
OUR CLIMATE
FUTURE
climate change action plan



Climate Change Action Plan Overview

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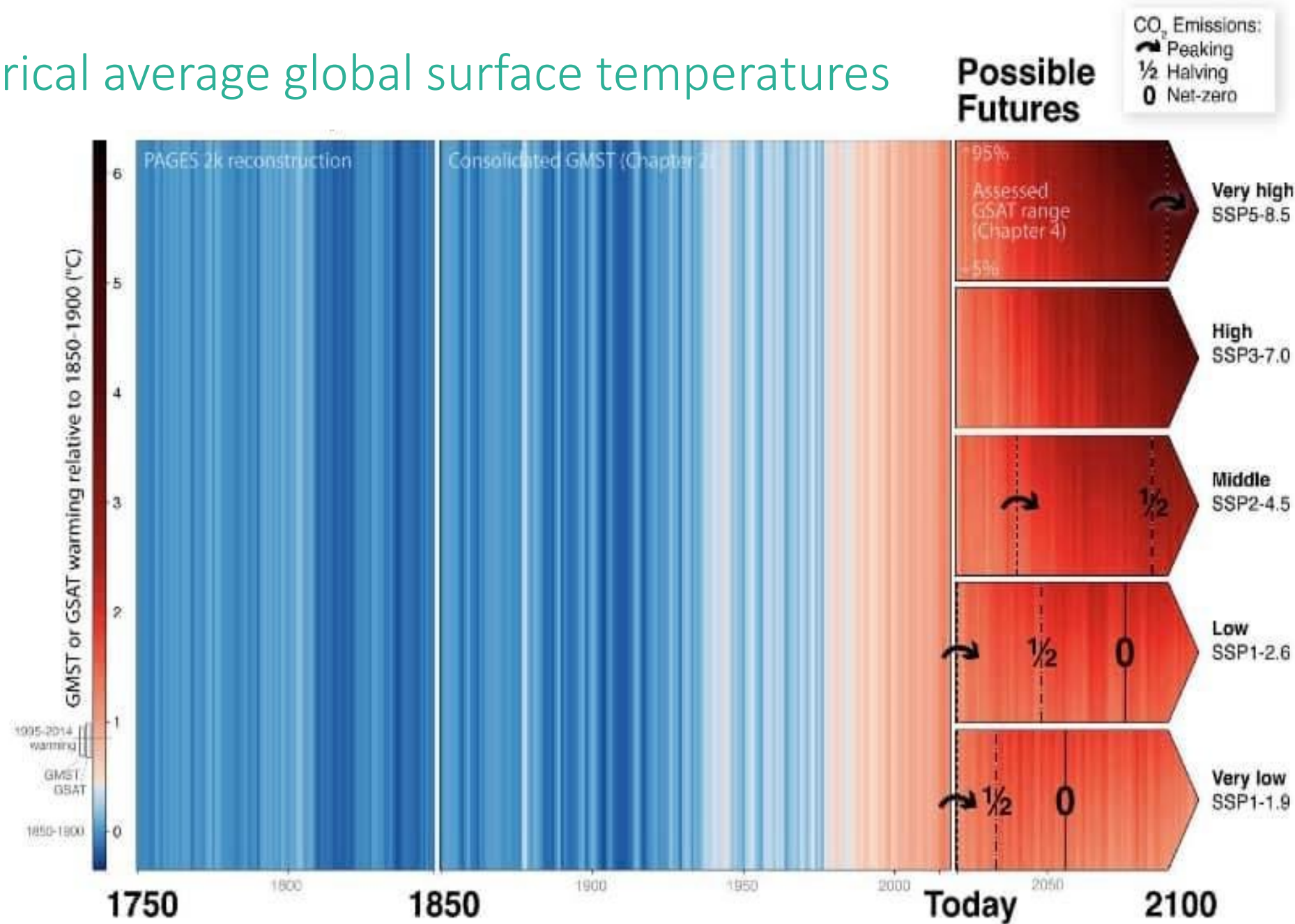
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**Vulnerability & Risk
Assessment**

Introduction

- The city's Environmental Sustainability Action Plan **expired in 2021** and will be **replaced with a Climate Change Action Plan**
- This new plan has incorporated citizen and stakeholder input , scientific research, and risk management to **recommend a set of actions** that the City can take to **address climate change in an environmentally, socially, and financially responsible way.**
- The Climate Change Action Plan helps to answer these two main questions:
 1. How can the City help **prepare** the community for predicted **changes to local weather patterns?**
 2. How can the City **reduce its greenhouse gas emissions** and help the community do the same?

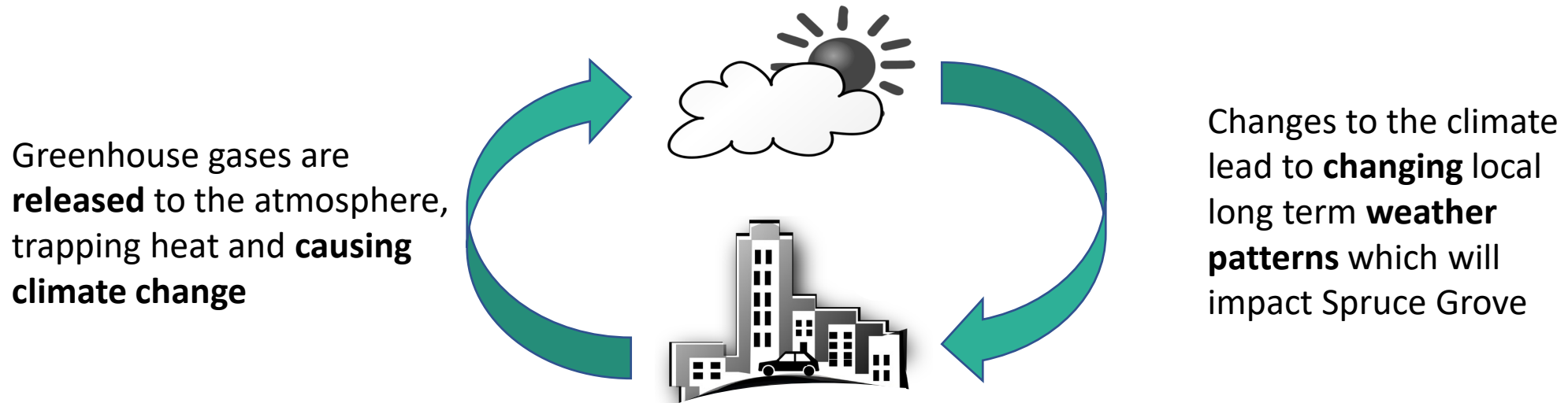
Historical average global surface temperatures





Why create a Climate Change Action Plan

To address the two different components of climate change planning:



Climate Change Mitigation:
Reducing local greenhouse gas emissions

Climate Change Adaptation:
Preparing for predicted changes to local weather patterns

Climate Change Adaptation: Vulnerability and Risk Assessment

Projected climate changes for Spruce Grove



Warmer Summers

Warmest Max Temp increase by 5°C
3 more heat waves per year
21 more hot days (+30°C)



Water Stress

Longer frost-free season
Increase drought risk



Warmer Winters

Coldest Min Temp decrease by 8°C
Half as many winter days (15°C)
Fewer freeze-thaw cycles



More Extreme Weather

Increase in extreme rainfall
More summer storms (wind, lightning)

ID of Potential Climate Change Risks and Opportunities



Warmer Summers

Heat Wave
Increased Summer Recreation
Longer Construction Season
Invasive species
Increased Agricultural Productivity
Reduced Space Heating Demand



Warmer Winters

Reduced winter recreation
Reduced cold stress



Water Stress

Drought
Water Supply Shortage
Increased Water Demand
Wildland Fire
Wildfire Smoke



More Extreme Weather

Freezing Rain
Hailstorm
Tornado
River flooding
Urban flooding
High winds

Climate Impact Scenario (Heat Wave Example)

Projected climate change

Hotter summer temperatures and more extreme heat

Impact event description

Heat wave

Potential consequences

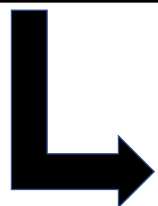
- Injuries and fatalities related to heat exhaustion and heat stroke
- Impacts exacerbated for vulnerable populations, including the young, elderly, disabled and long-term sick, as well people experiencing homelessness or living in poor-quality homes.
- Increased water demand [see water demand]
- Impacts to the power grid (outages)

Proxy indicator / threshold

Three consecutive days of temperatures above +30°C

Likelihood assessment (Heat Wave Example)

Score	Descriptor	Recurring climate events	Single climate events
1	Rare	Annual probability <1% (Less than 1:100-year event)	Event is almost certain not to occur (probability < 1%)
2	Unlikely	Annual probability 1 – 2% (1:50 to 1:100 year event)	Event is not anticipated to occur (1% - 33% probability)
3	Possible	Annual probability 2 - 10% (1:5 to 1:50 year event)	Event is just as likely as not to occur (33% - 66% probability)
4	Likely	Annual probability 10-50% (1:1 to 1:5 year event or less)	Event is expected to occur (66% - 99% probability)
5	Almost Certain	Annual probability > 50% (once every two years or more)	Event is virtually certain to occur (probability > 99%)



Historic value (1976-2005)

Near Future (2030s)

Distant future (2060s)

0.4 heat waves per year

1.3 heat waves per year

3.2 heat waves per year

Annual probability

Likelihood score

Historic

Future

Historic

Future

8%

82%

3

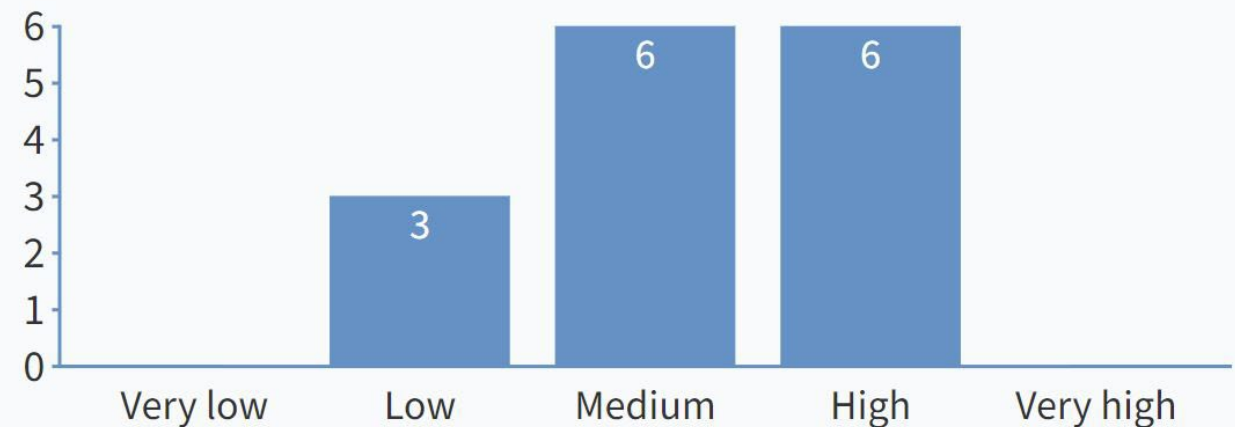
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Consequence assessment (Hail Example)

Score	Descriptor	Description
1	Insignificant	No directly related deaths, injuries, illnesses, or diseases.
2	Minor	
3	Moderate	No directly related deaths, 5-10 people injured or experiencing illness, some requiring hospital treatment. Moderate, temporary feelings of fear and anxiety.
4	Major	
5	Extreme	5 or more directly related deaths, and/or 10 experiencing illness, many seriously and requiring hospital treatment. Widespread and severe disturbance result



How severe would the consequences be of hailstorm with 45 mm hailstones?



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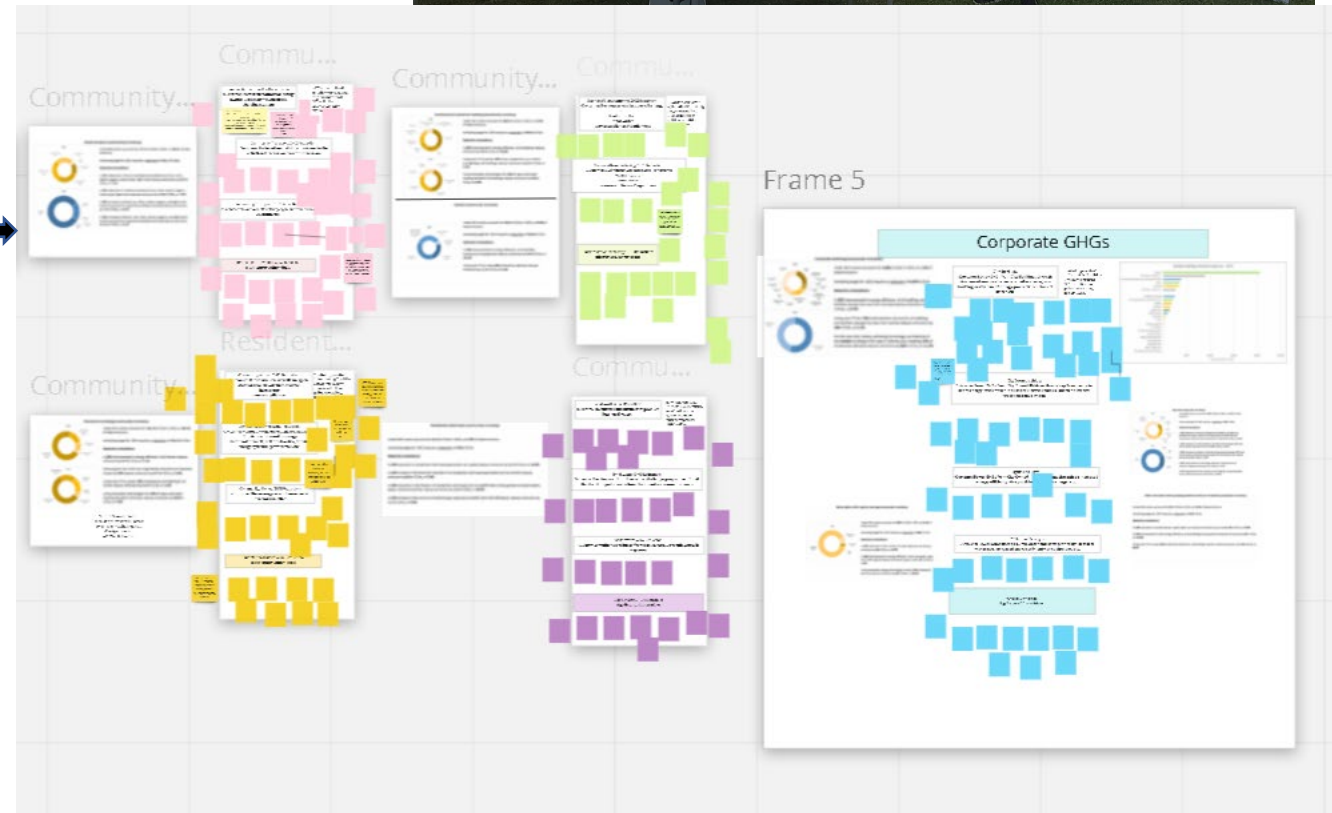
Assessment Results

- 4 high priority risks and 1 high priority opportunity
- 12 moderate priority risks and 3 moderate priority opportunities
- 4 low priority risks
- Adaptation actions developed for high and moderate priority risks and opportunities

Label	Climate risks and opportunities
High Priority	Drought Heat wave Longer construction season (Benefit) Freezing rain Hailstorm
Medium Priority	Water supply shortage High winds Increased water demand Invasive tree species Reduced winter recreation Lightning Increased space cooling Wildfire smoke Freeze-thaw cycles Ground level ozone Urban flooding Heavy snowfall Water supply shortage Invasive tree species Reduced winter recreation Increased summer recreation season (Benefit) Increased agricultural productivity (Benefit) Reduced space heating demand (Benefit)
Low Priority	Cold stress Tornado River flooding Wildland fire

Action Identification & Assessment

- Public engagement →
 - One online workshop
 - One in-person engagement
 - Presentation to high-school science classroom
 - Two surveys
- Spruce Grove staff →
 - Department interviews
 - Online workshops
- Literature review of other city plans
 - Leduc, Canmore, Calgary, Edmonton, Saskatoon, etc.



Multi criteria action assessment

Effectiveness	Benefits (averaged)	Vs.	Costs (averaged)	Capital Costs
Complementary Co-benefits				Operating Costs
Other benefits				Negative Side Effects
Equity				Feasibility
Flexibility				Acceptability

Adaptation: Key Results

Action Groupings:

- City Buildings and Infrastructure (14 actions)
- City Services (10 actions)
- Home, Businesses and Local Economy (6 actions)
- Water Management and Natural Infrastructure (8 actions)

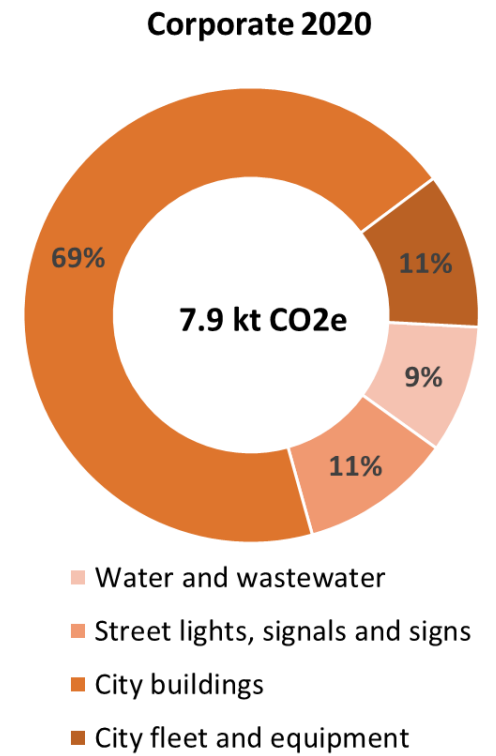
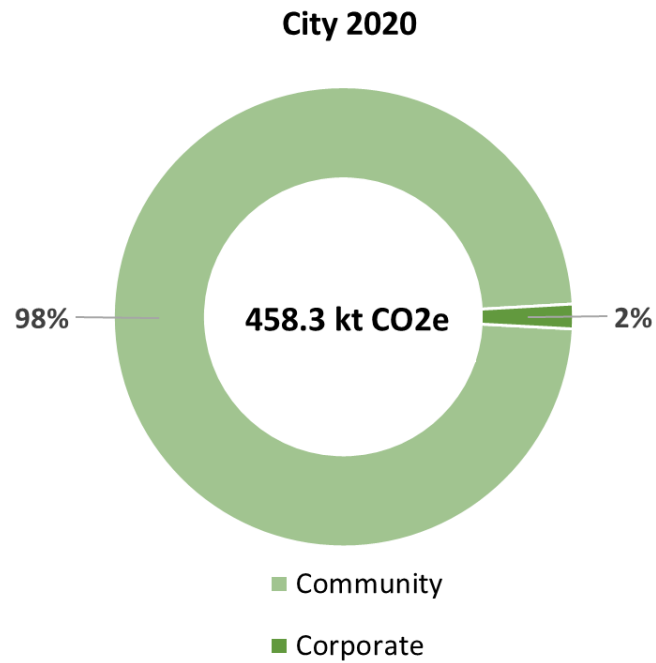
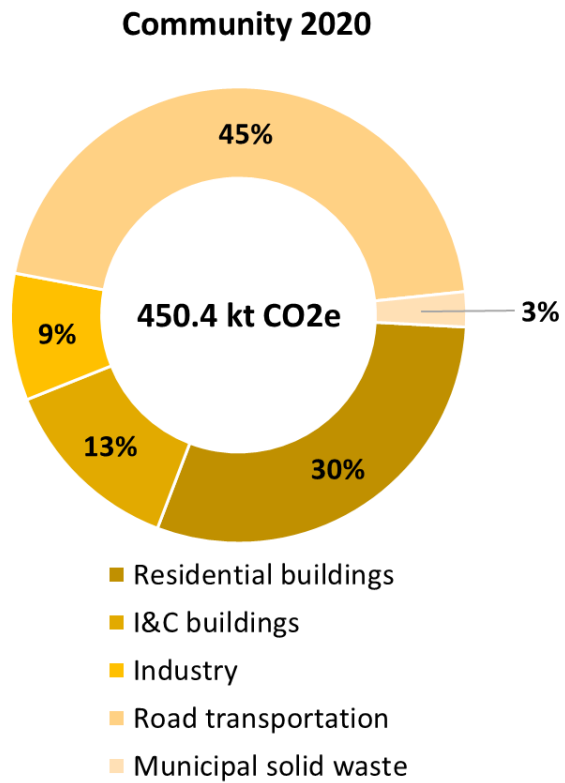
Example Actions: City Services

Action No.	Action	Action Type	Upfront Costs	Equity	Mitigation Benefits
2-1	Update the Winter Emergency Response Program to assist unsheltered people during extreme weather events	Program	\$\$\$	Exceptional	None or minor
2-2	Improve the climate resilience of locations used for refuge during states of local emergency by assisting with the installation of climate resilience features	Project	\$\$\$	Exceptional	None or minor
2-3	Develop an education program for residents to build awareness and improve communications about local climate change impacts and adaptation	Engagement	\$\$\$	Good	Somewhat
2-4	Encourage residents to create climate resilient home gardens	Engagement	\$\$	Good	Somewhat
2-5	Enhance existing neighbourhood social resilience programs, including the Spruce Grove Neighbour Network and Block Party Program	Program	\$	Exceptional	None or minor

Climate Change Mitigation:

GHG Emissions, Projections, Reduction
Scenarios

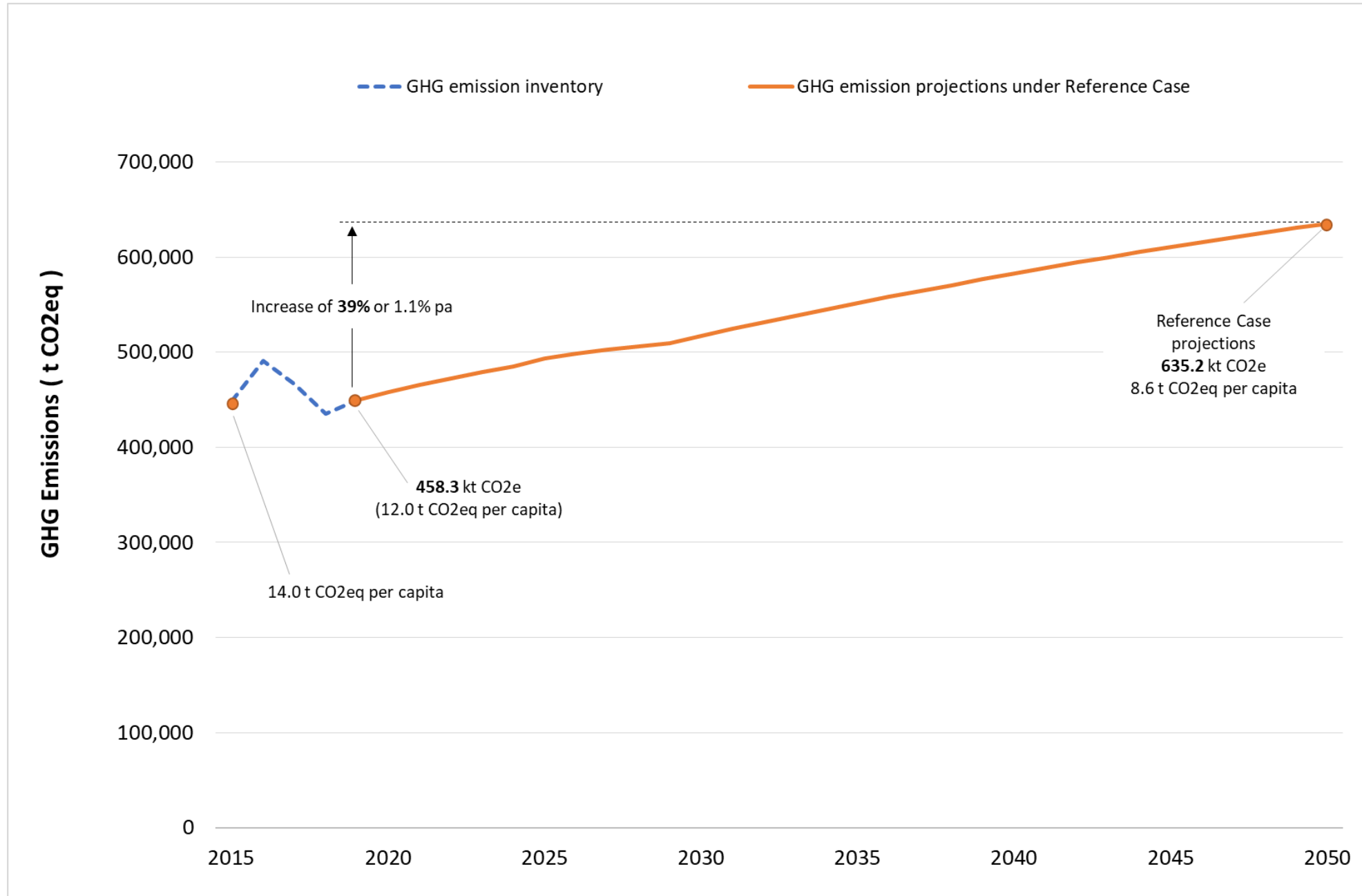
Sources of GHG emissions in Base Year – 2020 inventory



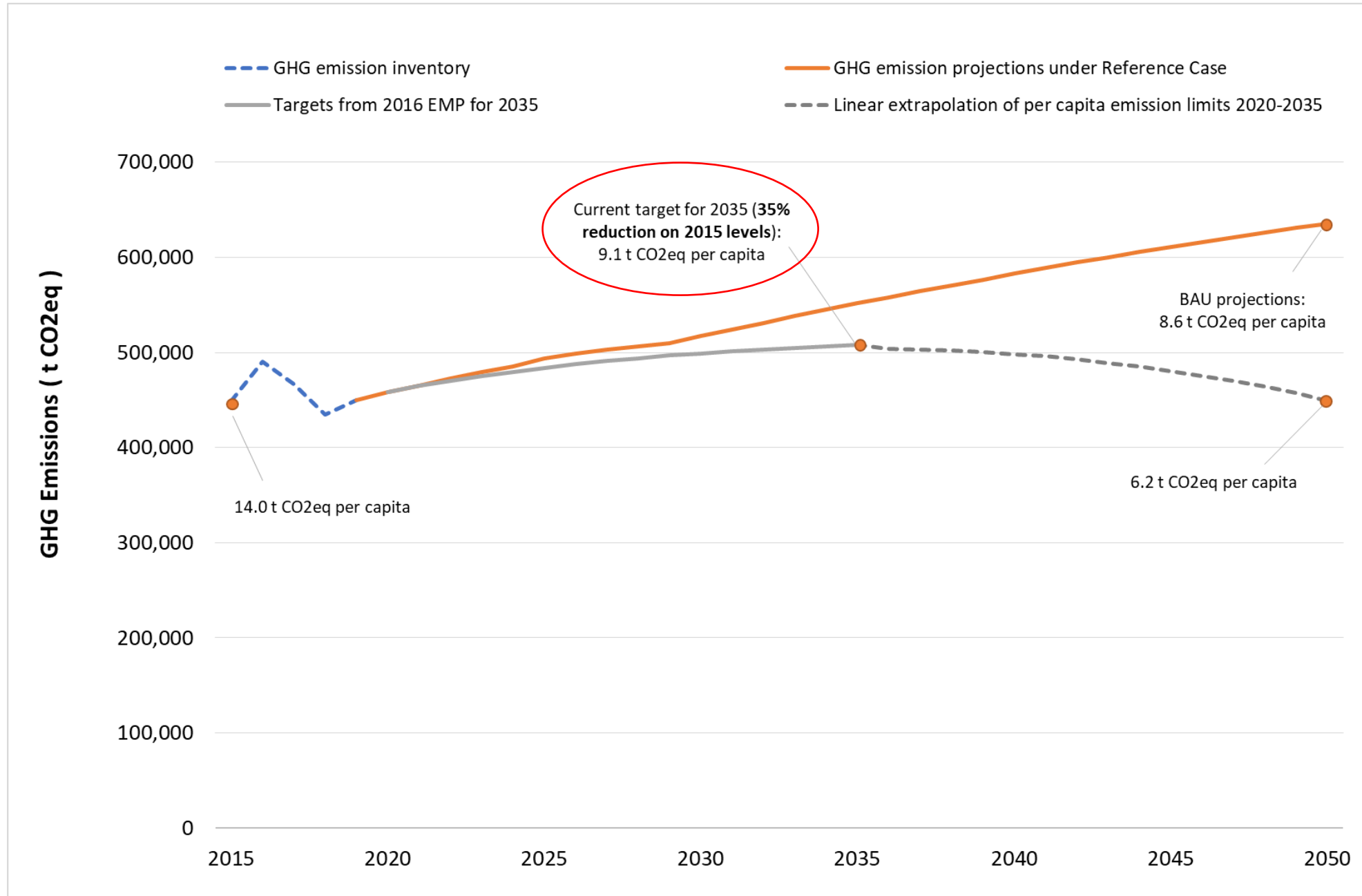
GHG Source Sectors: High to Low

	Sector Name	Description	Estimated City GHG Emissions in 2020
Community	Community Transportation & Land Use	Vehicles	45%
	Homes	Energy use in homes	30%
	Businesses + Industry	Energy use in businesses	21%
	Solid Waste	Landfilled organic waste	3%
Municipality	City Buildings	Energy for city buildings	1%
	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%

Projected GHG emissions for the City – the “Reference Case”



The emission reduction scenarios – 2016 goal

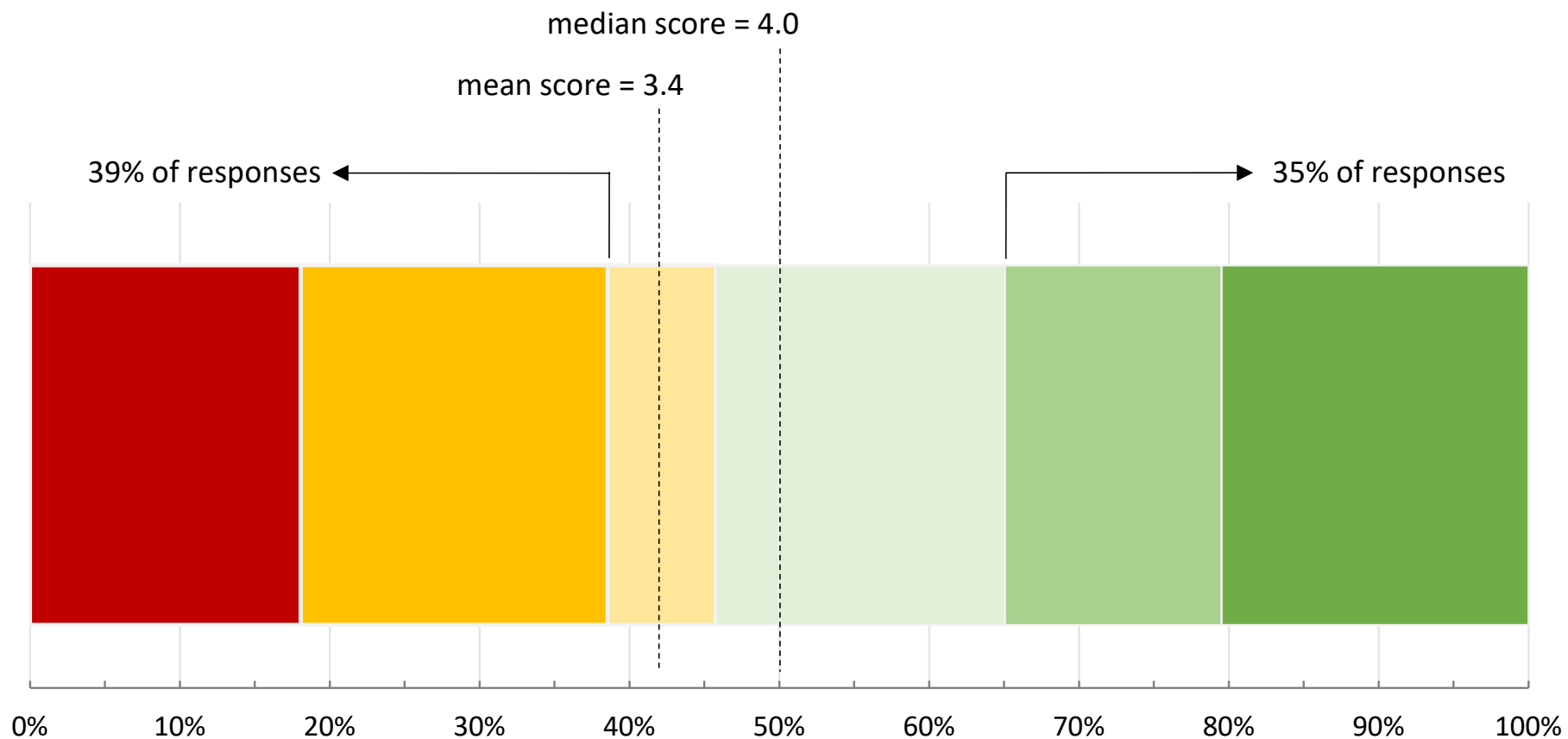


GHG Pathways: What Future Pathway to Aim For? Why?

Determined based on:

- Public engagement
- Discuss with Spruce Grove project manager
- Climate Science
- Principles of Equity
- Consideration of all GHGs produced with Spruce Grove

The emissions reduction scenarios – public opinion



■ Take no additional steps to reduce emissions [1]

■ Be slightly more ambitious [3]

■ Be significantly more ambitious [5]

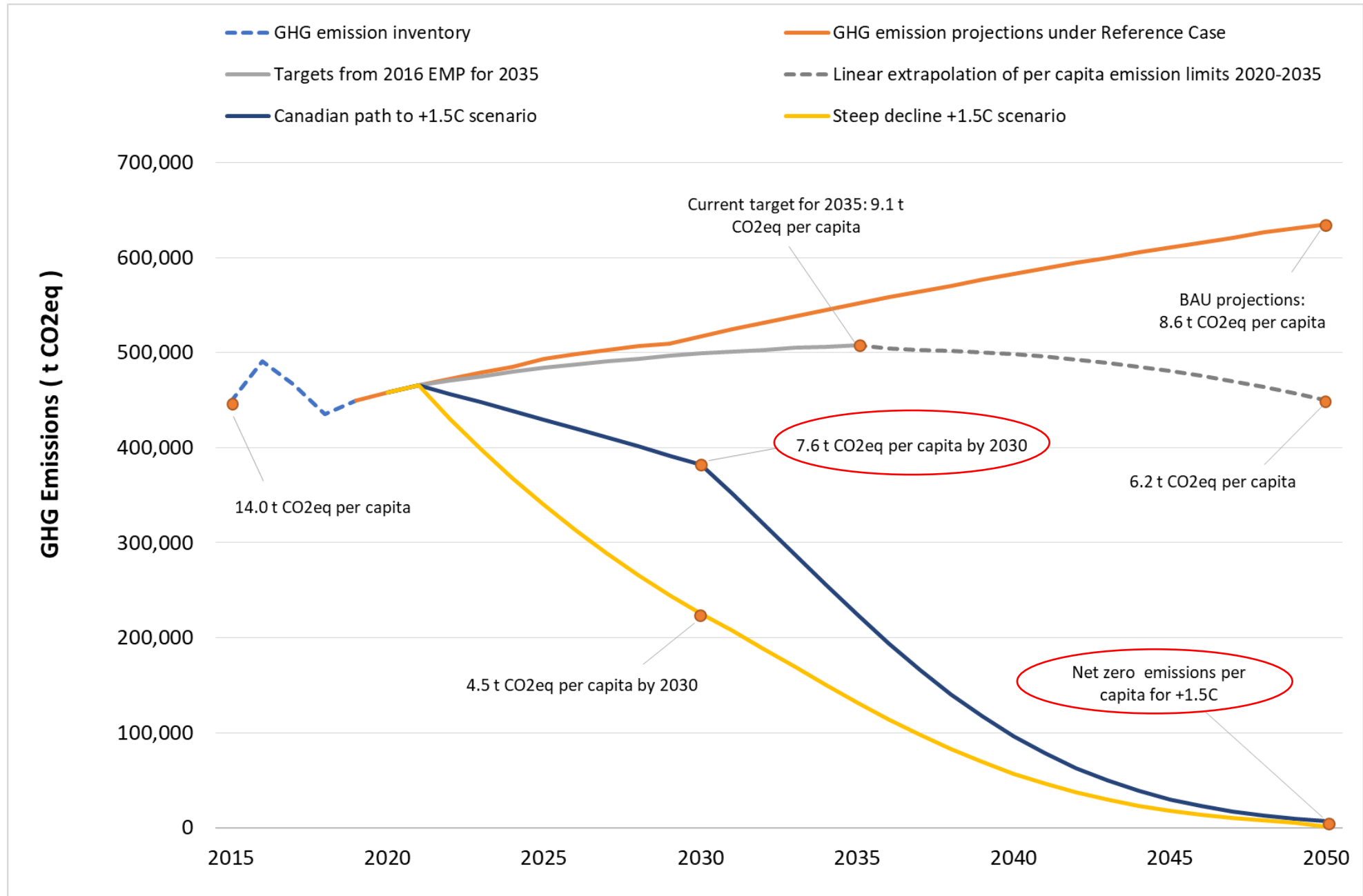
■ Meet our current targets and nothing more [2]

■ Be moderately more ambitious [4]

■ Be very ambitious [6]

n = 83

Emission Reduction Pathways



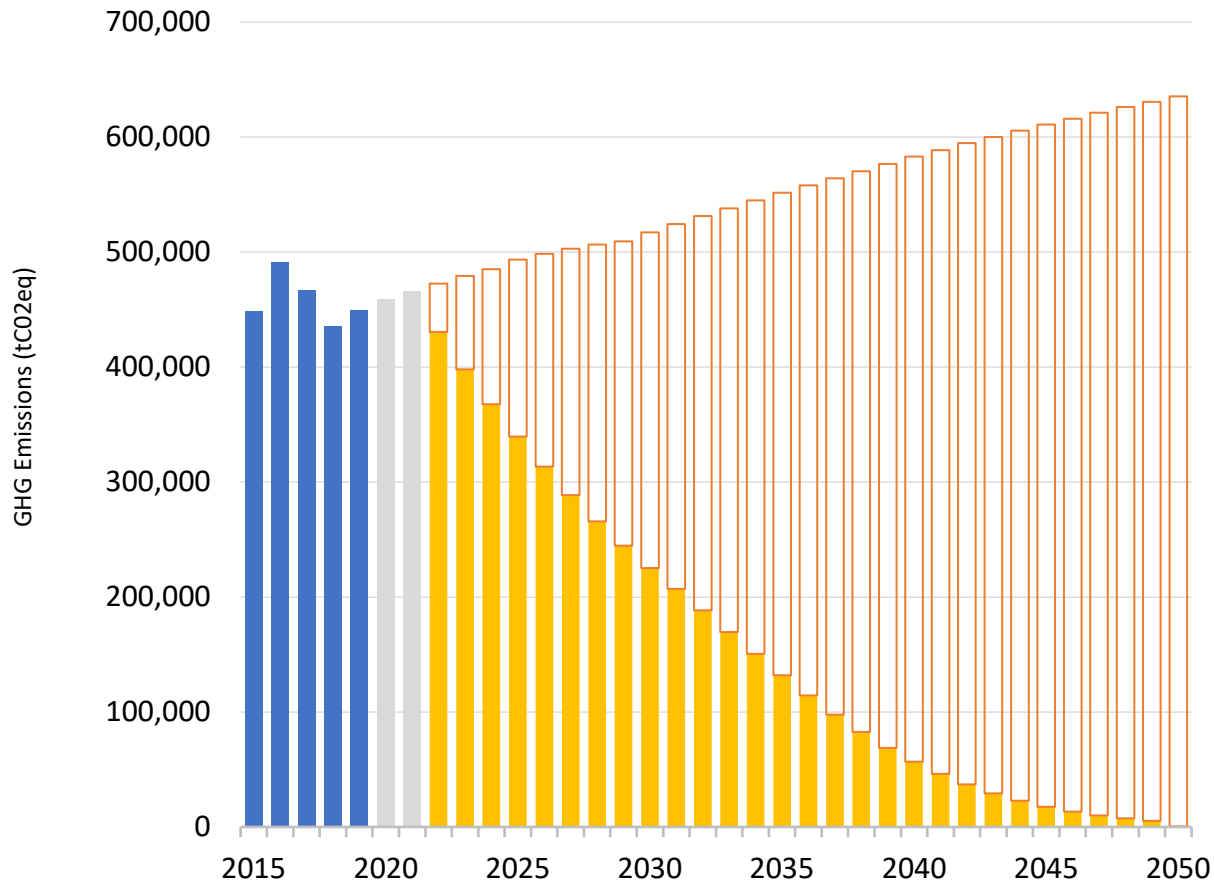
Pathways

Two Suggested Options

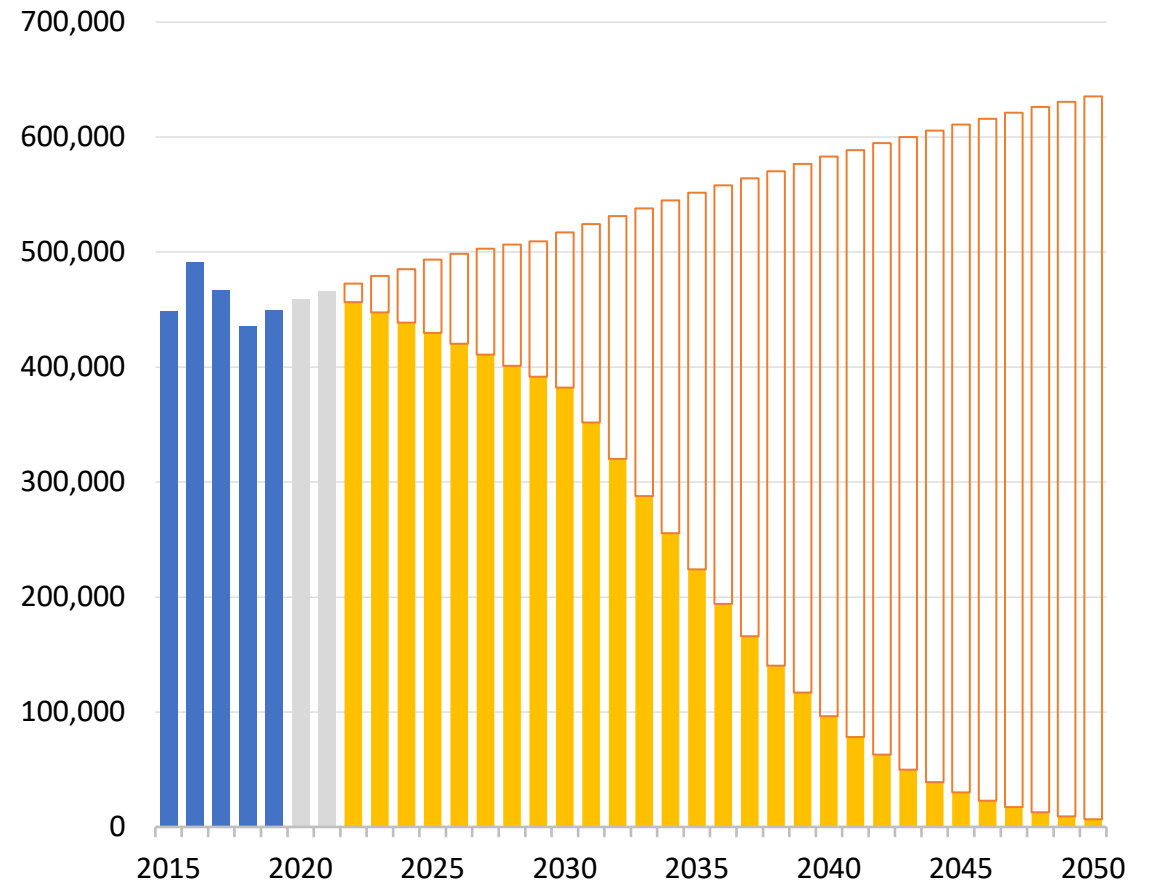
- “Steep Decline” Pathway
- “Canada Pathway”

Pathway Comparison

'Steep Decline' Pathway



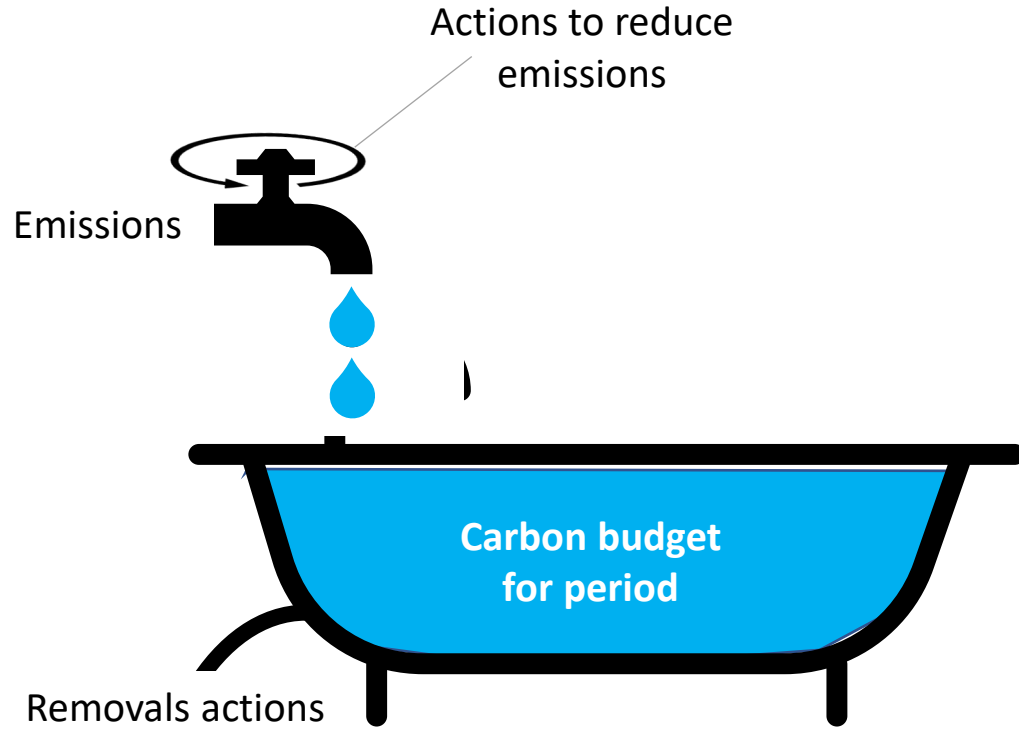
Canada Pathway



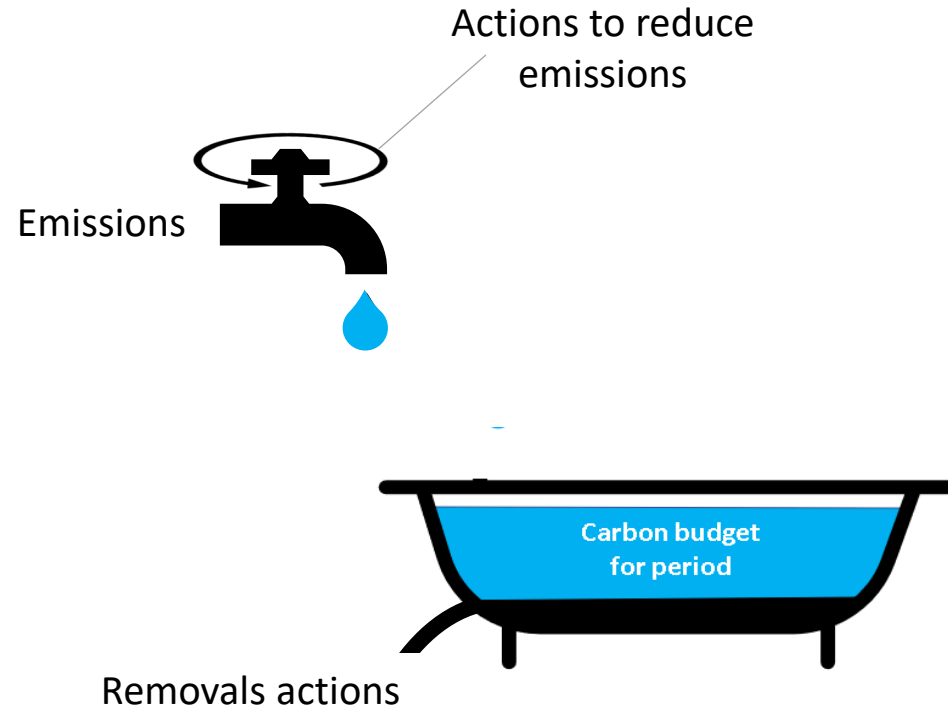
Pathway Comparison

Spruce Grove GHG Pathways	2030	2050
'Business As Usual' tCO ₂ eq/p estimate	10.3	8.6
'Existing City Targets' tCO ₂ eq/p goal	9.1	6.1
'Steep Decline Pathway' tCO ₂ eq/p goal	4.5	0
'Canada Pathway' tCO ₂ eq/p goal	7.6	0

Recommended Pathway Implementation Method: Carbon budgeting approach

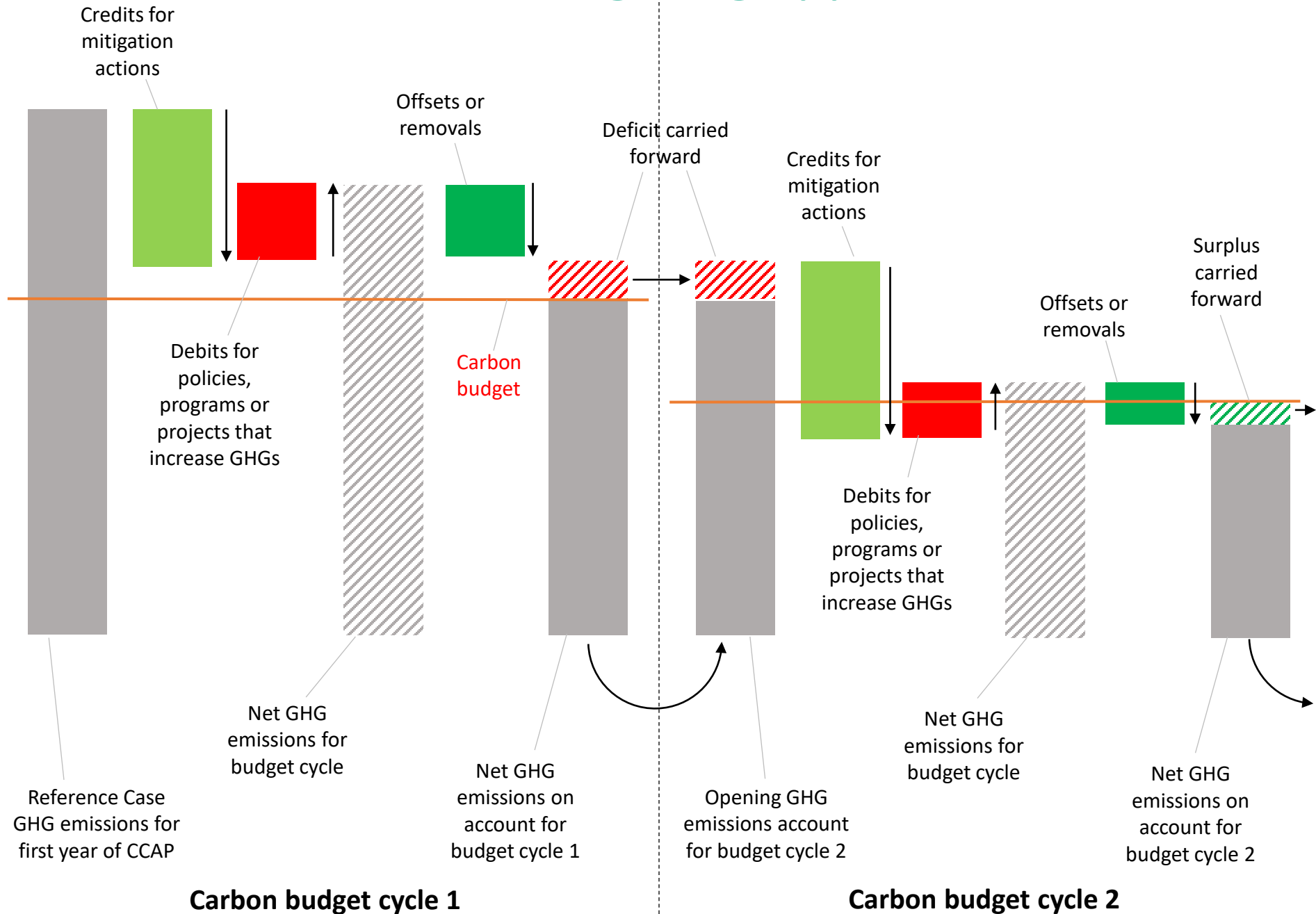


Carbon budget cycle 1

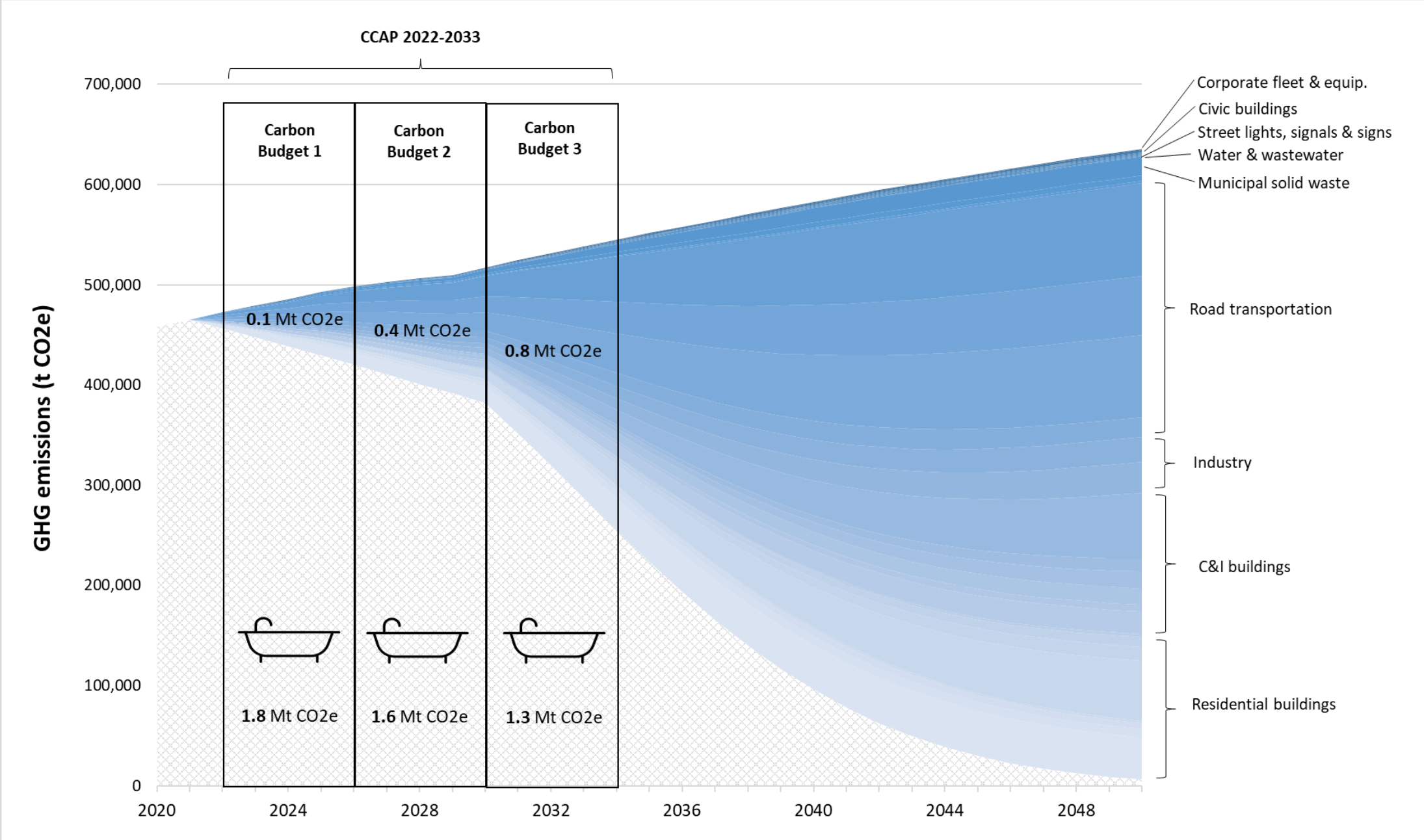


Carbon budget cycle 2
Note: Smaller 'bathtub'

Carbon budgeting approach



Example: 'Canada Pathway'



Pathway Comparison

		“Steep decline”	“Canadian path”
Per capita GHG emissions			
2020	t CO2e	12.0	12.0
End of carbon budget 1 (2022-2025)	t CO2e	7.7	9.7
End of carbon budget 2 (2026-2029)	t CO2e	5.0	8.0
End of carbon budget 3 (2030-2033)	t CO2e	3.2	5.4
Reduction on Reference Case			
Carbon budget 1	%	31	13
Carbon budget 1	%	52	23
Carbon budget 1	%	69	47
Energy cost savings [for ‘corporation’]			
Carbon budget 1	\$ 2020 M	129.8 [1.2]	52.0 [0.5]
Carbon budget 1	\$ 2020 M	318.8 [3.1]	138.6 [1.4]
Carbon budget 1	\$ 2020 M	463.2 [4.5]	740.8 [7.1]

GHG Mitigation Action Steps

Modelling Assumptions:

- Emissions reductions were shared equally across all sources
- Include consideration of
 - public policy adoption rates
 - technical feasibility

GHG Source Sectors

- Community Sectors:
 - Road Transportation
 - Residential
 - Local Businesses
 - Solid Waste
- Corporate Sectors:
 - City buildings
 - City Fleet
 - City Lights & Signs
 - Water and Sewage

Modelling Results:

	Steep Decline				Canada Path			
Summary table information	B1	B2	B3	Total	B1	B2	B3	Total
Emissions Reductions Required	387.7 ktCO2eq	888.9 ktCO2eq	1,300 ktCO2eq	2,576 ktCO2eq	155 ktCO2eq	384 ktCO2eq	757 ktCO2eq	1,300 ktCO2eq
Emissions Reductions Achieved	76.4 ktCO2eq	432.5 ktCO2eq	1,040 ktCO2eq	1,548 ktCO2eq	67.2 ktCO2eq	369 ktCO2eq	896 ktCO2eq	1,330 ktCO2eq
Percentage of required emissions achieved by 2033	20%	49%	80%	<u>60%</u>	43%	96%	118%	<u>102%</u>

Example Results (1): Community Road Transportation

		Steep Decline Path			Canada Path		
Result No.	Objective	Desired outcome By 2033:	GHG Reductions (% of Required <u>Sector</u> Total)*	GHG Reductions (% of Required <u>City</u> Total)*	Desired outcome By 2033:	GHG Reductions (% of Required <u>Sector</u> Total)*	GHG Reductions (% of Required <u>City</u> Total)*
R-T1	Annual reduction in average distances travelled	15% reduction for passenger vehicles and light trucks 2.5% reduction for medium trucks	29%	13%	12% reduction for passenger vehicles and light trucks 2.5% reduction for medium trucks	47%	22%
R-T2	Overall reduction in vehicle ownership	2.5% reduction for passenger vehicles, SUVs, light trucks, medium trucks	10%	5%	2.5% reduction for passenger vehicles, SUVs, light trucks, medium trucks	20%	10%
R-T3	Electricity used in electric vehicles comes from renewable sources	42% of electricity for all hybrid & electric vehicles is renewable	3%	2%	42% for all hybrid & electric vehicles is renewable	7%	3%
R-T4	Shift towards hybrid vehicles	42% for medium trucks	4%	2%	42% for medium trucks	9%	4%
R-T5	Shift towards electric vehicles	32%-39% for all private vehicles	9%	4%	32%-39% for all private vehicles	17%	8%
Total			54%	25%		101%	47%

Ways to Accomplish These Goals

Action No	Action	BCR	GHG Rank (n=73)	CAPEX	OPEX	Equity	Adaptation Benefits
1	Car dealership EV partnerships	1.7	17	<\$25k	<\$10k	Poor	None or minor
2	Promote existing programs to purchase EV	1.7	17	<\$25k	\$10k-\$25k	Fair	None or minor
3	Encourage businesses to promote working from home	1.6	22	<\$25k	<\$10k	Fair	None or minor
4	Improve active transportation infrastructure and culture	1.4	29	>\$500k	\$50k-\$100k	Very good	Significant
5	Increase local transit hours and area covered	1.3	35	\$100k-\$200k	\$50k-\$100k	Exceptional	None or minor
6	EV Education	1.3	35	\$25k-\$100k	\$25k-\$50k	Fair	None or minor
7	Encourage carpooling for commuting	1.2	38	\$25k-\$100k	\$10k-\$25k	Good	None or minor
8	Increase EV infrastructure through policy	1.2	39	\$25k-\$100k	<\$10k	Good	None or minor
9	Encourage EV carshare	1.1	43	<\$25k	\$10k-\$25k	Good	None or minor
10	Lobby for policies and programs to increase replacement of older ICI vehicles	1.1	44	<\$25k	<\$10k	Good	None or minor
11	Encourage EV taxis	1.1	45	<\$25k	<\$10k	Poor	None or minor

Example Results (2): City Fleet

		Steep Decline Path			Canada Path		
Result No.	Objective	Desired outcome By 2033:	GHG Reductions (% of Required <u>Sector</u> Total)*	GHG Reductions (% of Required <u>City</u> Total)*	Desired outcome By 2033:	GHG Reductions (% of Required <u>Sector</u> Total)*	GHG Reductions (% of Required <u>City</u> Total)*
R-F1	Reduction in average vehicle distance travelled	By 1-1.5% per year	9%	<0.1%	No reduction	0	0
R-F2	Improved fuel efficiency in tractors	Annual fuel efficiency improvement of 1.5%	6.3%	<0.1%	No reduction	0	0
R-F3	Incremental reduction of vehicle ownership	Reduction in 1-2 vehicles per vehicle type (passenger vehicle, light truck, medium truck, etc) per year	17%	<0.1%	No reduction	0	0
R-F4	Shift from gasoline and diesel vehicles to plug-in hybrid then full electric vehicles	Incremental shift in vehicle types towards electric vehicles (when available) and hybrid vehicles (when good electric options do not exist)	10%	<0.1%	Incremental shift in vehicle types towards electric vehicles (when available) and hybrid vehicles (when good electric options do not exist)	17%	<0.1%
R-F5	Shift from gasoline and diesel vehicles to full electric vehicles	Incremental shift in vehicles, including local transit buses, off-road construction and tractors/ equipment, towards full electric options	40%	<0.1%	Incremental shift in vehicles, including off-road construction and tractors/ equipment, towards full electric options	77%	0.1%
R-F6	Electricity for hybrid and electric vehicles is renewable	In 2033, shift to 100% renewable energy	15%	<0.1%	In 2033, shift to 50% renewable energy	12%	<0.1%
			97%	0.2%		100%	0.2%

Next Steps

1) Discussion of Results today

Our Question:

Which GHG Mitigation Pathway should the final CCAP focus on:

A) Steep decline B) Canada pathway

2) March 2022:

CCAP Report Finalization

Present CCAP to Council for adoption and potential commitment to the plan

Questions?