a typical single family detached home, for example, the biggest sources of GHGs are:

- Space heating and cooling – 67% of total household emissions
- Water Heating – 20% of total emissions
- Appliances and Lights – 13% of total emissions.

When organic matter like food, garden waste, or anything that could be composted is disposed at a landfill, it can produce methane, which is a powerful GHG. This produces 2% of total GHGs from Spruce Grove. The largest corporate source of total emissions are City buildings.

**Spruce Grove GHG Emission Sources**

| | Source | Description | Estimated City GHC Emissions in 2020 |
|---|---|---|---|
| Community | Road Transportation | Vehicles | 44.6% |
| | Homes | Energy use in homes | 29.4% |
| | Businesses & Industry | Energy use in business and industrial premises | 21.8% |
| | Solid Waste | Landfilled organic waste | 2.4% |
| Municipality | City Buildings | Energy for city buildings | 1.2% |
| | City Fleet | Fuel and energy for city vehicles and equipment | 0.2% |
| | Lights & Signs | Streetlights, signs etc. | 0.2% |
| | Water & Sewage | Water and sewage pumping | 0.2% |

## How do we compare with rest of Canada?

In 2020, city-wide GHG emissions amounted to 12 $tCO_2$ per person, which is the same emission rate as 2019. This is lower than the average emission rate for both Alberta and Edmonton for the same set of emission sources, but higher than the average emission rate for Canada.

| Location | GHG emissions in 2019 ($tC0_2eq/p$)[3] |
|---|---|
| Alberta | 22 |
| Edmonton | 20 |
| **Spruce Grove** | **12** |
| Canada | 10 |

[3]Includes the following emission sources: electricity generation, transmission and distribution; road transportation, residential, commercial and institutional buildings; construction and manufacturing; and solid waste disposal. Data was sourced from the National Inventory Report 1990-2019, Part III, Government of Canada, and the Municipal Energy + Emissions Database (www.meed.info/en/ca/).

# 9

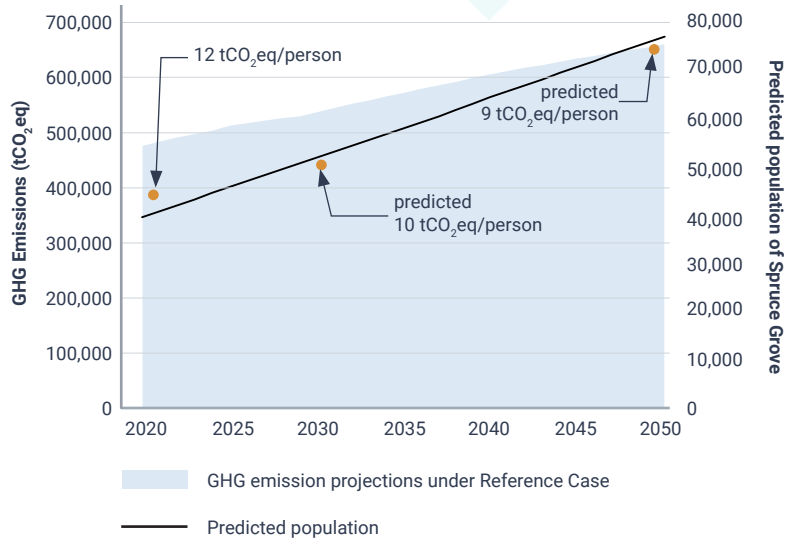
# Development of Emission Reduction Targets

## Technical Analysis

To decide on a long-term GHG emission reduction goal and the level of effort required to achieve that goal, we created a projection of what we predict would happen without any future action on the part of the City from 2020 until 2050. We labelled this version of the future as our **'Reference Case'**. This modelled projection took into account forecast growth in population, homes and land use, as well as trends in energy consumption, energy efficiency and fuel economy, distances travelled, etc. that have been observed historically in Alberta. Projected changes in the GHG emission intensity of electricity generated and supplied from the provincial power grid were also captured.

In this scenario of the future, GHG emissions per person are projected to reduce from 12 $tCO_2eq/p$ in 2020 to 10 $tC0_2eq/p$ by 2030 and to 9 $tC0_2eq/p$ by 2050. However, given expected growth in the City over the next 30 years, as shown in the figure in the next column, total city GHG emissions are still projected to increase by 40% between 2020 and 2050, reaching 635,000 $tCO_2eq$ in 2050.

**Projections of Reference Case GHG Emissions and City Population for Spruce Grove**




## What the city has already done

The 2011 Environmental Sustainability Action Plan, which this plan replaces, initiated an array of changes to improve the City's overall environmental sustainability and to reduce GHGs in the areas of land use and natural areas, transportation, waste, water, and energy. The City's current GHG emission targets were set in the 2016 Energy Management Plan and GHG Reduction Strategy:

- Reduce corporate GHG emissions per person to 50% below 2015 levels by 2035.
- Reduce community GHG emissions per person by 35% below 2015 levels by 2035.

To achieve both these targets, total city-wide GHG emissions would need to be limited to 9 $tC0_2eq/p$ by 2035. This is about 1 $tC0_2eq/p$ (or 9%) less than the projected Reference Case quantity for 2035. Even if we achieve the current target for 2035, total city-wide GHG emissions would still rise over time, and would be projected to be 11% higher than in 2020.

## What we heard from the community

Spruce Grove residents had the opportunity to participate in a number of workshops and surveys in 2021 to provide input to the development of this plan. Among other things, they were asked about the level of ambition the City should strive for in terms of reducing its GHG emissions. Options ranged from 'no additional steps be taken' to a 'very ambitious' GHG reduction goal, which was defined as 3 $tC0_2eq/p$ by 2030 and net zero emissions by 2050. Only 20% of survey participants felt that the city should take no additional steps to reduce GHG emissions, with 80% wanting at least some additional measures to be taken by the city. Approximately 50% of survey participants wanted 'moderate' to 'very ambitious' action taken, with the remainder wanting either 'no additional actions', 'currently existing actions only' or 'slightly more ambitious targets than exist now'. Some age differences were observed between responses, with 63% of survey respondents aged 18-44 wishing for 'moderate' to 'very ambitious' action taken by the city to reduce GHGs, but only 40% of survey respondents who were 45 and older wanted that level of GHG ambition by the city.

## A Science-based Target for Spruce Grove

*"Achieving [net-zero GHG emissions] is necessary to limit global warming to 1.5°C and to avoid the most catastrophic and irreversible impacts of climate change."*[4]

A science-based target is one that is driven by the latest climate science. It also defines the direction of travel—or path—towards an end goal, by setting a mid-term target, where emissions peak and then decline at different rates thereafter toward the end goal. To avoid the worst impacts of climate change, the Intergovernmental Panel on Climate Change recommends limiting global warming to 1.5°C above pre-industrial levels[5]. To achieve this goal, global GHG emissions must immediately start to decline and reach "net-zero" by 2050 or before.

### What do we mean by net-zero GHG emissions?

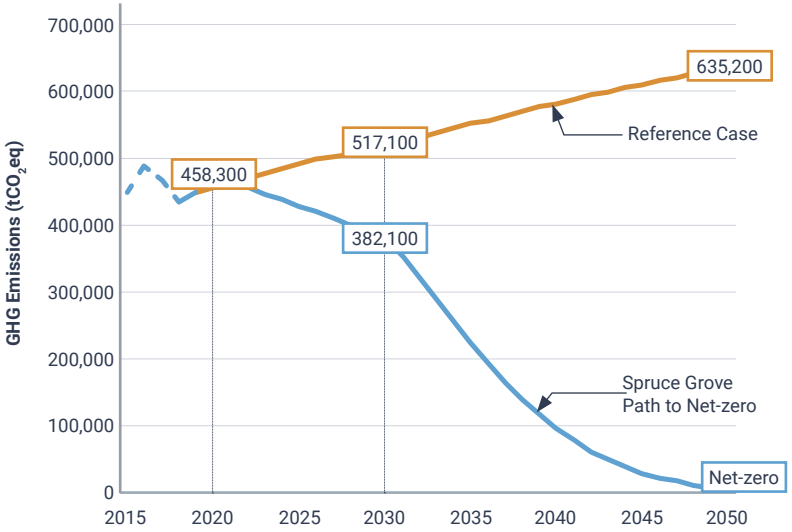
Net-zero emissions means achieving a balance between GHG emissions released into the atmosphere by human activity and GHG emissions removed from the atmosphere, such that no more emissions are added than are taken out over a specified period.

[4]Canada's Net-zero Advisory Board, Initial Observations, 2021, p 1.
[5]The Intergovernmental Panel on Climate Change (IPCC) is a pool of hundreds of leading scientists who provide governments with regular assessments of the scientific basis of climate change, its impacts, and options for mitigation and adaptation.

To align with the scientific consensus, this plan charts a path towards net-zero community-wide GHG emissions in Spruce Grove by 2050. To ensure that we are on track to achieve this end goal and that emissions are declining quickly enough, the plan includes a mid-term goal for 2030. The federal government's legislated mid-term target for 2030 is to reduce emissions by 40-45% below 2005 levels[6]. This plan adopts an equivalent mid-term target for Spruce Grove. This value also matches the 'moderate' level of GHG ambition asked about in the public survey asking about residents preferred level of 'GHG reduction ambition' for the city.

Spruce Grove's path to community-wide net-zero GHG emissions by 2050 is show in the figure below. The mid-term target for 2030 limits net annual emissions to 382.1 $ktCO_2eq$, which can also be described as 7.6 $tCO_2eq/p$ (this is equivalent to you driving an average passenger car halfway around the world). The goal for the last year of this plan, 2033, is to achieve 5.4 $tC0_2eq/p$. To achieve this mid-term target, projected Reference Case emissions in 2030 must be reduced by about 26% or 135 $ktCO_2eq$.

**Spruce Grove's Path to Net-zero Community-wide Emissions—Bending the Emissions Curve**




**Projected Emission Limits and Savings Required to Achieve Net-zero Community-wide Emissions by 2050**

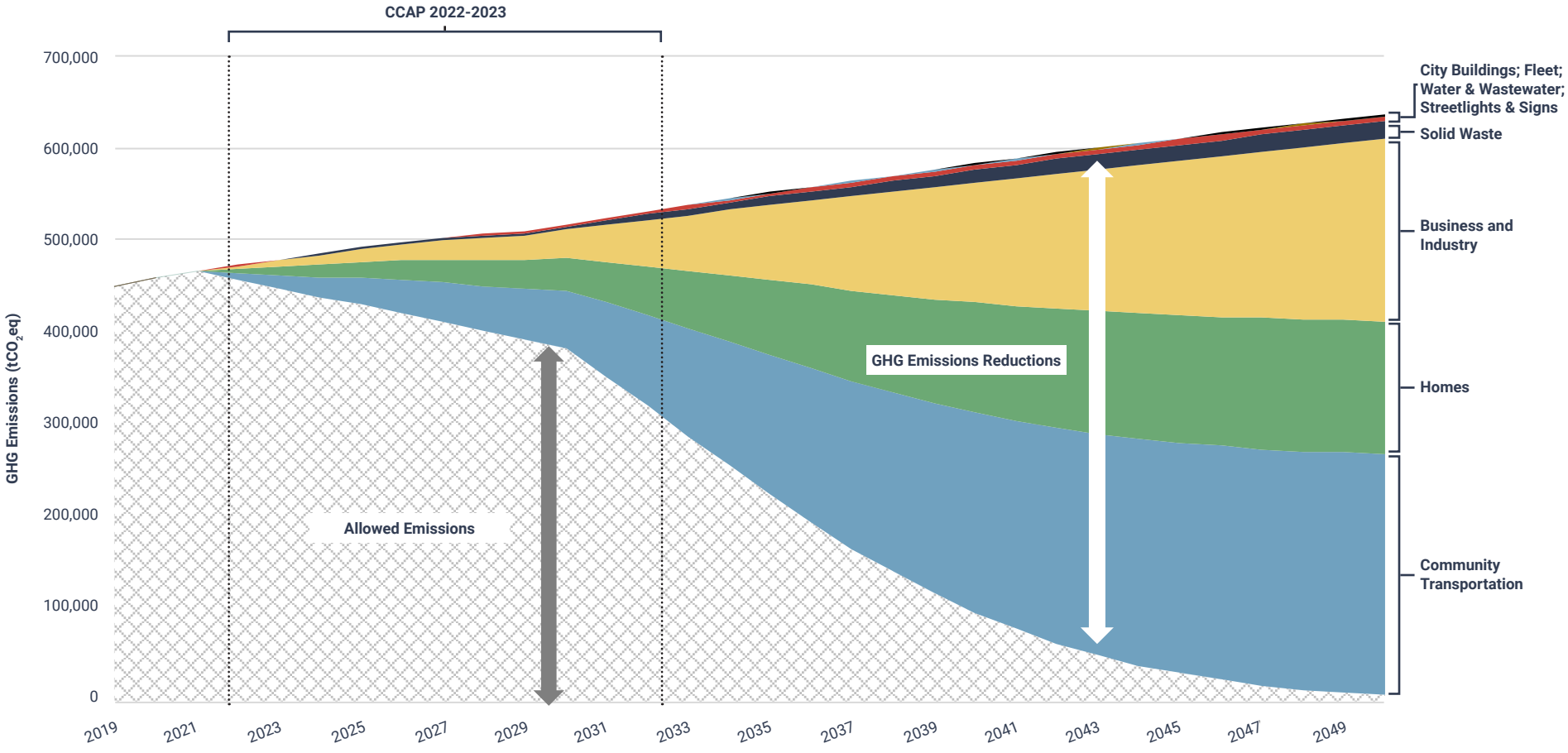
| | Annual emission limits in Spruce Grove Plan | | Annual emission reductions from Reference Case | |
|---|---|---|---|---|
| | $ktCO_2eq$ | $tCO_2eq/p$ | $ktCO_2eq$ | % |
| 2020 | 458 | 12.0 | - | - |
| 2025 | 430 | 9.7 | 64 | 13 |
| 2030 | 328 | 7.6 | 135 | 26 |
| 2035 | 224 | 4.0 | 327 | 59 |
| 2040 | 96 | 1.6 | 487 | 84 |
| 2045 | 30 | 0.4 | 581 | 95 |
| 2050 | - | - | 635 | 100 |

After 2030, emissions will need to fall rapidly year-on-year to reach our long-term goal of net-zero community-wide emissions in 2050. By 2035 and 2045, net annual GHG emissions must not exceed 4.0 tCO2eq/p and 0.4 tCO2eq/p, respectively, which would require reductions in projected Reference Case emissions of 59% in 2035 and reductions of 95% in 2045.

To achieve these ambitious targets, deep emission reductions will be needed from all sources of GHGs in Spruce Grove—from City-owned streetlights and signs to personal use of cars, SUVs and trucks. The relative contribution of each source to the overall required emission reductions needed along Spruce Grove's path to net-zero by 2050 are presented below in the form of a wedge diagram. The largest reductions are needed from road transportation, followed by our residential, commercial and public buildings.

[6]2030 Emissions Reduction Plan: Canada's Next Steps for Clean Air and a Strong Economy, Environment and Climate Change Canada, 2022.

## Required Reductions in Reference Case Emission by Source Along Spruce Grove's Path to Net-zero by 2050



# 10

# Our Path to Net-Zero Emissions

## What Can the City of Spruce Grove do to Reduce Community-wide Emissions?

Each level of government has different jurisdiction and tools to influence GHG emissions. Cities should take responsibility for reducing emissions within their geographical boundary, even those they do not directly control. The City of Spruce Grove can directly control, and directly and indirectly influence community-wide emissions in several ways:

- Corporate operations: The City can make decisions that directly control emissions from civic buildings and facilities, infrastructure and fleet, and the services they provide, including through procurement and service delivery.
- Innovation: The City can support research and the piloting of new technologies and innovative approaches to reduce emissions, through partnerships or funding.
- Incentives: The City can provide funding (e.g., grants or loans) and (non-)financial incentives (e.g., modify taxes or fees, or expedite permitting) to help reduce the upfront costs of reducing emissions for households and businesses.
- Regulation: The City can exercise its jurisdictional powers (e.g., through the land-use approvals continuum) to set and enforce regulations to require emission reductions.
- Education and capacity building: The City can provide general or specifically targeted information, education and training to help households and businesses take action to reduce emissions.
- Advocacy: The City can advocate to other levels of government to support emission reduction goals.

Successfully achieving net-zero emission in Spruce Grove by 2050 will depend on our ability to use these levers to encourage, support and require the implementation of GHG emission reduction actions within the City's boundaries. However, it will also depend on several factors over which we have less control and influence, including how rapidly and to what extent the GHG-intensity of the Alberta electricity grid declines, the speed and level to which the federal carbon tax escalates, and the implementation of other provincial and federal policies, programs, and funding in support achieving net-zero emissions by mid-century.

## Carbon Budget Milestones

To achieve net-zero emissions by mid-century and the mid-term target for 2030, the total "carbon budget" available to Spruce Grove between 2022 (the start of this plan) and 2050 is 6,260 $ktCO_2eq$. Simply put, a carbon budget is the cumulative amount of GHGs that can be released to the atmosphere over a certain period of time if global temperatures are to be kept below a certain temperature, like 1.5°C above pre-industrial levels. It is similar to a financial budget in

that it sets the amount of GHGs available to Spruce Grove to 'spend' (emit) over a particular time period.

To help track and manage GHG emission reductions over time, the total carbon budget for Spruce Grove is broken down into a series of manageable chucks, or multi-year mini budgets. Each multi-year mini budget sets progressively lower emissions limits and acts as a roadmap towards achieving our targets for 2030 and 2050. The length of each mini carbon budget is set at four years, to align with the municipal election cycle. This will enable the City to plan out GHG emission reduction policies, programs and projects for several years at a time as opposed to annually, providing increased lead time for action by households, businesses and other stakeholders.

This plan covers the first three 4-year carbon budgets:

- Budget 1 for the period 2022-2025;
- Budget 2 for the period 2026-2029; and
- Budget 3 for the period 2030-2033 (the last year of this plan).

## Modeled GHG Reductions

Detailed modeling was performed to understand the necessary emission reductions to stay within the three carbon budgets covered by the plan. As a guiding principle to conduct this modelling, emissions reductions were shared equally across all sources. In other words, all GHG sectors were expected to deliver the same percentage reductions in each year. The level of achievable emission reductions modeled for each source was based on levels of participation, adoption and savings observed from actions implemented in other jurisdictions.

For each of the three 4-year carbon budgets covered by the life of this plan, the projected Reference Case emissions, the allowable emissions, the required emission reductions and the feasible modeled reductions are shown in the table below. The table also shows whether we anticipate an emissions deficit (an overspend) or surplus (an underspend) at the end of each carbon budget cycle.

It takes time to scale-up market supply and demand and the necessary investment and capacity to realize adoption rates of energy and GHG savings actions necessary to achieve our ambitious goals. For this reason, and the fact that the first actions are unlikely to be implemented before 2023, it is anticipated that it will not be feasible to achieve the required emission reductions for the first carbon budget—the modeling suggests a budget deficit of 87 $ktCO_2eq$. By the end of the second budget, we expect the budget deficit to rise to 104 $ktCO_2eq$. However, as implementation of energy and GHG saving actions is rapidly scaled-up over the course of this plan, we expect to show a surplus of 35 $ktCO_2eq$ by the end of the third carbon budget in 2033.[7]

The anticipated reductions in community-wide GHG emissions will also yield energy costs savings for the City, households and businesses amounting to $475 million (2020 dollars) over the life of this plan.

[7]Further details on the modeling undertaken for this plan are provided in the accompanying technical report: GHG Emission Projections and Reduction Scenarios: Technical Report #2, City of Spruce Grove, Climate Change Action Plan, January 2022.

### Carbon Budgets and Modeled Community-wide Emission Reductions

| | Budget 1 2022-25 | Budget 2 2026-29 | Budget 3 2030-33 | Overall Plan (2022-2033) |
|---|---|---|---|---|
| | ($ktCO_2eq$) | ($ktCO_2eq$) | ($ktCO_2eq$) | ($ktCO_2eq$) |
| Carbon budget (allowable emissions) | 1,773 | 1,624 | 1,342 | 4,739 |
| Reference Case GHG emissions | 1,930 | 2,017 | 2,111 | 6,058 |
| Required reductions to stay within budget | 157 | 393 | 769 | 1,319 |
| Modeled reduction (achievable potential) | 70 | 376 | 908 | 1,354 |
| Surplus or (deficit) over time period | (87) | (17) | 139 | 35 |
| Cumulative running balance | (87) | (104) | 35 | |
| | Deficit | Deficit | Surplus | |

The carbon budget milestones shown in the table serve as guideposts to indicate the necessary pace and scale of implementation to achieve our mid-term emission reduction target for 2030 and set Spruce Grove on the road to achieving net-zero community-wide emissions by 2050. How rapidly implementation is scaled up will ultimately depend on the final budgets approved by Council. This will directly affect the actual GHG emissions reductions that the plan will deliver.

The climate mitigation component of this plan is organized into nine themes. The first theme, 'Low Carbon Energy Supply and Carbon Sinks', has the potential to affect GHG mitigation across many parts of the city. The remaining eight themes align with the major sources of GHG emissions in Spruce Grove.

Each theme includes a table of actions that Spruce Grove will investigate in its attempts to meet its GHG mitigation target. Each action was assessed using the criteria described in the section above called 'Prioritizing Climate Change Actions'. In these tables, actions are organized from high to low in terms of the overall expected benefit of an action. As well, to help organize next steps on each action the overall Type and Sub-type of each action are also described.

In order to achieve the Spruce Grove GHG mitigation goal, a wide array of actions will need to be taken, by both city residents and at every level of government. This plan describes actions that can be taken by the City of Spruce Grove either directly (through changes to governance or procedures followed by the city) or indirectly (through partnerships with other organizations or through lobbying other levels of government).

# Theme 1: Low Carbon Energy Supply and Carbon Sinks

Two methods of reducing GHG emissions across Spruce Grove are to a) to increase the proportion of energy (electricity or heating energy) that comes from renewable energy source and b) to store carbon by increasing the number of trees planted across the city. Energy Supply actions could help to reduction GHG emissions across the entire city, and could be an important source of GHG emissions reduction. The total quantity of GHG emissions directly reduced through tree planting is relatively small. However, higher numbers of trees can help to reduce ambient air temperature and reduce the demand for electricity to be used for air conditioning.

The City will explore adoption of the actions described below as part of its GHG reduction strategy.

**Actions to Reduce Spruce Grove GHG Emissions from the Energy Supply**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Public-private partnerships for community energy generation**<br>Investigate partnerships with local educational facilities and/or businesses to create renewable energy pilot projects that would benefit Spruce Grove. | Outreach | Partnerships | Very High |
| 2 | **Privately funded community renewable energy**<br>Explore ways to increase private renewable energy production at a community or city level, through methods such as geothermal energy, private local solar farms, wind turbines, etc. | Outreach | Partnerships | High |
| 3 | **Renewable power generation at city facilities**<br>Continue to install renewable energy sources, such as solar panels, at City facilities. | Ventures | Program | High |
| 4 | **Public-private partnerships for community energy generation**<br>Investigate methods to improve the long-term financial maintenance viability of renewable energy infrastructure such as the Greenbury wind spires that are installed by developers and then maintained by the city. | Governance | Assessment | High |
| 5 | **Develop a Green Industrial Area**<br>Create local policies and incentives to create a 'green industrial area', composed of renewable energy production companies and/or companies that are part of the transition towards energy efficiency, energy use electrification, and renewable energy | Governance | Policy | High |
| 6 | **Provincial and federal advocacy to reduce GHG intensity of grid**<br>Advocate for the federal and provincial governments to pursue low-GHG forms of electricity generation while ensuring sufficient electricity supply. | Outreach | Advocate | Moderate |
| 7 | **Community energy systems**<br>Explore ways to increase energy efficiency at a community level, through methods such as district energy systems. | Governance | Assessment | Moderate |
| 8 | **City owned renewable energy/energy systems**<br>Investigate with a feasibility study the possibility for city owned alternative energy systems and city owned renewable energy production, included co-gen and district energy. When technologically and financially appropriate, obtain battery storage to support city renewable energy production and improve city resilience to power outages. | Governance | Assessment | Moderate |

### Actions to Reduce Spruce Grove GHG Emissions from Carbon Sinks

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Citizen tree planting**<br>Create opportunities for citizens to plant trees in publicly owned spaces. | Governance | Plan | Very High |
| 2 | **Increased city tree planting**<br>Increase the number of trees planted by the city along boulevards and in green spaces. | Governance | Plan | High |

## Theme 2: Low-carbon Community Transportation

The energy that Spruce Grove residents use to move from place is the largest single source of GHGs in the City, accounting for 44.6% of GHG emissions. The majority of this energy use is due to the use of gasoline, diesel and other fuel for vehicles. Less than 1% of these GHGs currently come from electricity used to power hybrid and electric vehicles. Methods of reducing GHG emissions from transportation include reducing the total distances that people need to travel, making it easier to use lower-GHG intensive forms of transportation such as active transportation and transit, and switching fuel sources for vehicles from gasoline and diesel-powered vehicles towards electric vehicles.

The target for Spruce Grove is to reduce GHG emissions from transportation by 615 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

### Actions to Reduce Spruce Grove GHG Emissions from Community Transportation

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Car dealership EV partnerships**<br>Help educate residents about electric vehicles by encouraging local car dealerships to offer more floor space, salesman time, etc. to electric vehicles | Outreach | Partnerships | High |
| 2 | **Promote existing programs to purchase EV**<br>Advertise provincial and federal grants, and offer targeted city incentives, to replace personal and commercial ICE vehicles (older or less efficient) with electric vehicles (preferred) or hybrid vehicles (also beneficial); run local advertising campaigns encouraging people to make the switch | Venture | Program | High |
| 3 | **Encourage businesses to promote working from home**<br>Reduce the amount of time spent commuting to a job: Encourage businesses to offer work from home options or private workshare space | Outreach | Advocate | High |

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 4 | **Improve active transportation infrastructure and culture**<br>Create and implement a cohesive plan to significantly increase walking, biking, e-biking, and e-scooter use within the next 10 years, e.g. encourage citizens to try out new forms of local transportation, install sidewalk 'missing links', improve accessibility of sidewalks (ramps etc), include active transportation networks in snow and ice removal/treatment plans, install more bike lanes and bike racks, install bike racks on buses and at bus route hubs, continue to incorporate identification and construction of paved bus stops that are connected to the active transportation network | Governance | Plan | Moderate |
| 5 | **Increase local transit hours and area covered**<br>Create a strategy to increase the amount of within-Spruce Grove transit use through: increased hours of transit, expanded service area of transit; advertising of on-demand service more; reduce local transit fees | Governance | Plan | Moderate |
| 6 | **EV Education**<br>Use city resources to educate the public about the relative benefits of electric vehicles over 'internal combustion engine' vehicles | Ventures | Engagement | Moderate |
| 7 | **Encourage carpooling for commuting**<br>Reduce the number of vehicles needed to transport people to work: run advertising campaigns to promote carpooling | Ventures | Engagement | Moderate |
| 8 | **Increase EV infrastructure through policy**<br>Improve local electric vehicle infrastructure: research how to improve local EV infrastructure, increase the number of public electric vehicle charging stations, including at all City facilities for staff and public use; create designated parking spots for hybrid and electric vehicles; create a bylaw requiring EV charging stations in new multi family buildings, mixed use buildings, commercial buildings, and parking lots. Continue to take advantage of available grants to facilitate charging station installation | Governance | Assessment | Moderate |
| 9 | **Encourage EV carshare**<br>Encourage the creation of, and reduce barriers to, and EV car sharing program/ business | Governance | Policy | Moderate |
| 10 | **Lobby for policies and programs to increase replacement older ICI vehicles**<br>Incentivize the replacement of older vehicles with newer vehicles: work with regional groups to lobby for the provincial government to incentivize the purchase of fuel-efficient vehicles and to retire inefficient older vehicles; | Outreach | Advocate | Moderate |
| 11 | **Encourage EV taxis**<br>Increase the visibility and acceptance of electric vehicles by encouraging or mandating that all local taxis/ rideshare vehicles be electric vehicles only | Governance | Policy | Moderate |
| 12 | **Reduce idling through policies and improved traffic flow design**<br>Create a plan to reduce local vehicle 'idling' time: advertise efficient driving techniques; improve traffic light timing; reduce the number of traffic lights to reduce total time driving, investigate creation of a local anti-idling bylaw | Governance | Plan | Moderate |
| 13 | **Renewable energy EV charging**<br>Use renewable energy to power electric vehicle recharging stations: install solar panel canopies above parking stalls in public parking lots such as at the Civic Centre, and use that energy to help power the charging station | Ventures | Project | Moderate |

# Theme 3: Low-Carbon Homes

The second largest source of GHG emissions in Spruce Grove, at 29.4%, is from energy used in residential homes. Just over half of these emissions come from burning natural gas for space heating and water heating. Remaining GHG emissions come from electricity. The GHG emissions from electricity depend on the way the electricity was generated on the Alberta grid (coal, natural gas, wind, solar, etc.). Electricity is primarily used to power appliances, as a (less common) source of space heating, for home lighting, and for air conditioning. Methods of reducing GHG emissions from homes include using less energy overall in our homes as well as changing to less GHG intensive sources of energy than are currently the standard.

The target for Spruce Grove is to reduce GHG emissions from homes by 348 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

### Actions to Reduce Spruce Grove GHG Emissions from Homes

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **New development sustainability checklist**<br>Enable and encourage city staff to provide a voluntary sustainability checklist for new developments to increase awareness of actions that could be taken to reduce GHG emissions and increase climate resiliency. Actions could be aligned to meet LEED or other standards. | Ventures | Operations | Very High |
| 2 | **Lobby for prompt adoption of updates to energy building codes**<br>Encourage the provincial government to promptly adopt the regular updates to the National Building Code, and to adopt other appropriate energy efficiency requirements to the provincial building code | Ventures | Engagement | Very High |
| 3 | **Amend permissions for non standard heating technologies**<br>Amend development permissions to allow for non-standard heat sources such as ground source heat pumps to be used on multiple sizes of building | Governance | Policy | Very High |
| 4 | **Energy conservation education**<br>Continue existing program to educate residents about ways to use energy and water more efficiently in their homes | Ventures | Engagement | Very High |
| 5 | Above-code new construction program<br>Encourage construction companies to construct local homes that use 'better than code' levels of energy efficiency in local buildings. Explore the relative cost and benefit of offering various forms of grants or tax breaks to home residents to either reduce their overall energy use through improved energy efficiency, or to install renewable energy such as solar panels. Include affordability and other equity considerations in the design of these grants. | Ventures | Program | Very High |

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 6 | **Lobby for higher energy efficiency standards in building code**<br>Work with other local communities through organizations such as the EMRB to agree on a set of new 'regional' energy efficiency related building energy efficiency standards to lobby the provincial government to adopt | Outreach | Partnerships | High |
| 7 | **Encourage builders & developers to make solar-ready homes**<br>Encourage construction companies to construct homes that are either solar PV 'ready' or that include pre-installed solar panel, at both a local level and through regional groups such as the EMRB | Outreach | Partnerships | High |
| 8 | **Home retrofit grant program**<br>Provide targeted incentives to residents to conduct energy retrofits, targeting older or 'known inefficient' residential buildings. Explore the relative cost and benefit of offering various forms of grants or tax breaks to home residents to either reduce their overall energy use through improved energy efficiency, or to install renewable energy such as solar panels. Include affordability and other equity considerations in the design of these grants. | Ventures | Program | High |
| 9 | **Lobby for solar-ready homes in building code**<br>Work with other local communities through organizations such as the EMRB to agree on a set of building codes to lobby the provincial government to adopt that would require new homes to either be solar PV 'ready' or to include pre-installed solar panels | Outreach | Partnerships | High |
| 10 | **Home Energy Audit Assistance**<br>Advertise and potentially provide grants to homeowners to allow them to have an energy audit of their home, helping them to identify the most cost-effective and most energy-saving ways to retrofit their homes | Ventures | Program | High |
| 11 | **Home retrofit CEIP program**<br>Help residents finance deep energy retrofits, ideally to a net zero level, by approving the Clean Energy Improvement Program (CEIP) at a city level | Governance | Policy | High |
| 12 | **CEIP implementation for home renewable energy**<br>Help residents finance the installation of their own renewable energy, such as solar panels, by approving the Clean Energy Improvement Program (CEIP) at a city level | Governance | Policy | High |
| 13 | **Voluntary home labelling**<br>Adopt or make use of existing programs and procedures such as the Edmonton EnerGuide home rating system and the related Home Energy online Map rating program to a) provide prospective homeowners with historical home energy use and b) tell existing homeowners how their energy use compares to their neighbours | Ventures | Program | Moderate |
| 14 | **Design homes for larger household sizes**<br>Encourage builders to build homes that are suitable for more than a single nuclear family: multi-generational homes, secondary suites, laneway homes, etc. | Outreach | Advocate | Moderate |
| 15 | **Encourage construction of smaller homes**<br>Encourage builders to construct smaller homes: smaller single family dwellings, townhouses, infill suites, etc. at both a local level and through regional groups such as the EMRB | Outreach | Advocate | Moderate |

# Theme 4: Low-Carbon Businesses and Industry

GHG emissions from local businesses and industry account for 21.8% of Spruce Grove's emissions. Businesses and industry, like homes, produce most of their GHG emissions from space heating and water heating. Other energy uses that produce GHGs include powering equipment and motors, lighting, space cooling. Methods of reducing GHG emissions from businesses, like with homes, include finding ways to reduce overall energy use and in changing to less GHG intensive sources of energy than are currently the standard.

The target for Spruce Grove is to reduce GHG emissions from business by 196 $ktC0_2eq$ and from local industry by 107 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

**Actions to Reduce Spruce Grove GHG Emissions from Local Businesses and Industry**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Recognize Business Achievements**<br>Develop a recognition and awards program for businesses that reduce their energy use and adopt lower GHG emission sources of energy production (e.g. transitioning from natural gas heating to forms of electricity powered heating), building on existing businesses recognition programs that are already sponsored by governments and industry associations | Ventures | Program | High |
| 2 | **Energy literacy program for business sector**<br>Provide tailored outreach education programs to businesses, potentially delivered by third parties with relevant expertise, to help them understand the benefits and opportunities relating to energy efficiency, energy use electrification, and renewable energy adoption. And actively support builders to take advantage of improved building codes and new, more energy efficient construction methods and technologies, to reduce the overall energy use of businesses. | Ventures | Program | Moderate |
| 3 | **Retrofit program for existing businesses buildings**<br>Provide incentives for existing businesses to conduct and then act on the results of energy efficiency audits, e.g. grants to conduct energy audits, or tax breaks for meeting certain conditions of an energy audit | Ventures | Program | Moderate |
| 4 | **Business incentive program for renewable energy**<br>Provide local incentives for local businesses to install renewable energy, such as solar panels or geothermal energy production | Ventures | Program | Moderate |

# Theme 5: Low-Carbon Solid Waste

Organic matter (food, garden waste, wood, paper or fabric) that is sent to a landfill instead of being composted can decompose in a way that produces methane, which is a strong greenhouse gas. GHG emissions from solid waste are responsible for 2.4% of Spruce Grove's emissions.  Methods of reducing GHG emissions from solid waste relate to reducing the overall quantity of waste being landfilled and an overall reduction in the quantity of organic waste that is landfilled instead of being composted or otherwise treated.

The target for Spruce Grove is to reduce GHG emissions from homes by 36 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

**Actions to Reduce Spruce Grove GHG Emissions from Local Solid Waste**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Continue existing waste education**<br>Continue existing programs to educate residents about how to reduce, reuse, and recycle | Ventures | Program | Very High |
| 2 | **Focus education on organic diversion**<br>Increase support for existing education programs and pilot projects for residents and business owners that are specifically focused on improving diversion of organic materials to the organics waste container | Ventures | Resourcing | Very High |
| 3 | **Composting partner best practises**<br>Work with the existing city composting partner to encourage them to adopt composting best practices | Outreach | Advocate | Moderate |
| 4 | **Every other week garbage collection**<br>Implement every other week waste collection to encourage appropriate recycling and organics diversion | Ventures | Program | Moderate |

# Theme 6: Low-Carbon City Buildings

Buildings and facilities owned by the City produce 1.2% of the city's GHG emissions. Almost half of this comes from the energy needed to power indoor recreation facilities such as the Agrena. The remaining energy use in this area are split between public works facilities, protective services facilities, city service buildings such as City Hall, and outdoor recreation facilities. Overall, methods of reducing GHG emissions from city buildings include building and retrofitting buildings to use less energy overall, and, in switching towards less GHG intensive forms of energy use for these buildings than are currently used.

The target for Spruce Grove is to reduce GHG emissions from city buildings by 16 $ktC0_2eq$ between 2022 and 2033. The City will explore adoption of the actions described below in order to achieve this goal.

**Actions to Reduce Spruce Grove GHG Emissions from City Buildings**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Act on energy benchmark analysis of city buildings**<br>Use and act on findings of energy conservation analyses of city buildings to identify ways to improve energy efficiency. | Ventures | Project | Very High |
| 2 | **Incorporate long term energy costs into building design decisions**<br>Incorporate consideration of lifetime building energy costs into design considerations for new city facilities | Governance | Policy | High |
| 3 | **Purchase renewable electricity for city corporate use**<br>Investigate the purchase of renewable electricity for corporate electricity use | Governance | Assessment | Moderate |
| 4 | **Civic Centre energy efficiency**<br>Incorporate high energy efficiency considerations into the design of the Civic Centre | Ventures | Project | Moderate |
| 5 | **'Net Zero' existing city buildings**<br>Update the green building policy to retrofit existing city buildings towards a 'net zero' standard | Governance | Policy | Moderate |
| 6 | **'Net Zero' new city buildings**<br>Update the green building policy to require new city buildings to be built towards a 'net zero' standard | Governance | Policy | Moderate |

# Theme 7: Low-Carbon City Fleet

The City vehicle fleet includes vehicles ranging from light passenger vehicles to the heavy equipment used to plow snow and clean streets. These vehicles account for 0.2% of Spruce Grove's GHG emissions. Methods of reducing GHG emissions from the city fleet include finding opportunities to reduce the use of city vehicles, right-sizing vehicles for the task at hand, and transitioning vehicles towards hybrid and electric options over time.

The target for Spruce Grove is to reduce GHG emissions from the City Fleet by 2 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

**Actions to Reduce Spruce Grove GHG Emissions from the City Fleet**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Right-sized city vehicles**<br>When replacing vehicles and fleet equipment, continue to select vehicles/equipment with appropriate energy (fuel or electricity) needs for the required task - downsizing or upsizing as necessary instead of replacing vehicles with the same type of vehicle/machine that was used most recently | Ventures | Operations | Very High |
| 2 | **Reduced city vehicle use**<br>Continue to look for opportunities to reduce the use of city vehicles, as part of the Green Fleet Plan | Ventures | Operations | Very High |
| 3 | **Electric City fleet and supporting infrastructure**<br>Continue to invest in electric vehicle infrastructure for city owned vehicles, taking advantage of grants from organizations such as the MCCAC. In the EV strategy being developed in 2022, create a plan to eventually transition city fleet to all electric vehicles, when electric options exist. | Governance | Policy | Moderate |

# Theme 8: Low-Carbon City Lights and Signs

Spruce Grove's street lights, traffic signals, crosswalks and electronic signs account for 0.2% of the city's GHG emissions. Methods for reducing GHG emissions from lights and signs include safely reducing unneeded lighting, improving the efficiency of lighting used, and powering signs using renewable energy

The target for Spruce Grove is to reduce GHG emissions from its lights and signs by 2 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

**Actions to Reduce Spruce Grove GHG Emissions from City Lights and Signs**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Complete replacement of lights with high efficiency light bulbs**<br>Replace all remaining city lighting with LED or similarly efficient lights (e.g. streetlights, parking lots, etc.) | Ventures | Project | High |
| 2 | **Reduce unneeded City lighting**<br>Adopt recommendations from Fortis about safely reducing or removing public lighting, where appropriate (e.g. through motion sensor lighting) | Ventures | Project | High |
| 3 | **Power City lighting using renewable energy**<br>Where possible, power city lights and signs using renewable energy (signage, walkway lighting, etc.) | Governance | Plan | Moderate |

# Theme 9: Low-Carbon Water and Sewage

Spruce Grove's pumping stations for potable water and sewage account for the remaining 0.2% of the city's GHG emissions. Methods for reducing GHG emissions from these stations include finding ways to maintain or reduce the amount of water used by residents and to ensure that all equipment is well maintained and efficient.

The target for Spruce Grove is to reduce GHG emissions relating to water and sewage by 2 $ktC0_2eq$ between 2022 and 2033, compared to predicted 'Reference Case' GHG emissions. The City will explore adoption of the actions described below in order to achieve this goal.

**Actions to Reduce Spruce Grove GHG Emissions from Water and Sewage**

| Action No. | Action | Action Type | Action Sub-Type | Expected Benefit |
|---|---|---|---|---|
| 1 | **Water conservation education programs**<br>Maintain existing water use education programs | Ventures | Program | Very High |
| 2 | **Efficient water and wastewater equipment**<br>Continue to ensure that water and wastewater mechanical systems are designed and operated efficiently | Ventures | Operations | Very High |
| 3 | **Water leak mitigation**<br>Invest staff time in maintaining the quality of the water and wastewater system to reduce leaks | Ventures | Resourcing | Moderate |

# 11

# Moving Forward


This plan identifies 99 actions that Spruce Grove can take over the next 12 years (2022-2033) to help prepare for the threats and opportunities of a changing climate, and to chart a course towards net-zero community-wide GHG emissions by 2050—joining hundreds of Canadian municipalities contributing to the collective goal of limiting future climate change.

To start implementation of this plan, specific departments will be identified to work on particular actions.  Monitoring, evaluation and review of progress on this plan will occur every 4 years, in line with the city's carbon budgets.

Our plan is comprehensive, science-based, informed by public engagement, and built on principles of social equity and justice. Successful implementation of the actions in this plan will help make our community safer, make current and future generations of residents healthier and more secure, make our economy more vibrant and stable, our environment more sustainable, and our society more inclusive and equitable.

# 12

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Caitlin van Gaal, Environmental Advisor

## City of Spruce Grove Staff

## Internal Team Lead

- Workshop attendees
- Survey participants
- Spruce Grove Farmer's Market organizers and attendees
- Students from St. Peter the Apostle Catholic High School

## Consultant Team

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