

CITY OF LEDUC

Greenhouse Gas Reduction

ACTION PLAN 2020 - 2030



MAY 2019

Acknowledgements

This report was prepared for the City of Leduc by All One Sky Foundation. If you have any questions or comments regarding the information included in this report, please contact:



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Executive Summary

Background

The City of Leduc has shown strong environmental leadership over the past several years through initiatives to keep our environment even cleaner and more biodiverse for many years to come. The City of Leduc has already implemented initiatives that save money and reduce greenhouse gas (GHG) emissions because they make good business sense. The City of Leduc's *GHG Reduction Plan* builds on commitments made in the *Municipal Development Plan (2017)*, the *Environmental Plan (2012)*, and the *Weather and Climate Readiness Plan (2014)*.

This GHG Reduction Plan is the next step in implementing GHG reduction projects that achieve "best bang for buck." It outlines the City of Leduc's commitment to achieve a GHG reduction target and a roadmap on how to achieve it within ten years. The City gathered ideas from the community through surveys, workshops and public information events and materials providing ample opportunity to offer input.

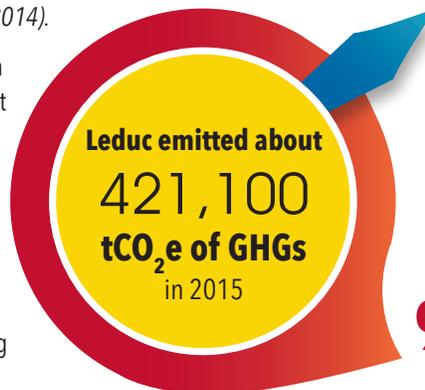
The City of Leduc's GHG Reduction Plan is a made-in-Leduc solution to a global issue. The plan respects unique local priorities, using the lessons learned from established environmental initiatives and others who have tackled similar challenges.

Leduc's GHG Reduction Plan provides a prioritized plan for municipal, community and local residents' actions over the next decade. The plan assigns departmental responsibilities and timelines to ensure accountability to guide progress towards achievement of the GHG reduction target.

The plan, including the GHG reduction target, has been purposefully designed to be pragmatic and responsible, while demonstrating leadership on climate action to inspire residents and businesses to do their part to reduce global GHG emissions. The actions to reduce GHGs are practical, and cost-effective and built with community input.

Inventory

Before a target could be set, an inventory was developed to estimate all of the GHG emissions in the City of Leduc. These are broken down into emissions from activities taken by the broader "community," as well as actions taken by Leduc operations, or the "corporate" emissions. The results of the inventory, using 2015 as a baseline year are below.



4% City of Leduc
(16,400 tCO₂e)

65% COMMERCIAL
(Buildings)

14% STREETLIGHTS

13% FLEET

6% SEWAGE

2% SOLID WASTE

96% Community
(404,700 tCO₂e)

33% COMMERCIAL
(Buildings)

27% RESIDENTIAL
(Buildings)

26% TRANSPORTATION

7% INDUSTRY

7% COMMUNITY

7% SOLID WASTE

By 2030, total community and corporate emissions are projected to rise to 460,740 tonnes of carbon dioxide equivalent (tCO₂e), equivalent to year-on-year average growth of about 0.6% since 2015.

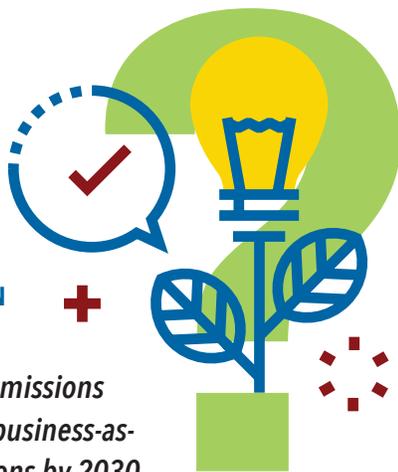
Target

Council, stakeholders and staff agreed early in the process that the future GHG reduction target must be practical, achievable and built from the bottom-up using cost-effective actions as its basis. In other words, the City of Leduc would not endorse a GHG reduction target without a detailed action plan to achieve that target, along with details on the costs and benefits of the actions. Public support for the target and related actions was also imperative for target selection.

Following a detailed engagement process and considering budgetary restraints, Council was presented for their approval an overall GHG reduction target for the City of Leduc.

CITY OF LEDUC GHG REDUCTION TARGET:

**Reduce GHG emissions
by 3% below business-as-
usual projections by 2030.**



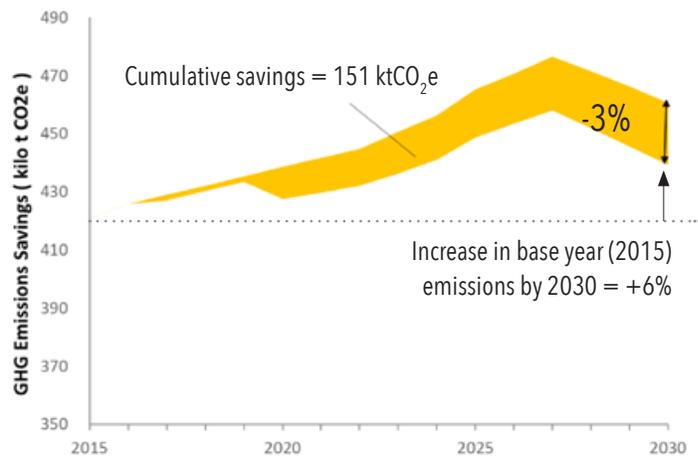
This target can also be described as: 3% above baseline year (2015) emission levels.

Achievement of the City of Leduc GHG reduction target requires actions at both a corporate level and a community level. The corresponding targets are:

- **CORPORATE TARGET:** 20% reduction below business-as-usual by 2030 or at 8% below 2015 levels.
- **COMMUNITY TARGET:** 3% reduction from business-as-usual by 2030 or for emissions at 6% above 2015 levels.

Exhibit 1A

City of Leduc GHG Reduction Target



Note that if all of the actions described in this plan are implemented, (low, medium and high scenarios), the City of Leduc could achieve a **higher target of 9% reduction** below business-as-usual by 2030, or an absolute reduction of 1% below 2015 levels.

If only the low and medium scenario actions are implemented, the city would achieve a 5% reduction below business as usual by 2030, or an absolute reduction of 4% above 2015 levels.

Even though the low scenario target is recommended at this time, due to the fiscal climate, all actions have been retained in the plan to provide the opportunity for City of Leduc to implement them if budget becomes available over the next ten year period. In addition, grants may become available that would enable the City to commit to actions beyond the low scenario. As well, some actions from the medium and high scenarios may be implemented given there is low or no cost to the City of Leduc (e.g. PACE, Organics Diversion Policies and Programs for Businesses and Apartments, Organics Processing Facility). In this case, the City would likely exceed their GHG reduction target of 3%. Progress towards the target will be reviewed annually by City Council.

Community Input

The City of Leduc engaged with the public and key stakeholders to gather their perspectives and input on their GHG Reduction Plan. Engagement activities included:

- communication through a paid print, digital advertising, and a brochure,
- a dedicated section on the Leduc website,
- written feedback through an engagement hub and online survey,
- education and input through a Climate Mitigation Express workshop,
- ongoing input through the Leduc Environmental Advisory Board (LEAB) GHG Reduction Sub-Committee that served as an advisory committee on the plan,
- stakeholder engagement workshop, and
- a public open house.

See *Appendix C* for detailed information on the consultation process and input received.

What We Heard

A majority of public and stakeholders support GHG reduction actions in Leduc. At the public open house no opposition to the GHG Reduction Actions, the target nor the costs was expressed. The display boards showed all actions in this plan, resulting in a 9% target at cost per average Leduc household of \$4 to \$5.50 per year for ten years.

The majority of attendees wanted the plan to go further in reducing GHG emissions. Written comments on the open house survey sheet indicated a majority (83% positive) support for a 9% GHG reduction target, and all actions were supported by the majority.



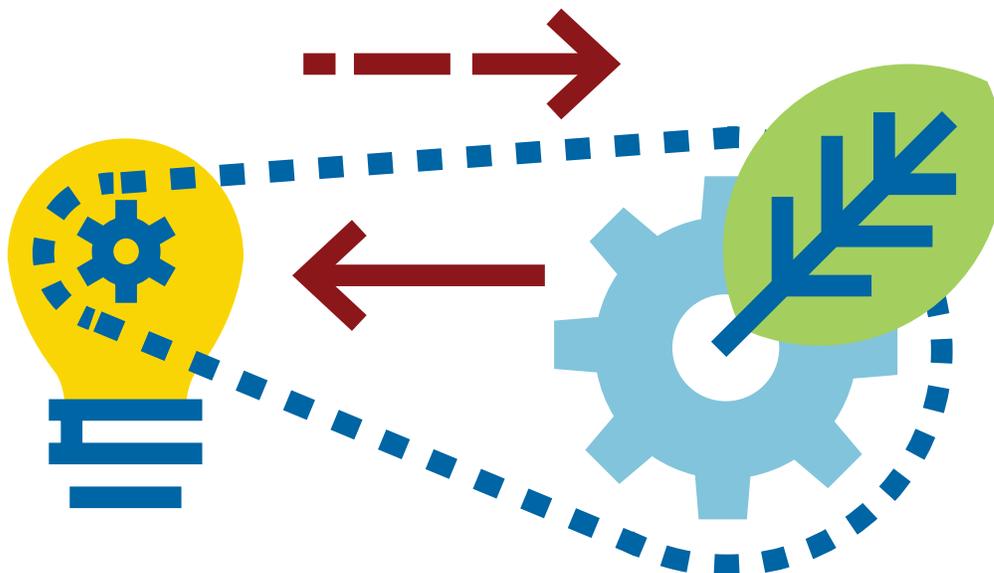
In the detailed survey conducted earlier in the consultation process, the following actions had the highest support:

- **planting trees and preserving natural areas** (93% support action by the City of Leduc as a corporation, and 90% support action by residents and businesses in the community of Leduc),
- **encouraging of composting and recycling** (89% for City action and 87% for community action),
- **improving energy efficiency** (83% and 85%),
- **neighbourhood planning to encourage walking** (75% agree City of Leduc should take action),
- **more walking and biking paths** (71% agree City of Leduc should take action),
- **increased public transportation** (67% agree City of Leduc should take actions),
- **biking or walking more** (71% agree residents and businesses should take action),
- **carpooling** (63% agree the community should take action), and
- **using renewable energy** (54% agree residents and businesses should take action).

Planning Process

Leduc's GHG reduction planning process followed these steps:

1. Generated a **GHG inventory** quantifying emissions from the City (corporate emissions) and the wider community (community emissions) for 2015.
2. Projected a **business-as-usual forecast** of energy and GHG emissions to 2030 assuming no additional GHG reduction action.
3. Studied the **Leduc context** to understand challenges, existing actions and GHG reduction opportunities, and researched work in other regions.
4. Built **vision and guiding principles** to guide the development of the Plan, gathered from a workshop with LEAB members and staff.
5. Created a long list of **potential GHG reduction actions** based on the results of our spring engagement (online survey, engagement hub, and stakeholder Climate Management Express workshop with additional ideas gathered at the staff and stakeholder workshops).
6. **Screened potential actions** through City of Leduc staff and stakeholder meetings.
7. Generated three **GHG reduction scenarios and targets (low, medium and high)** based on actions selected for each scenario.
8. **Evaluated actions** for GHG reduction potential and cost-effectiveness. Any actions that were not deemed cost-effective (benefits did not outweigh the cost) were removed from consideration.
9. Drafted details around the **high, medium and low scenarios, explaining costs and benefits and the associated GHG targets that could be achieved.** These were presented at the open house, posted on-line and sent by direct email to stakeholders.
10. Assessed final feedback from the open house, stakeholders, and final reviews by LEAB, staff and council. Drafted the GHG Plan.
11. **Presented the recommended scenario** to Committee of the Whole and final report to Council April 2019.



Actions

The following actions are included in the City of Leduc's GHG Reduction Action Plan. If all the actions are completed, the city would achieve the GHG reduction target of 9% below business as usual by 2030. However, only the "low" actions are recommended at the time of writing to achieve a 3% target.

The costs are estimated and include both capital and operating. For a detailed breakdown of costs see *Appendix A*.

Note that **Council has not approved all of these costs; all individual actions must go through the regular budget process on an annual basis.**

Actions were only included if benefits outweighed the cost. The benefit-cost ratios (BCR) indicates the relative costs and benefits of an action. These values were established during the modelling process. A BCR of higher than one indicates there is a positive value or benefit of an action over time. For example the BCR for the LED streetlight action of 3.7 means that there are 3.7 times more benefits than costs in the modelling process.

The cost per tonne of carbon dioxide equivalent reduced (\$/tCO₂e) is calculated to demonstrate the average cost over time to reduce one tonne of CO₂e from a project. A negative cost per tonne indicates there are **more** benefits than costs of reducing that one tonne of CO₂e. For example, if installing an LED lightbulb pays back its initial investments before the end of its useful life and brings in additional financial savings – its financial benefits exceed its costs and its cost per tonne is negative \$39/tonne.

Exhibit 1B

Actions by Scenario, GHG Impacts, Estimated Costs

Low Scenario Actions – 3% Target

Action	Start	Capital	Operating	GHG Reductions (tCO ₂ e)
LED Streetlights	2017	No additional costs		21,900
Solar on LRC, Operations Buildings	2017	No additional costs		26,600
Energy Retrofits to City Buildings	2019	Approved in 2019 budget		25,500
Infill/High Density Development Policy	2020	Within existing resources		36,200
Mixed Use Development Policy	2020	Within existing resources		11,500
Biocover for Landfill	2019	LDRWMA		216,300
Garbage Baling	2019	LDRWMA (potential increase in environmental fee)		91,700
Tree Planting	Ongoing	In operational budget		1,595

Medium Scenario Actions - 5% Target

Action	Start	Capital or One-Time	Operating	GHG Reductions (tCO ₂ e)
Create Energy Efficiency Champions	2023	-	\$5K ongoing	2,800
Promote Efficiency and Renewable programs, GHG Education Hub	2020	\$30K over 2 years, \$5K thereafter, and 0.5 FTE in 2020 (\$44K operating and \$6.5K one-time)		13,700
Buy Best in Class New Fleet	2020	Within existing resources		400
Promote Active Transport, Enhanced Transit & U-Pass Marketing	2020	\$50K one time		22,080
Electric Vehicle (EV) Charging Stations & Policy	2026	\$110K one time and \$2-4K thereafter		250
Enhance Commuter Transit	2026	\$600K	\$200K	6,600
Promote Secondary Suites	2023	-	\$10K over 3 years	3,800
Lower Tipping Fees for Organics	2020	LDRWMA (potential increase in environmental fee)		500

High Scenario Actions - 9% Target

Action	Start	Capital	Operating	GHG Reductions (tCO ₂ e)
Green Building Standards for City Buildings	2026	\$50K - \$60K for 5 years, \$5K ongoing		9,600
New Solar for City Buildings	2023	\$728K over 3 years	-	690
Electric Commuter Bus	2026	\$269K one time		350
PACE (Residential & Commercial Buildings)	2020	0.25 - 0.5 FTE - \$22K to \$44K operating plus \$6.5K one-time start up		474,950
Waste Reduction Education for Business & Apartments.	2020	\$30K for 2 years, 0.5 FTE in 2020 business case plus \$44K in operating plus up to \$6.5K in one-time start up costs depending on other staffing		1,015
Organics Diversion Policies & Programs for Business & Apartments	2026	TBD following Waste Reduction Education action		8,975
Variable size cart program	2026	\$300K	\$20K ongoing	5,205
Organics Processing Facility	2026	LDRWMA (potential increase in environmental fee)		51,725

Exhibit 1C

Summary of Key Actions by Sector, GHG Impacts, Cost Effectiveness Results and Implementation Plan with Budget Impacts

Sector	Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
Energy Supply	1. Solar on LRC, Operations Buildings	2017	Facility and Property Services	No additional costs	26,630	1.3	28	Low
	2. New Solar for City Buildings	2023	Facility and Property Services	\$728,000 over 3 yrs	7,450	1.4	18	High
Buildings	1. LED Streetlights	2017	Environmental Services	No additional costs	21,910	3.7	-39	Low
	2. Energy Retrofits to City Buildings	2020	Facility and Property Services	2019 Projects budget	25,450	2.3	9	Low
	3. Promote Efficiency and Renewable Programs, GHG Education Hub	2020	Environmental Services	\$105,000 over 10 yrs plus 0.5 FTE - \$44K plus \$6.5K in one-time start up in the 2020 business case	13,700	1.4	5	Medium
	4. PACE*	2020	Environmental Services	0.25 - 0.5 FTE \$22,000 - \$44,000 ongoing from 2021 plus \$6,500 in one-time start up costs	474,950	1.0	35	High
	5. Create Energy Efficiency Champions	2023	Facility and Property Services	\$40,000 over 8 yrs	2,810	4.8	-36	Medium
	6. Green Building Standard for City	2026	Facility and Property Services	\$297,000 over 5 yrs**	9,600	3.2	-28	High
Transport	1. City to Buy Best-in-Class New Fleet	2020	Facility and Property Services	Within existing resources	400	0	-374	Medium
	2. Promote Active Transportation	2020	Environmental Services	\$25,000 over 1 yr	20,730	101.2	-379	Medium
	3. EV Charging Stations in New Developments	2023	Planning & Development	Within existing resources	250	1.9	-211	Medium
	4. Public Electric Vehicle Charging Stations	2026	Facility and Property Services	\$122,000 over 5 yrs	690	1.4	-88	Medium
Transit	1. Enhanced Transit Marketing	2020	Transportation	\$25,000 over 1 yr	1,380	11.1	-612	Medium
	2. Enhanced Commuter Transit	2026	Transportation	\$1,600,000 over 5 yrs	6,550	1.4	-130	Medium
	3. Electric Commuter Bus	2026	Transportation	\$269,000 over 1 yr	330	1.3	-138	High

Sector	Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
Land Use	1. Infill - High Density Development Policy	2020	Planning & Development	Within existing resources	36,180	0	-235	Low
	2. Mixed-use Development Policy	2020	Planning & Development	Within existing resources	11,480	0		Low
	3. Promote Secondary Suites	2023	Planning & Development	\$10,000 over 3 yrs	3,830	5.0	-40	Medium
	4. Tree Planting & Maintenance	2016	Environmental Services	No new budget required	1,595	9.2	-4,572	Low
Waste	1. Biocover for Landfill	2019	LDRWMA	LDRWMA budget	470,100	17.4	3	Low
	2. Garbage Baling	2019	LDRWMA	LDRWMA potential increase to environmental fee	255,010	3.0	18	Low
	3. Waste Reduction Education for Business & Apartments	2020	Environmental Services	\$30,000 for two years, plus 0.5 FTE - \$44K plus up to \$6.5K in one-time start up depending on other staffing	1,015	0	-61	High
	4. Lower Tipping Fees for Organics	2020	LDRWMA	LDRWMA potential increase to environmental fee	3,740	0	-82	Medium
	5. Organics Diversion Policies & Programs for Business & Apartments	2023	Environmental Services	TBD following waste Action 3	11,390	0	-11	High
	6. Organics Processing Facility	2026	LDRWMA	LDRWMA potential increase to environmental fee	1,100	0	-34	High
	7. Variable Size Cart Program	2026	Environmental Services	\$300,000 & \$20,000 ongoing	4,800	1.6	32	High

* PACE is a program where building owners can finance renewable energy projects (e.g. solar panels) or energy efficiency upgrades (e.g. new windows) through their property tax. The loan remains with the property even through a sale; thus, the term may be extended over 20 years or more. Often, lower interest rates are available. PACE does not affect the borrowing capacity of the property owner. Information on costs for municipalities to administer the program to be determined as the program evolves. In other jurisdictions, administration costs are covered by program participants.

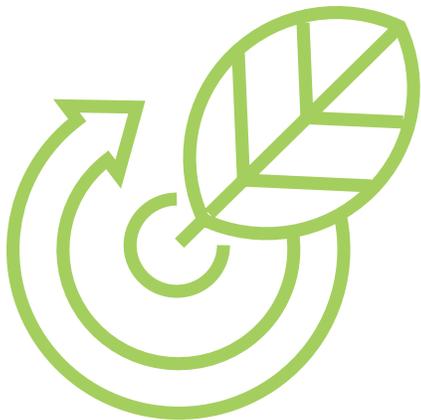
** Depending on Facilities Master Plan, approved budgets and future technological advancements. (e.g. solar costs).

Implementation Costs

Council was presented for approval the 3% reduction target with the corresponding low scenario actions.

In addition, the medium and high scenario actions are incorporated into this plan as a road map for future actions that can be taken as resources become available.

See *Appendix A* for a full breakdown of the expected operational and one-time costs for each action over the period of 2020 through 2030.



1 Introduction

Leduc has shown environmental commitment through initiatives that keep our natural environment healthy and clean for many years to come.

Leduc's environmental initiatives – from waste diversion to enhancing our natural areas – help Leduc achieve the vision set out in the *Leduc Environmental Plan – Phase 1*, approved by Leduc City Council in 2012. That plan outlined an intent to develop a plan to reduce greenhouse gas (GHG) emissions throughout the community.

The City of Leduc has already implemented initiatives that save money and reduce GHG emissions because they make good business sense. This GHG Reduction Action Plan is the next step in implementing GHG reduction projects that achieve “best bang for buck” and establishing a GHG reduction target that can be achieved in ten years. The plan was developed with input from the community through surveys, workshops and public information events and materials.

Leduc's GHG Reduction Action Plan is a made-in-Leduc solution to a global issue. The plan respects Leduc's unique local priorities, using the lessons learned from established environmental initiatives and others who have tackled similar challenges. The foundation for this plan includes:

- commitments made in the City of Leduc's *Municipal Development Plan (2017)* and the *Environmental Plan (2012)*,
- the 10-year *Weather and Climate Readiness Plan (2014)* that highlights adaption measures to prepare for changing local weather impacts,
- a baseline inventory of Leduc's current greenhouse gas emissions, and
- the award of a \$113,600 grant from the Federation of Canadian Municipalities, with assistance from the Government of Canada, to develop the GHG emission reduction plan.



Leduc's GHG Reduction Action Plan provides a prioritized road map for municipal, community and local residents' GHG reduction actions over the next decade. The plan assigns departmental responsibilities and timelines to ensure accountability and help the City meet a GHG reduction target. The plan, including the GHG reduction target, has been purposefully designed to be pragmatic and responsible, while demonstrating leadership on climate action to inspire residents and businesses to do their part to reduce global GHG emissions. The actions to reduce GHGs are practical, cost-effective and built with community input.

Even though the expected costs of each action are outlined in this plan, financial approval has not been provided by Council. Council approved this plan as a roadmap for the actions expected over the next ten years. Financial approval must be sought annually through the regular Council budget processes.



2 Background

2.1 Leduc Context

The City of Leduc is one of the fastest growing cities in Alberta, largely due to its long history as a key hub in Alberta's energy sector. With proximity to Alberta's primary highway, the City of Edmonton, the Edmonton International Airport and two business/industrial parks, Leduc produces a unique GHG profile.

Between 2009 and 2018 the City grew, from 16,967 to 32,448; which is a 4.2% growth rate over 2017 and 91.2% growth since 2006. Growth in the City is expected to continue, reaching about 49,120 by 2035. Residential dwellings are similarly projected to grow from 11,730 in 2016 to about 20,465 (19,650-21,955) by 2035.

Concurrently, this growth will increase demand for energy with potentially significant consequences for GHG emissions, unless action is taken to decouple GHG emissions from economic growth of the City. Judiciously selected and timely actions can promote "green growth" with rising prosperity and falling GHG emissions.



2.2 Partners for Climate Protection Program

The City of Leduc joined the Partners for Climate Protection (PCP) Program through a resolution carried unanimously on June 13, 2016. As a first step to meeting their commitment, the City of Leduc has met Milestone 1 by completing this corporate and community GHG inventory and forecast. The related Corporate and Community GHG Inventory adheres to the PCP Protocol (Canadian Supplement to the International Emissions Analysis Protocol, *Federation of Canadian Municipalities & ICLEI*).

The Partners for Climate Protection (PCP) program supports a network of Canadian municipal governments committed to reducing GHGs. PCP membership covers all provinces and territories and accounts for more than 65% of the Canadian population. The program empowers municipalities to take action against climate change through a five-milestone process that guides members in:

- Milestone 1:** creating a corporate and community GHG inventory,
- Milestone 2:** setting realistic and achievable GHG reduction targets,
- Milestone 3:** developing a local action plan to meet the GHG reduction target(s),
- Milestone 4:** implementing plans using specific, measurable actions to reduce emissions, and
- Milestone 5:** monitoring their results.

To date, approximately 350 municipalities are part of the PCP network and over 180 local climate change action plans have been prepared under the PCP program.

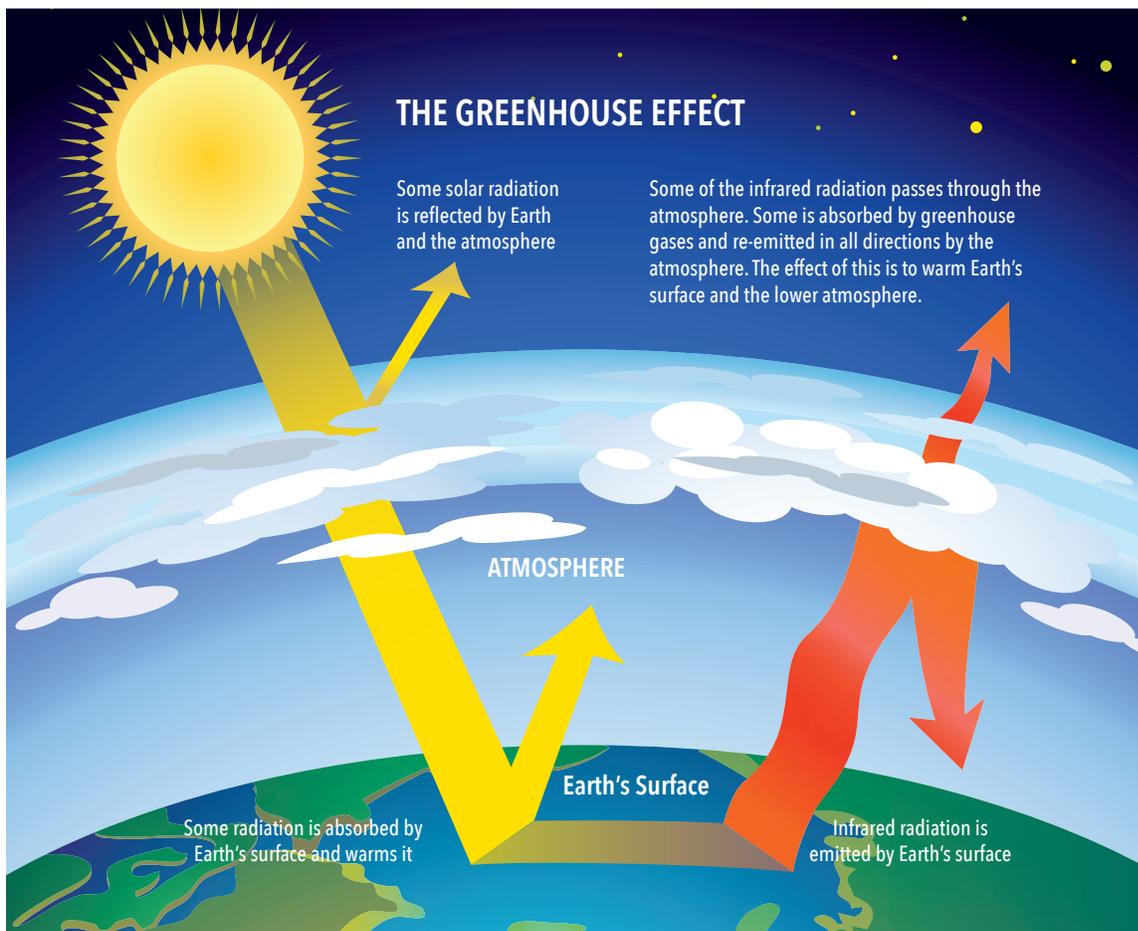
2.3 Understanding Climate Change

Climate change is a long-term shift in weather conditions measured by changes in temperature, precipitation, wind, snow cover and other indicators. It can involve changes in average conditions¹ and in extreme conditions.

Climate change is a result of the expansion of the natural greenhouse effect. Higher GHG concentrations in the atmosphere are amplifying the greenhouse effect and warming the planet, affecting wind patterns, precipitation and storm events. Strong scientific consensus finds that it is extremely likely that humans are causing the climate to change.²

Weather is what you experience when you step outside on a particular day. It is the state of the atmosphere at a certain location in the very short-term. **Climate** is the average of the weather patterns in a location over a longer period of time.³

Climate change does not mean every day or year will be warmer than the previous one. Changes in weather patterns will continue to produce some unusually cold days and nights, and winters and summers, even as the climate warms. There is growing consensus that the frequency and intensity of extreme weather events (such as very hot days, very cold days, or intense precipitation) is likely to increase this century due to rising temperatures.



The wide range of potential climate change impacts, include: increased risk of flooding and drought, increased strain on water resources, more frequent and intense heatwaves, more frequent wildfires and intense storms. In addition, rising temperatures and changing precipitation patterns may increase the risk of certain illnesses and diseases, introduce new invasive species to the region, and result in changes to wildlife habitat. An increase of 2°C above pre-industrial levels risks exceeding natural tipping points such as thawing of large areas of that are expected to cause significant irreversible negative changes in our climate.⁴

Based on the Intergovernmental Panel on Climate Change's (IPCC) latest Special Report, in order to stabilize global warming at less than 2°C it would require unprecedented efforts to cut fossil-fuel use in half in less than 15 years and eliminate their use almost entirely in 30 years. Addressing this monumental challenge requires all levels of government to act – including municipalities. The IPCC also reported that 1.5°C temperature increase could be reached in as little as 11 years and almost certainly within 20 years without major cuts in greenhouse emissions.⁵

Based on the National Round Table modelling, completed in 2012, the economic impact of climate change on Canada, with no mitigation efforts, could reach \$5 billion per year in 2020 and between \$21 and \$43 billion per year in 2050.⁶

2.3.1 Leduc's Climate is Changing

The impacts of climate change and extremes of weather and climate events have the potential to affect every aspect of life in Leduc, including municipal infrastructure and services, private property, the local economy, the natural environment and the health, safety and well-being of Leduc citizens.

Leduc is being impacted by our changing climate. Leduc's mean annual temperature over the past 30 years has increased 2.7°C. Future projections for the Leduc region predict a further increase in mean annual temperature of 2.0°C by the 2050s. Stream flows in the North Saskatchewan River, Leduc's drinking water source, are expected to continue to decline as Alberta glaciers are projected to lose 80-90% of their volume by the end of the century.⁷

2.3.2 Municipalities Addressing Climate Change

Municipalities have an important role to play in reducing their contribution to global GHG emissions to reduce the effects of future climatic changes. In 2009, Federation of Canadian Municipalities (FCM) estimated that municipal governments have direct or indirect control over approximately 44% of Canada's GHG emissions.⁸ With this level of influence, municipal action is important to cost effectively reducing global GHG emissions.



2.3.3 Benefits of Municipal Climate Action

Action to reduce greenhouse gases can be perceived as expensive with negative consequences such as reducing citizens' choices. However, many climate actions can reduce barriers to a better quality of life increasing community livability. Some climate actions can actually save dollars in the long-run through conserved energy, avoided landfilling costs or inexpensive energy generation all without decreasing service levels. Some examples of municipal benefits from climate include:

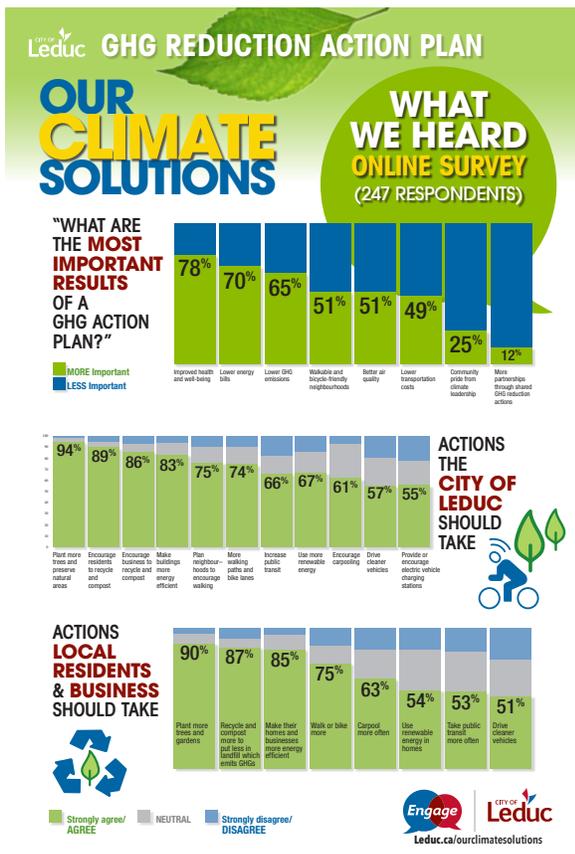
- improving the quality of life for residents (e.g. increased transit enables greater mobility for seniors and low-income residents, and reduces traffic congestion),
- saving communities money (e.g. more efficient municipal buildings reduce utility operational costs in the long run);
- increasing community resilience to potential future regulations (e.g. shielding municipalities and citizens from increases in the carbon levy); and
- fostering a strong sense of community pride (e.g. the community spirit generated by the City of Leduc's rooftop solar projects).

3 Community Input



Development of Leduc’s plan took into account the views of residents, business and community representatives, stakeholder groups, civic staff, City Council and the Leduc Environmental Advisory Board (LEAB).

LEAB assisted the planning team at key points in the planning process and fulfilled the role of community advisor.



The City of Leduc engaged the public and key stakeholders to gather their perspectives and input on their GHG Reduction Action Plan. Engagement activities included:

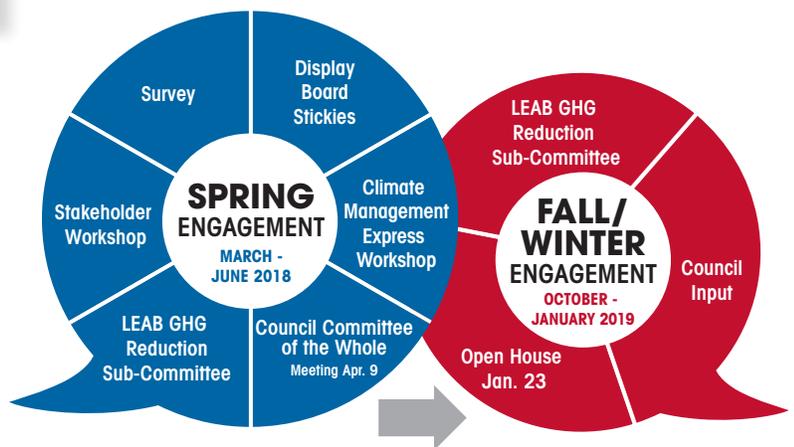
- communication through a paid print, digital advertising, and a brochure,
- a dedicated section on the Leduc website,
- written feedback through an engagement hub and online survey,
- education and input through a Climate Mitigation Express workshop,
- ongoing input through the Leduc Environmental Advisory Board (LEAB) GHG Reduction Sub-Committee, which served as the official advisory committee for the plan,
- stakeholder engagement workshop, and
- a public open house.

EXHIBIT 2

Engagement Process for the GHG Reduction Plan

The following steps provided a transparent process, captured ideas and tested recommendations prior to City Council approval of the plan.

- ENGAGED the Leduc community for plan ideas.
- COMPILED preliminary recommendations.
- PRESENTED preliminary recommendations to the Leduc community for further input.
- DEVELOPED final recommendations and present them to City Council for approval.





3.1 Engagement Overview by the Numbers

Between April 1 and June 5, 2018:

- Our Climate Solutions webpage received 492 views.
- Three Facebook survey promotion posts in April and May collectively reached almost 4,000 people and received 11 likes, 5 shares and 71 post clicks.
- Two Facebook paid advertisements collectively appeared over 95,000 times and received 398 total clicks.
- Leduc's online survey had 247 people respond.
- The Engagement Hub had 94 stickies posted.
- A total of 27 stakeholders from 18 different organizations were invited to attend the stakeholder workshop with 12 stakeholders attending.

In the fall and winter:

- Our Climate Solutions webpage received 223 views with 104 view specific to the Open House.
- Three Facebook open house promotion posts in January collectively reached almost 4,700 people and received 21 likes/shares and 67 post clicks.
- Approximately 50 people attended the open house to present the draft GHG Reduction Action Plan.

Council was also consulted on the GHG Reduction Action Plan and its related engagement and modelling process. In April 2018, Council received a presentation on the plan's modelling and engagement process, as well as the survey, vision and guiding principles. In October 2018, Council reviewed and provided input on the scenarios being modelled and the associated targets and GHG reduction actions.

In early April 2019, Council reviewed final input and the recommended target. Finally, council provided final approval of this City of Leduc GHG Reduction Action Plan on April XX, 2019.

3.2 What We Heard – Survey

Based on the 200+ survey responses received, the top four benefits of a GHG reduction action plan include:

- improved health and well-being (78% rated this result as "more important", that is, 4 or better out of a scale of 8),
- lowering energy bills (70% rated more important),
- lower GHG emissions (65% rated more important), and
- walkable and bicycle-friendly neighbourhoods (51% rated more important).

All proposed City of Leduc GHG reduction actions are supported by the majority of those who responded. The top six City of Leduc GHG reduction actions include:

- planting trees and preserving natural areas (93% of participants agree),
- encouraging of composting and recycling by residents and businesses (over 89-86% of participants agree),
- improving energy efficiency (83% agree),
- neighbourhood planning to encourage walking (75% agree),
- more walking and biking paths (71% agree), and
- increased public transportation (67% agree).

All resident and business GHG reduction actions listed are supported by the majority of those who responded. The top six resident and business GHG reduction actions include:

- planting trees and preserving natural areas (90% agree),
- composting and recycling (87% agree),
- improving energy efficiency (85% agree),
- biking or walking more (71% agree),
- carpooling (63% agree), and
- using renewable energy (54% agree).



3.3 What We Heard – Stakeholder Workshop

Overall the feedback from the stakeholder workshop was positive as they supported the majority of GHG reduction actions proposed. The following additional action items were suggested:

- a waste management program that collects organics from businesses,
- education on the benefits of walk and transit-oriented development,
- enhance transit service so it is accessible for Leduc, Leduc Industrial, Nisku and Edmonton,
- continue to enhance and plan for multi-use trails,
- pursue anti-idling through City leadership, bylaws and signage,
- consider solar carports, and
- consider the introduction of biodigesters.

3.4 Public Open House

Support of the GHG Reduction Plan and a desire to take actions further emanated from input at the public open house. Through the public open house evaluation forms and in conversation with the facilitators, no opposition to the GHG Reduction Action Plan was expressed. The majority of comments requested the City strengthen the actions to further reduce GHG emissions.

Based on the evaluation forms, 83% of attendees supported the 9% GHG reduction target with the remaining responses (17%) supporting the 5% reduction target. These numbers should be treated with caution as only 12 attendees filled out the evaluation forms.



3.5 Simultaneous Engagements

While Leduc was engaging in their GHG reduction planning process, a parallel process called “Engage Leduc” was taking place. The City of Leduc was renewing its Community Vision and Four-Year Strategic Plan. As part of the planning process, the City reached out to engage with the community and listen to their needs, wants, hopes and dreams for the future of Leduc. Several GHG reduction related themes were predominant during the Engage Leduc process. In general, Leduc residents expressed support of the following issues:

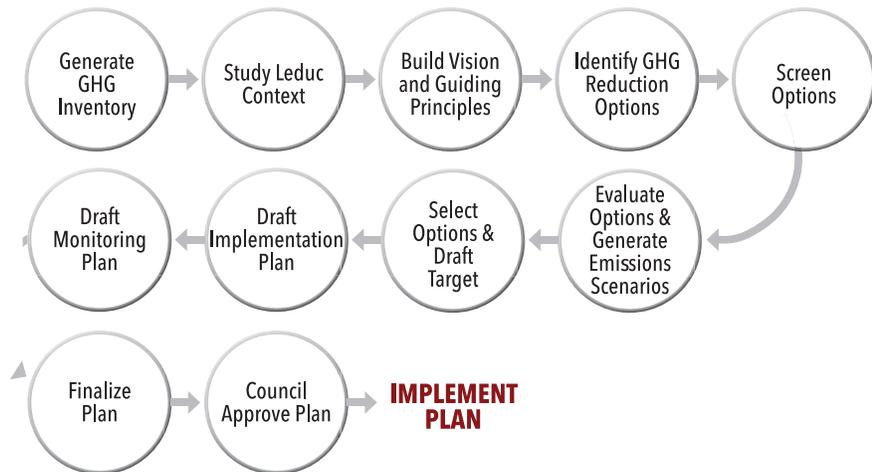
- transit,
- parks and pathways,
- reducing GHG emissions,
- reducing waste, composting and recycling,
- renewable energy sources,
- reducing urban sprawl, and
- inward growth.



4 GHG Reduction Planning Process

Exhibit 3

City of Leduc GHG Reduction Planning Process



From concept to final plan, the City of Leduc undertook an eleven-step process to gather input, write and finalize our GHG Reduction Action Plan. Part of this planning process involved the consultant team using their Community Inventory and Economic Analysis Tool (CI-EAT) to generate Leduc's GHG inventory and forecast, and to quantify the costs and benefits of potential GHG reduction actions. Leduc's GHG reduction planning process followed these steps.

- Generated a **GHG inventory** quantifying emissions from the City (corporate emissions) and the wider community (community emissions) for 2015.
Factors considered: energy prices and use, population, GDP, number and size of buildings, travel modes, number of vehicles, fuel economy, vehicle kilometres travelled, waste sent to landfill and other local landfill factors etc.
- Projected a **business-as-usual forecast** of energy and GHG emissions to 2030 assuming no additional GHG reduction action.
Factors considered: predicted trends in population, GHG emissions, the economy, etc.
- Studied the **Leduc context** to understand challenges, existing actions and GHG reduction opportunities, and researched work in other regions.
- Built **vision and guiding principles** to guide the development of the plan, gathered from a workshop with LEAB members and staff.
- Created a long list of **potential GHG reduction actions** based on the results of our spring engagement (online survey, engagement hub and stakeholder Climate Management Express workshop with additional ideas gathered at the staff and stakeholder workshops).
- Screened potential actions** through City of Leduc staff and stakeholder meetings.
- Generated three **GHG reduction scenarios and targets (low, medium and high)** based on actions selected for each scenario.
- Evaluated actions** for GHG reduction potential and cost-effectiveness. Any actions that were not deemed cost-effective (benefits did not outweigh the cost) were removed from consideration.
- Drafted details around the **high, medium and low scenarios, explaining costs and benefits and the associated GHG targets that could be achieved**. These were presented at the open house, posted on-line and sent by direct email to stakeholders.
Factors considered: energy inputs and outputs of actions, social cost of carbon, energy prices over time, capital and re-occurring costs, cost of landfilling, cost of organics processing etc.
- Assessed final feedback from the open house, stakeholders, and final review by LEAB, staff and council. **Drafted the GHG Reduction Action Plan.**
- Presented** the recommended scenario to Committee of the Whole and final report to Council by May 2019.

5

Vision & Guiding Principles



5.1 Our Climate Solutions: Vision 2030

Leduc is a cleaner and healthier community with reduced energy consumption, less waste generation and lower costs as a result of their GHG reduction actions. Residents, council and staff have a common understanding of how they are influencing the climate and are taking local action to address the global issue of climate change.

Leduc is collaborating with nearby municipalities and all levels of government to leverage efforts to reduce GHG emissions.

Sector-specific elements of Our Climate Solutions Vision can be found in section 7 GHG Reduction Actions under each specific sector's title.

5.2 Principles

Development of Leduc's GHG Reduction Plan has been guided by principles that were developed by staff and stakeholders. These principles will also continue to guide plan implementation over the next ten years.

- **LEADING BY EXAMPLE** –

The City of Leduc will demonstrate leadership by reducing GHG emissions from their own facilities and operations.

- **COMMUNITY-WIDE EFFORT** –

A variety of stakeholders and residents are included in efforts to reduce GHG emissions throughout the community.

- **BEST BANG FOR BUCK** –

Actions are cost-effective as they reduce the maximum amount of GHG emissions considering the ease of influence, costs and staff time.

- **BALANCED APPROACH** –

Some initiatives will be innovative, based on leading edge thinking and action, while others will be chosen based on their proven track record of results.

- **REALISTIC TIMEFRAME** –

A relative balance is struck between short, medium, and long-term opportunities.

- **MADE IN LEDUC** –

Actions are reflective of Leduc priorities and culture.



6 Inventory

The City of Leduc's 2015 Greenhouse Gas Inventory calculates GHG emissions including carbon dioxide (CO₂), methane and nitrous oxide coming from the City of Leduc and the Leduc community. The GHGs are summarized into a standard unit – tonnes of carbon dioxide equivalent (tCO₂e). Corporate and community inventories are an important part of developing a municipal GHG Reduction Plan.

A municipal GHG inventory:

- reveals which sectors and/or operations use the most energy and emit the most GHG emissions indicating where to focus GHG reduction efforts,
- helps municipalities track where dollars are spent on energy and carbon potentially revealing cost savings opportunities through energy conservation and efficiency efforts,
- provides a reference point enabling energy and emissions tracking over time. This baseline data will be used to compare future inventories against and to measure progress when monitoring the effectiveness of this GHG Reduction Plan, and
- enables a municipality to access provincial and federal funds by demonstrating commitment to planning for GHG reduction efforts.

6.1 Inventory Results

6.1.1 Community and Corporate GHG Emissions

The City of Leduc emitted approximately 0.42 megatonnes (Mt), or 420,000 tonnes of GHG emissions (tCO₂e) in 2015. Corporate GHG emissions represent 4% of the total, whereas community GHG emissions constitute 96% (*Exhibit 4*). The majority of GHG emissions are from the commercial and institutional (buildings) sector (34%), followed by: residential (26%), transportation (25%), solid waste (7%), and industrial (7%)¹¹ (*Exhibit 5*).

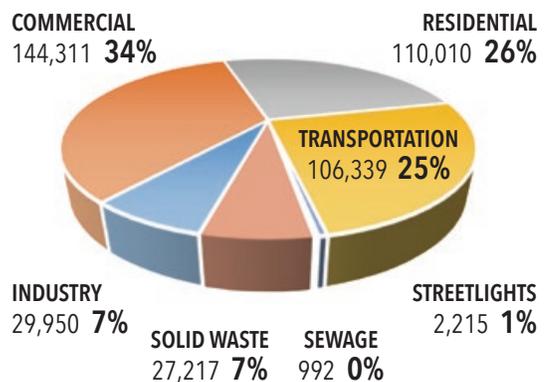
Exhibit 4

2015 Community and Corporate GHG Emissions (tCO₂e) Comparison



Exhibit 5

Community and Corporate GHG Emissions (tCO₂e), by Source Sector

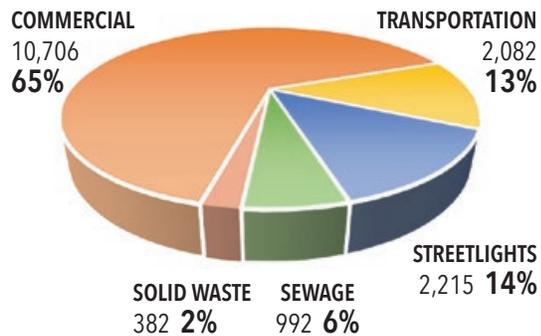


6.1.2 Corporate GHG Emissions

Total corporate GHG emissions for the City of Leduc's corporate inventory were 16,377 tCO₂e. The majority of GHG emissions, 65%, are generated by buildings (*Exhibit 6*). Streetlights contribute 14%, fleet contributes 13% and sewage contributes 6% to the total corporate GHG emissions. Finally, waste represents only 2% of Leduc's corporate GHG emissions.

Exhibit 6

2015 Corporate GHG Emissions (tCO₂e), by Source Sector

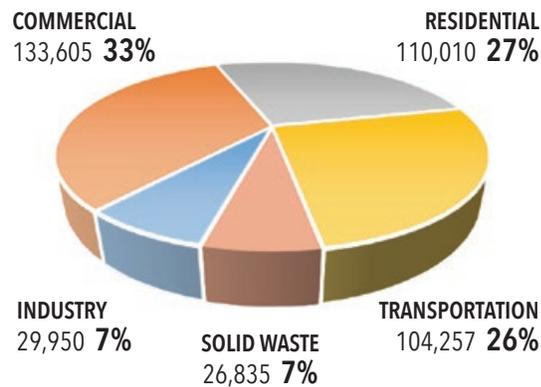


6.1.3 Community GHG Emissions

Total community GHG emissions in the City of Leduc in 2015 were approximately 404,658 tCO₂e. Just over one-third (33%) total GHG emissions are sourced from energy consumption by commercial buildings (*Exhibit 7*). Energy use by residential dwellings and transportation represent the next largest sources of total GHG emissions, accounting for 27% and 26% of the total, respectively. Solid waste and industrial emissions both contribute 7%.

Exhibit 7

2015 Total Community GHG Emissions (tCO₂e), by Source Sector



6.1.4 GHG Emissions Forecast

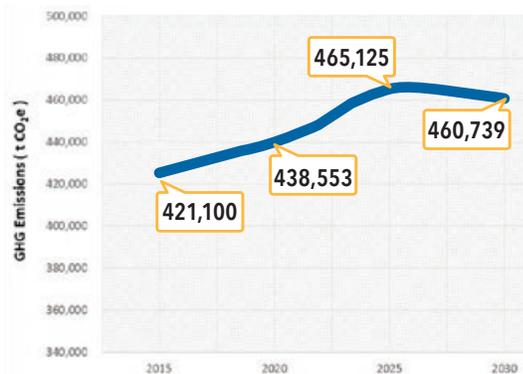
By 2030, Leduc's total GHG emissions are projected to rise to 460,740 tCO₂e; equivalent to year-on-year average growth of about 0.6% since 2015 (*Exhibit 8*).

Between 2015 and 2030 the population of the City of Leduc is projected to increase from about 29,300 to 43,330. That is equivalent to an annual average compound growth rate of +2.6%. Hence, total GHG emissions are projected to grow at a slower rate than the population - somewhat decoupling from population growth from GHG emissions. This decoupling is partly the result of reductions in the GHG intensity of the provincial electricity grid.

Our assumption is that corporate and community emissions will increase at the same moderate rate of +0.6%. Based on this assumption, business-as-usual corporate emissions will grow to over 18 ktCO₂e by 2030.

Exhibit 8

Projected City of Leduc GHG Emissions (tCO₂e), 2015-2030





7 GHG Reduction Actions

Our plan focuses on actions within a 10-year timeframe – 2020-2030. However, being an action-oriented municipality, Leduc had already implemented several significant actions that made sense from both an economic and environmental perspective including solar installations, conversion to LED streetlights and organics diversion. To ensure the emissions reductions from those previous actions are accounted for in the GHG inventory, and to recognize these early efforts, significant GHG reduction actions between 2016 and 2019 have also been quantified and included in this plan.

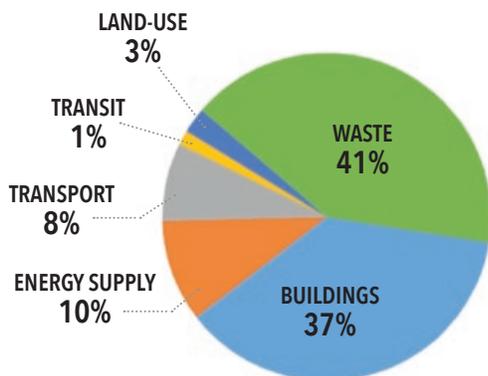
Leduc's GHG emission reduction plan enables the City to meet a GHG reduction target by assigning responsibilities and timelines to GHG reduction actions. The proposed actions are:

- practical,
- cost effective,
- built with community and stakeholder input,
- reduce GHGs, and
- result in benefits such as energy or fuel cost savings, or other community and social benefits.

Cumulative GHG emissions reductions between 2020 and 2030 reach approximately 277,000 tCO₂e for actions modelled in this plan. Under the high scenario, lifetime emission reductions reach approximately 554,000 tCO₂e or about 120,000 cars off the road for a year. Most of the emission reductions are in the waste and buildings sectors (41% and 37% respectively).

Exhibit 9

Cumulative GHG Emissions Savings by Sector, 2020-2030
Based on high scenario (9% reduction)



A “wedge” diagram outlines emission reduction actions as “wedges” or “slices” that collectively contribute to meeting a specific target.¹² The size and shape of each wedge can indicate the relative contribution overtime from each action or sector.

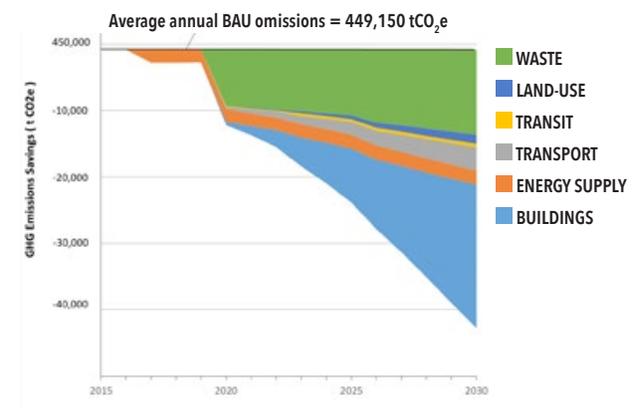
Transforming the City of Leduc's GHG emission reduction plan into a wedges diagram demonstrates the relative contribution of each sector over time (*Exhibit 10*). The importance of waste- and building-related actions is apparent. The steep triangle nature of the building-related wedge indicates consistent uptake overtime can grow the resulting GHG impacts from actions.

Two main economic outputs were used to gauge the cost effective of each GHG reduction actions:

- Benefit-cost ratios (BCR) indicates the relative costs and benefits of an action. A BCR of higher than one indicates there is a positive value or benefit of an action over time.
- Cost per tonne of carbon reduced (\$/tCO₂e) is calculated to demonstrate the average cost over time to reduce one tonne of CO₂e from a project.¹³ A negative cost per tonne indicates there are more benefits than costs of reducing that one tonne of CO₂e. For example, if installing an LED lightbulb pays back its initial investments before the end of its useful life and brings in additional financial savings – its financial benefits exceed its costs and its cost per tonne would be negative.

Exhibit 10

GHG Emission Reductions by Sector to 2030
Based on high scenario (9% reduction)





Energy Supply ACTIONS

7.1 Energy Supply Actions

Alberta's grid-based electricity generation has the highest GHG emissions factor of any Canadian province and six times greater than the Canadian average.¹⁴ This factor results in high GHG emissions associated with Alberta's buildings. As a result, electricity generated from building-based renewable sources (otherwise known as distributed generation) in Alberta can have a significant impact on GHG emissions. Distributed generation in targeted locations can also defer or avoid electricity distribution infrastructure investments thereby reducing utility costs for all ratepayers.

Alberta currently has the best photovoltaic (PV) incentives in the country. Leduc has already begun to take advantage of these with the installation of solar arrays on the LRC and Operations Building.

District energy involves transferring heating and cooling between buildings using less energy or cleaner energy than if individual buildings had their own boilers and/or chillers. The technology has environmental benefits when natural gas heat can be delivered more efficiently and/or renewable or waste energy sources can be incorporated more easily than by having them on individual buildings or connected to the grid.

ENERGY SUPPLY VISION

The City of Leduc has reduced its GHG impact and energy costs generating renewable and clean energy production from its operations.

It has inspired the wider community to adopt more renewable and clean energy generation.

ACTIONS

Some building actions also address issues that relate to energy supply. For efficiency, they were only included in the building section of this plan.

LOW SCENARIO

- SOLAR ON LRC, OPERATIONS BUILDINGS – Install solar on the Leduc Recreational Centre and the Operations building. – Completed¹⁵**

Leduc Recreation Centre and City Operations Building currently have 5,622 photovoltaic solar panels on their roofs. Between the two buildings total installed capacity is 1.77 MW. At the time of installation, the LRC solar array was the largest rooftop system in Western Canada.

HIGH SCENARIO

2. **NEW SOLAR FOR CITY BUILDINGS – Install more renewable energy units on city owned and operated buildings and facilities.**

Leduc is looking to install more photovoltaic (PV) panels on their existing buildings. PV installations on new buildings are included in Building Action 6 – Green Building Standard for City, which

recommends all new buildings cover 50% of their electricity requirements by solar panels on the building. The recommendation here is for the City to install additional 500 kW over the next ten years, on an existing or a new building.

Exhibit 11 outlines the GHG impacts, cost effectiveness results, and implementation plan for the main energy supply GHG reduction actions.

Exhibit 11

ENERGY SUPPLY ACTIONS

Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
1. Solar on LRC, Operations Buildings	2017	Facility and Property Services	No additional costs	26,630	1.3	28	Low
2. New Solar for City Buildings	2023	Facility and Property Services	\$728,000 over 3 yrs	7,450	1.4	18	High

POTENTIAL ACTIONS FOR FUTURE CONSIDERATION

Energy supply-related GHG reduction actions 3-5 have not had their impacts quantified due to a higher level of uncertainty of their direct GHG reduction impacts. Given less certainty around the cost-effectiveness, these will be considered by City of Leduc as other resources become available. Nevertheless, these actions have been deemed as important to remove barriers or support other actions.

3. **Explore modifying permitting process to streamline the process of applying and inspecting solar PV and solar thermal systems.**

The City of Leduc will explore the potential for a solar combo permit to streamline the process of installing PV and solar thermal systems. Currently, building and electrical permits are covered under the safety code, and the development permits are covered under the land use bylaw. Structural, weight/loading and electrical issues must all be considered with rooftop solar systems to ensure safety and efficacy of the system.

4. **District Energy – Determine whether it is cost effective for the City to pursue district energy.**

The City of Leduc will continue to explore opportunities to pursue district energy including where to build and what type of system. The waste heat potential at the West Campus Recreation Centre may provide an interesting opportunity for district energy application.

5. **Encourage Solar Ready Residential Buildings – Encourage new buildings to be solar ready.**

Developers/builders will be encouraged to build solar ready homes. These homes are wired for PV panels but potentially also include the plumbing for solar thermal water heating. Materials and a checklist will be provided to developers/buildings. This could be combined with Buildings Action 8 – Sustainability Checklist.



Buildings ACTIONS

7.2 Buildings Actions

A building can last 50 to 100 years (and more) so energy efficient construction and retrofits could influence GHG emissions for a long period of time.¹⁶

Energy efficiency costs are paid for by energy savings over time. After paying off initial investments, the City, individuals or businesses begin to save money through the energy savings. This is why energy efficiency actions in this report are associated with a negative cost per tonne of CO₂e reduced. In other words, Leduc can save money in the long-run by reducing GHGs through their energy efficiency actions.

Reducing energy consumption in City-owned buildings and other infrastructure allows savings from energy costs to be redeployed to other priorities, including other climate mitigation actions, after the initial capital investments have been paid off.

Buildings are the most significant source of Leduc's GHG emissions; they make up 67% of community and 65% of corporate inventory, and 37% of Leduc's proposed GHG reduction target.

Both provincial and municipal governments have a role in managing emissions from the building sector. Provincial governments can use utility rates and/or environmental charges to pay for energy efficiency programs. They have the clear legislative authority to improve the building code¹⁷, and can reduce the GHG intensity of the grid by incenting more renewable energy. These are key policy levers to reduce GHG emissions from buildings.

Municipalities have direct control over their own buildings and infrastructure. Municipalities also ensure adherence to the building code which also offers a unique point of contact to influence new buildings and renovations prior to their commencement.

BUILDINGS VISION

Leduc's corporate and community buildings are highly efficient, maximize the use of renewable energy, and are designed – to maximize use of solar energy, thereby reducing costs and increasing comfort.

ACTIONS

Actions to reduce GHG emissions in municipal buildings are in direct control of the City and hence are often cost effective and have very predictable GHG reduction results.

LOW SCENARIO

1. **LED STREETLIGHTS – Replace all streetlights with LED bulbs.** – Completed^{18 19}

In 2017, the City of Leduc's energy distribution company, Fortis Alberta, replaced all streetlights in Leduc with LED bulbs. Not only does this reduce GHG emissions, LED streetlights provide a wide consistent light pattern that ultimately results in better, safer lighting. LEDs have a much longer operating life reducing replacement costs of bulbs and the maintenance required to replace them. The light is controlled and focused downward reducing light pollution such as light trespass into homes, impacts on wildlife, and skyglow (which prevents us from seeing stars at night).



LOW SCENARIO

2. **ENERGY RETROFITS TO CITY BUILDINGS – Establish an implementation plan for energy efficient retrofits of existing buildings.**

The City of Leduc has already engaged a firm to undertake a comprehensive building renewal and energy performance program. The project will start in 2019 with an energy audit of all City facilities and preparation of a 10 year plan to conduct energy efficiency retrofits to lighting, heating, insulation, etc. in various City facilities. Monitoring and verification of savings, and building occupant maintenance training will also be part of the Plan.

The assumptions in this model were based on 10-20 actions in existing city buildings including lighting and building automation system recommissioning and installation across facilities, a new roof on part of the Leduc Recreation Centre along with new electrical demand rate and service feed retrofit, variable speed pumping for pools and ice plant heat recovery.

MEDIUM SCENARIO

3. **PROMOTE EFFICIENCY AND RENEWABLE PROGRAMS, GHG EDUCATION HUB – Promote existing programs that provide support for energy efficiency improvements to buildings.**

Energy Efficiency Alberta offers a suite of energy efficiency programs involving financial incentives for installation of energy efficient technologies, energy savings studies/audits and on-site energy managers. Their programs are offered to residential, business, non-profit and industrial sectors. Promoting these programs through the City of Leduc's communication channels could inexpensively increase the uptake in these programs – improving their energy efficiency of buildings in Leduc and reduce related GHG emissions.



HIGH SCENARIO

4. **PASS A BYLAW to allow Clean Energy Improvement Financing / Property Assessed Clean Energy (PACE) in Leduc.**

PACE is a financing opportunity for energy efficiency and renewable energy upgrades repaid as a charge on the property tax bill. The loan remains with the property even through a sale thus, the term may be extended over twenty years or more and often lower interest rates are available.

A made-in-Alberta approach to PACE is the Clean Energy Improvement Program administered by Energy Efficiency Alberta (EEA). To launch the program in their jurisdiction, the City of Leduc must adopt an enabling bylaw. The City of Leduc has agreed to submit an Expression of Interest to PACE Alberta confirming the City of Leduc's interest in having a PACE program delivered to its constituents when it becomes available in Alberta.



Property Assessed Clean Energy (PACE)

PACE is similar to local improvement taxes that have been used for upgrades such as sidewalks and sewers, but in this case the repayment is based on an upgrade to a single property. Because PACE is typically in the senior lien position (takes priority over more "junior" debt), the loan is seen to be secure and lower interest rates can be offered and the term may be extended over twenty years or more. Longer terms lessens monthly payment costs allowing more projects to be cash flow positive enabling comprehensive retrofits with significant energy savings.

The reason PACE financing was created was to overcome a classic barrier to energy efficiency – uncertainty whether a property owner will own a property long enough to recoup their costs through energy savings.

Financing approvals are simplified as underwriting is centered on the property and well-known cost-effective upgrades, therefore some onerous conditions are avoided such as corporate financials, personal guarantees, equity investments etc.

PACE does not affect the borrowing capacity of the property owner. As property tax payments and obligations are not capitalized, they do not result in additional debt. Because there are no negative effects on the property owner's cash flow or earnings and borrowing capacity can be used for core business investments (as opposed to clean energy investments).

Because PACE is included on the property tax assessments, municipalities have an administrative role to play. Additional costs can be covered through an interest adder on the loan. Municipalities usually have to adopt a bylaw to enable PACE within their jurisdiction.



MEDIUM SCENARIO

5. **CREATE ENERGY EFFICIENCY CHAMPIONS**
- Develop and implement an education program for City staff to increase energy saving behaviours at work and create staff energy efficiency champions.

The City of Leduc will implement an energy conservation behaviour program to reduce GHG emissions from City operations. The GHG reductions modelled in this plan are based on a study of five commercial sector staff behavioural energy conservation program, which showed energy savings of at least 4% from programs, depending on specific characteristics. The programs combined visible support from upper management with multiple communication modes sending an array of messages to staff. Peer champions used engagement techniques including feedback, peer influence, competition, and rewards.²⁰

HIGH SCENARIO

6. **GREEN BUILDING STANDARD FOR NEW CITY BUILDINGS** - Require all new city buildings to meet an energy efficiency or green building standard.

By 2026, the City of Leduc will establish an energy saving standard that all new City owned municipal buildings will meet. Energy standards for City buildings demonstrates to the public commitment to cost effectiveness and the environment. A formal standard ensures this commitment will continue into the future even if staff turnover occurs.

The standard will be written directly into request for proposals (RFP) when the City design and constructs new buildings. The standard will define an appropriate payback period for the proposed energy efficiency and/or renewable energy measures (e.g. 15 years) and a specific energy savings goal (e.g. 20% improvement in energy savings).

In this report, the modelling assumptions were that as of 2026, all new buildings would:

- achieve a 20% improvement in energy efficiency over business-as-usual design; and
- 50% of all electricity requirements would be covered by solar panels on the building.

Programs that reduce GHG emissions from other commercial and residential buildings can have a high impact, given the number of buildings they have the potential to influence.

Exhibit 12 outlines the GHG impacts, cost effectiveness results, and implementation plan for the main building-related GHG reduction actions.

Exhibit 12

BUILDING ACTIONS

Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenarios
1. LED Streetlights	2017	Environmental Services	No additional costs	21,910	3.7	-39	Low
2. Energy Retrofits to City Buildings	2020	Facility and Property Services	2019 Projects budget	25,450	2.3	9	Low
3. Promote Efficiency and Renewable Programs, GHG Education Hub	2020	Environmental Services	\$30,000 over two years and \$5,000 thereafter, plus 0.5 FTE - \$44K plus \$6.5K in one-time start up in the 2020 business case	13,700	1.4	5	Medium
4. PACE	2020	Environmental Services	0.25 - 0.5 FTE \$22,000 - \$44,000 ongoing from 2021 plus \$6,500 in-one time start up costs	474,950	1.0	35	High
5. Create Energy Efficiency Champions	2023	Facility and Property Services	\$40,000 over 8 yrs	2,810	4.8	-36	Medium
6. Green Building Standard for New City Buildings	2026	Facility and Property Services	\$297,000 over 5 yrs ²¹	9,600	3.2	-28	High

POTENTIAL ACTIONS FOR FUTURE CONSIDERATION

Building-related GHG reduction actions 7-10 have not had their impacts quantified due to a higher level of uncertainty of their direct GHG reduction impacts, however they still have been deemed important to remove barriers or support other actions. Given less certainty around the cost-effectiveness, these will be considered by City of Leduc as other resources become available.



7. **BYLAW, POLICY AND PROCESS REVIEW – Review and amend Bylaws, policies, and processes to remove barriers and promote renewable energy, maximize use of solar energy and more energy efficient buildings.**

Leduc will undertake a review to ensure their bylaws do not inadvertently impose barriers, restrictions or penalties on homes and buildings that introduce “beyond code” energy efficient features and/or renewable energy units.

A more energy efficient home can face the following issues:

- building projections to provide passive solar shading can require greater setbacks from property lines,
- highly energy efficient walls can be significantly thicker, again, which can require greater setbacks from property lines, and/or can reduce usable space in the home, and
- roof-top renewable energy units can require homes to be reduced in height depending on bylaw requirements.

Therefore, some examples of bylaw amendments could include:

- relax maximum height requirements,²²
- calculate “build-to-lines” from the *outer wall*,²³
- measure floor area from the *inner wall*,²⁴
- amend height and floor area ratios,²⁵
- allow building projections for passive solar shading to project into the required yard, and
- a consideration of solar rights to enable light penetration and photovoltaic panel efficacy.

Non-financial incentives could be considered, such as:

- density bonuses for redevelopment for advanced energy efficiency and renewable energy features,
- prioritize permit applications for buildings that meet certain standards, and
- make energy efficiency/renewable energy information readily and easily available.

8. **SUSTAINABILITY CHECKLIST – Introduce a (voluntary) sustainability checklist for new developments.**

As part of permit applications for subdivisions, developments and building permits, a sustainability checklist would be provided to developers. The goal is to increase awareness of GHG reduction actions and other sustainability related features that are possible when building. The list could act as a tool to engage in dialogue with applicants on sustainable building practices.

Filling out the checklist would be voluntary but it could also be linked to provision of non-financial incentives to encourage these practices.

9. **INCREASE STAFF CAPACITY TO PROMOTE GREEN BUILDING – Increase capacity of city staff to promote green building development.**

Increasing staff understanding of energy efficient/renewable building features through training and education can increase understanding in the building and development community. The permit and building inspection process for retrofits and new buildings provide an excellent opportunity for City of Leduc staff to interface with the community on these issues.

10. **SOLAR -READY CITY BUILDINGS – All new City of Leduc buildings will be “solar ready”.**

By 2026, all new City of Leduc buildings will be PV solar ready. PV solar ready buildings have the wiring and structure to ensure ease of installation of PV panels post-construction.





Transportation ACTIONS

7.3 Transportation Actions

Transportation GHG emissions contribute 26% of Leduc's community GHG emissions and 13% of the corporate GHG inventory. Transportation and transit actions constitute 8% of the GHG reductions under the high scenario.

In 2016, commuting to work in a private vehicle constituted 91% of travel with only 6% of those travelling as passengers; in other words, 94% of Leduc commuters travel in single occupancy vehicles (SOVs). Only 3 percent of Leduc commuters walked or biked to work. (Statistics Canada, 2017).

Transportation GHG emissions can be reduced by:

- avoiding vehicle trips by walking, biking, telecommuting, etc.,
- reducing GHG emissions by taking public transit, ridesharing, carsharing, buying a more efficient vehicle, and
- switching to less GHG-intensive fuels such as electric vehicles (EVs).

To change transportation habits, a range of policies/programs should be introduced:

- **PROVIDE ALTERNATIVES** – people need to be provided with a safe, viable alternative to single occupancy vehicle travel.
- **EDUCATE AND INCENT ALTERNATIVES** – citizens need to be aware of and motivated to choose alternative transportation modes. Financial and non-financial incentives make it faster, less expensive, and/or easier to choose alternatives.
- **DISCOURAGE SOVS** – higher costs and longer travel times can discourage SOV use.

Traffic and roadway management strategies such as high-occupancy vehicles (HOV)/bus lanes can provide strong incentive to carpool or use transit during congestion periods. They can also increase commuting time by reducing the amount of roadway available to SOVs. Parking fees or limiting parking availability result in a higher financial and time costs providing further motivation to seek SOV alternatives.



Sidewalks and good walking/biking trails/bike lanes will increase active transportation by making it safer, easier and more pleasant. Viable active transportation routes have been shown to increase active transportation and improve resident quality of life. Municipalities can enhance active transportation by:

- expanding and enhancing trails and sidewalks,
- increasing snow clearing of trails and sidewalks,
- identifying and enhancing bike routes by making high traffic areas safer for bikers (e.g. designated bike lanes),
- connecting public transit into active transportation routes,
- establishing and/or enhancing biking supportive infrastructure such as bike racks, and
- providing education/marketing materials such as walking and biking maps and campaigns to shift transportation habits.

E-bikes (bikes with electric assist) have been shown to generate more trips, longer trips and different types of bicycle trips. The ability to ride further and faster with less effort, carry more cargo or children, overcome hills, and feel safer can address multiple barriers to biking (MacArthur, 2018).

Municipalities have a role to play in encouraging the purchase of electric vehicles by helping ensure charging infrastructure must be in place in multi-family dwellings and at city parking facilities.

Transit is outlined in its own section starting on page 24.

TRANSPORTATION VISION

Residents feel safe and motivated to use Leduc's expansive and convenient biking and walking routes for day to day transportation. Citizens avoid idling and are driving more fuel efficient and electric vehicles, as there is sufficient charging infrastructure throughout the City. The fuel used and GHG emissions per kilometre travelled is reduced due to a more efficient and electrified fleet.

ACTIONS

MEDIUM SCENARIO

1. **CITY TO BUY BEST-IN CLASS NEW FLEET - Add fuel efficiency/GHG intensity to Procurement Manual list.**

City of Leduc fleet staff are already motivated to conserve fuel and purchase more efficient/less emitting vehicles. To take further action, they will add fuel efficiency/GHG considerations to their Procurement Manual list. This action ensures the City will consider these factors in vehicle purchases and becomes part of relevant Requests for Proposals. A sustainability clause already exists in the Procurement Manual but these additional criteria will ensure GHG emission reductions are considered.

MEDIUM SCENARIO

2. **PROMOTE ACTIVE TRANSPORTATION - Develop and implement an education campaign to promote active transportation.**

The City of Leduc already promotes Clean Air Day by offering free transit and undertakes the Commuter Challenge. They will build on these promotions and provide an education campaign on low GHG forms of transportation. This action will be connected to Transit Action 1 - Enhanced Marketing for Transit.

Best practice campaigns have seen a significant reduction in GHG emission. Kelowna's Active Transportation Program (smartTRIPS) used community-based social marketing (CBSM) concepts to encourage active transportation. They saw a decrease of 10 to 20% in vehicle-kilometres travel (VKT) by and increase the use of active transportation modes by 10 to 20%.

E-bike promotion should be considered as an element to such a campaign given it is a newer technology that may not have been included in past projects.



MEDIUM SCENARIO

3. **EV CHARGING STATIONS IN NEW DEVELOPMENTS - Develop and implement electric vehicle policy for new developments to require electric vehicle charging infrastructure.**

Bylaws to require EV charging stations in new multi-family dwellings, mixed use buildings and parking building will ensure this vehicle choice is more available to all residents. The policy could be structured to require that developers include a certain ratio of level two charging stations in all new City developments.

MEDIUM SCENARIO

4. **PUBLIC ELECTRIC VEHICLE CHARGING STATIONS - Introduce City-owned charging stations for electric vehicles**

The City of Leduc will install electric vehicle charging stations at key public services buildings. As electric vehicles gain market share and the GHG intensity of electricity declines overtime, municipal contribution to EV infrastructure is becoming more important. Installation of EV charging stations could be undertaken by any level of government but it makes sense to offer these charging stations at municipal facilities. Provincial or federal government grants may be required to provide sufficient funding to install the charging stations.

Exhibit 13 outlines the GHG impacts, cost effectiveness results, and implementation plan for the main transportation GHG reduction actions.

Exhibit 13

TRANSPORTATION ACTIONS

Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
1. City to Buy Best-in Class New Fleet	2020	Facility and Property Services	Within existing resources	400	0	-374	Medium
2. Promote Active Transportation	2020	Environmental Services	\$25,000 over 1 yr	20,730	101.2	-379	Medium
3. EV Charging Stations in New Developments	2023	Planning & Development	Within existing resources	250	1.9	-211	Medium
4. Public Electric Vehicle Charging Stations	2026	Facility and Property Services	\$122,000 over 5 yrs	690	1.4	-88	Medium



POTENTIAL ACTIONS FOR FUTURE CONSIDERATION

Transportation-related GHG reduction actions 5-7 have not had their impacts quantified due to a higher level of uncertainty of their direct GHG reduction impacts. Given less certainty around the cost-effectiveness, these will be considered by City of Leduc as other resources become available. Nevertheless, these actions have been deemed as important to remove barriers or support other actions.

- 5. **EARLY FLEET RETIREMENT – Add a criterion to the list of fleet retirement criteria to consider retiring high fuel use vehicles before fuel efficient vehicles when appropriate considering their function.**

When prioritizing which vehicles should be retired, GHG emissions will become a key factor under consideration. Retiring a higher emitting vehicle early enables the use of a less emitting vehicle resulting in GHG reductions.

- 6. **LOW EMISSION VEHICLE MAINTENANCE – Establish vehicle maintenance policies and operating (driving) guidelines that reduce energy consumption.**

The City of Leduc will ensure their vehicle maintenance policies and operating guidelines will reduce energy consumption whenever feasible.

- 7. **UPDATE WALK AND BIKE-ABILITY REVIEW – Update the review of Leduc’s walk and bike-ability considering barriers, best practices, and infrastructure enhancements.**

Leduc already uses multiways as key connectors for pedestrians and cyclists. They are founded on the principles of access, safety and continuity. The City has over 48 km of primary multiways, separated from traffic and cleared of snow in the winter, with complimentary secondary and tertiary routes.

Building on past initiatives such as the Multiway Map and the Walkable Alberta Leduc Community Report, the City of Leduc will review current walking and biking corridors for gaps and barriers. It will identify future infrastructure enhancements (e.g. bike lanes on roadways) and make a plan for their upgrade.

Best practices should be used as a guide to address Leduc specific issues. Every Leduc Area Structure Plan (ASP) for new developments outlines an arterial and collector pathway along it. It is older areas in the City that may require retrofitting. This action will identify and fill in gaps.

Communication of safety and conductivity improvements could take place through the active transportation education campaign (see *Transportation Action 2 – Promote Active Transportation*).





7.4 Transit Actions

Public transit brings multiple benefits to a community including:

- reduced air and GHG emissions,
- enhanced citizen mobility options, especially for adolescents and senior citizens,
- decreased congestion,
- increased road safety,
- consumer savings,
- increased potential for physical activity, and
- enhanced economic activity.

Thus, there are many reasons to pursue public transit beyond GHG reductions.

To reduce GHG emissions, transit planners must design routes that maintain moderate to high ridership. Passenger numbers must be high enough to take multiple vehicles off the road, considering a traditional bus generates more GHG emissions than one passenger vehicle. Electric buses can alleviate GHG concerns from low ridership transit but low fare revenue would be limit the cost effectiveness.

TRANSIT VISION

Citizens are moving out of their cars and into Leduc's fast, convenient and low GHG transit thereby saving them money and increasing their mobility. The City has bus stops within 400 meters of the majority of residences. The fuel used and GHG emissions per kilometre travelled are reduced due to a more efficient and/or electrified fleet.

ACTIONS

This plan considered expanded transit from a GHG reduction perspective only. Expanded transit beyond these actions may be desirable for other reasons including mobility, equity, economic development and traffic congestion alleviation.

While many transit actions were modelled, it is the actions included in this plan that were deemed cost effective and achieve GHG emission reductions. If fares were adjusted or ridership proves higher than historic trends, further enhanced transit on existing routes and/or new routes could be justified from a cost effectiveness perspective.

MEDIUM SCENARIO

1. **ENHANCED TRANSIT MARKETING – More resources will be directed towards marketing Leduc’s existing transit.**

Connected to transport action – Active Transportation Education Campaign, the City of Leduc will increase Leduc Transit marketing to increase boardings. Part of these efforts should include marketing the U-Pass to graduating grade 12 students and their parents. Successful marketing strategies will draw upon social marketing (including community-based social marketing techniques)²⁶ as well as other social science insights to encourage alternative modes of transportation.

MEDIUM SCENARIO

2. **ENHANCED COMMUTER TRANSIT – Increase the use of public transit by increasing the hours of service for commuter buses.**

This action would increase the ridership on commuter buses to Edmonton by increasing hours offered and potentially through route modifications. It is anticipated this service would increase boardings by 47% (subsequently at the same rate as population growth).

HIGH SCENARIO

3. **EXPLORE LIFECYCLE COSTS, barriers and advantages of purchasing electric buses for Leduc public transit.**

Communities are increasingly electrifying their bus fleets to reduce GHG emissions, as battery technology costs decrease and electric buses have been proving their viability even in cold weather. The City of Edmonton is in the process of electrifying their fleet and St. Albert has had electric buses since May 2017.

This action involves upgrading commuter buses. The modelling results outlined in *Exhibit 14* are the lifecycle GHG impacts of one electric 60-foot commuter bus.²⁷ If the whole fleet of commuter buses were electrified, GHG emission reductions would be four times greater (1,300 tCO₂e) and six times greater (2,000 tCO₂e) if electric buses were also purchased for Transit Action – Enhanced Commuter Transit.

Exhibit 14 outlines the GHG impacts, cost effectiveness results and implementation plan for the main transit-related GHG reduction actions.

Exhibit 14

TRANSIT ACTIONS

Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
1. Enhanced Transit Marketing	2020	Transportation	\$25,000 over 1 yr	1,380	11.1	-612	Medium
2. Enhanced Commuter Transit	2026	Transportation	\$1,600,000 over 5 yrs	6,550	1.4	-130	Medium
3. Electric Commuter Bus	2026	Transportation	\$269,000 over 1 yr	330	1.3	-138	High



POTENTIAL ACTIONS FOR FUTURE CONSIDERATION

Transit-related GHG reduction actions 4 and 5 have not had their impacts quantified due to a higher level of uncertainty of their direct GHG reduction impacts. Given less certainty around the cost-effectiveness, these will be considered by City of Leduc as other resources become available. Nevertheless, these actions have been deemed as important to remove barriers or support other actions.

4. **INTRODUCE MORE PARK'N RIDES – Explore introducing more Park'n Ride lots to encourage the use of public transit.**

Leduc currently has three Park'n Ride lots (Alexandra Arena, Leduc Recreation Centre, and Leduc County Centre). The City will explore whether additional Park'n Ride lots are necessary to encourage a greater use of Leduc public transit.

5. **ENHANCE TRANSIT RELATED BIKE INFRASTRUCTURE – Explore the need and the efficacy of enhancing transit-related bike infrastructure.**

Bike racks on buses and bike racks and/or lockers near transit hubs could encourage transit users by enabling "first and last-mile" transportation for public transit. The City of Leduc will explore the safety and the need for adding bike racks to their buses. Needs and gaps in bike rack availability and/or lockers could be identified through *Transportation Action – Walk & Bike-ability Review*.





Land Use ACTIONS

7.5 Land Use Actions

How we plan our communities greatly influences the type of housing developed and how residents move through the city. By extension, land use decisions impact transportation GHG emissions and to a lesser degree building-related GHGs.

Concentrating population by commercial nodes and/or the downtown core means a higher percentage of the population can walk or bike to services and their workplace. Increased walk- and bike-ability has been shown to have better health and higher happiness, increase property values and strengthen community bonds. High density neighbourhoods and services within walking distance of key transit routes allow for increased transit frequency and greater financial viability.

Buildings in areas with higher population density tend to have smaller GHG footprints per person given living spaces tend to be smaller. Secondary suites achieve densified, more compact housing by reducing the living space for one family by making one housing unit into two. These also reduce GHG emissions by reducing the amount of heating space per dwelling.

One unique barrier to further densifying Leduc's downtown core is that it lies within the Airport Vicinity Protection Areas (AVPA). There is a limit on dwelling units within the AVPA restricting Leduc's development of its downtown core. This is being reviewed by the Planning department in the context of infill and secondary suites, and all recommendations below are subject to AVPA compliance.

Land use related GHG reduction actions constitute 2% of the GHG reduction target out to 2030 under the high scenario. This number increases in the longer term considering the total emission reductions over the full lifetime of these land use policies and programs.

Because of the long term nature of land use decisions, it is important to consider GHG implications at the outset.



LAND USE VISION

Residents and businesses are choosing to live and work in Leduc because of its walkable design and integrated green spaces. Leduc's compact nature and conveniently located services, across many neighbourhoods, encourage citizens to bike or walk for many local trips. The densified housing, high number of secondary suites and mixed-use areas contribute to a low per capita building energy consumption.

ACTIONS

LOW SCENARIO

1. INFILL - HIGH DENSITY DEVELOPMENT POLICY - Encourage infill and high-density housing in the downtown core, commercial zones and along transit routes.

The City of Leduc will identify areas where further infill is possible and implement measures to encourage infill. Areas in and close to the downtown core, commercial development and along existing transit routes will most likely be prioritized. Efforts to encourage infill in existing residential areas may include:

- Educate developers on options for infilling.
- Prioritize infill permit applications.
- Continue to implement the streetscape capital improvements outlined in the downtown masterplan.
- Meet or exceed Edmonton Metropolitan Region Plan minimum greenfield density targets and aspirational intensification targets.

In new residential areas, there will be efforts to encourage high density housing which may include:

- Educate and promote the benefits of high-density housing to residents and developers; for example, developing guidelines for builders on high-density housing.
- Review the permitting action plan to incentivize multi-family applications. If possible, timelines for permit processing for high density housing may be expedited or at minimum identify clear timelines to improve predictability for developers.
- Meet or exceed Edmonton Metropolitan Region Plan minimum greenfield density targets and aspirational intensification targets.
- In the ASP guidelines, encourage developers to plan for active transportation, local access to retail and increased access to transit.

LOW SCENARIO

2. MIXED-USE DEVELOPMENT POLICY - Encourage mixed use development in downtown and other appropriate areas.

Steps to encourage mixed-use zones in Leduc include:

- Continue to implement the streetscape capital improvements outlined in the downtown masterplan. In 2020 when reviewing the land-use bylaw, review the land use districts to allow for more mixed use - subject to compliance with AVPA.
- In the Municipal Development Plan (MDP) consultation process, confirm the concept regarding mixed-use walking distance as outlined in the neighbourhood design guidelines.
- Develop a target for percent of residents within 10 minutes-walk of services.



MEDIUM SCENARIO

3. **PROMOTE SECONDARY SUITES – Encourage secondary suites including garage, or garden dwellings.**

Higher density residential areas may also be achieved by encouraging homeowner/developers to build/renovate secondary suites. The following steps to encourage suites may include:

- Educate home owners on the benefits of secondary suites. Benefits outlined may include: additional income, no property tax/ service fee implications and reduced per capita energy consumption.
- Educate homeowners on the steps required to incorporate a secondary suite into their homes such as building code requirements, hiring a contractor and drafting tenancy agreements etc.
- Streamline the process for approving new suites. One such step would be consulting council during the MDP process on whether secondary suites become a permitted use and address the question of whether townhouse end units can have secondary suites.

- Encourage secondary suites in new builds as a more cost-effective way to incorporate a suite into a home and/or encourage homes to be suite-ready (e.g. run electrical and plumbing requirements and take fire separation steps).
- Consider reduced permit costs.

LOW SCENARIO

4. **TREE PLANTING AND MAINTENANCE – Increase the budgets for tree replacements and planting.**

The Leduc Environmental Advisory Board hosts annual community tree planting and pollinator garden events, where at least 600 trees are planted each year. This number has been increasing year over year with the availability of grants and partnerships. In addition, City of Leduc approved new budgets in 2019 for tree replacement and additional tree planting.

Exhibit 15 outlines the GHG impacts, cost effectiveness results and implementation plan for the main land use-related GHG reduction actions.

Exhibit 15

LAND USE ACTIONS

Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
1. Infill – High Density Development Policy	2020	Planning & Development	Within existing resources	36,180	0	-235	Low
2. Mixed-use Development Policy	2020	Planning & Development	Within existing resources	11,480	0		Low
3. Promote Secondary Suites	2023	Planning & Development	\$10,000 over 3 yrs	3,830	5.0	-40	Medium
4. Tree Planting & Maintenance	2016	Environmental Services	No new budget required	1,595	9.2	-4,572	Low



7.6 Waste Actions

GHG emissions (methane) from landfills are generated by the decomposition of organic waste in the absence of oxygen. After organics are deposited in the landfill related methane can be emitted for more than 40 years. This gas has a 34 times greater climate impact as compared to carbon dioxide (CO₂).

Diverting organic waste from the landfill through education, financial motivation, and/or requiring separate organics containers are effective ways to reduce GHG emissions.

Commencing in 2012, Leduc's residential curbside organics diversion program, alongside their recycling program, has achieved diversion rates of 49-54%.

Historic waste in the landfill continues to emit methane for over 40 years, but a biocover can reduce these emissions. Preliminary results show that the process of garbage baling also greatly reduces methane from new solid waste being contributed to the landfill.

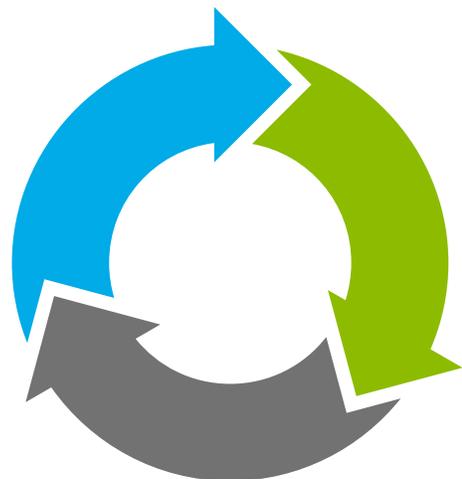
Solid waste contributes 7% of Leduc's community GHG emissions, 2% of corporate GHG emissions, and 41% of Leduc's proposed GHG reduction target under the high scenario.

WASTE VISION

Most residents and businesses recycle and compost. The City of Leduc has met and exceeded its diversion target of 65%. The City of Leduc's residents and businesses understand how to divert and reduce their waste and recognize the related GHG and other benefits.

The Leduc and District Regional Waste Management Facility (LDRWMF) has significantly reduced its methane emissions through GHG emission reduction technologies such as a biocover and garbage baling.

Businesses and multi-family residents have substantially reduced their waste by diverting organics and recycling from the landfill.





ACTIONS

LOW SCENARIO

- BIOCOVER FOR LANDFILL - Install a biocover at LDRWMF.**

Leduc and District Regional Waste Management Authority (LRDWMA) is installing a biocover to cap historic waste and reduce GHG emissions.

A biocovers is a organic cover made of compost and soils and supports vegetation growth, as opposed to a traditional clay cover. The organic material oxidizes (or destroys) the methane passing through the cover. Biocovers are particularly appropriate for landfills, like LDRWMF, where landfill gas collection systems are not economically feasible.

LOW SCENARIO

- GARBAGE BALING - Process waste using garbage baling technology.**

LRDWMA is planning to compact new waste into garbage bales to avoid attracting birds, due to the proximity to the airport. Garbage baling compresses municipal solid waste (MSW) into air-tight bales and wraps them in plastic. This process halts biological activity and consequently the production of methane emissions. There is some decomposition that occurs initially in the bale and subsequently when the plastic deteriorates, however this process is aerobic and therefore does not produce methane.

One study shows that methane was not detected 8 months and 20 months after the bale was produced.²⁸ Given the limited data available on the methane implications of this process and no knowledge of energy inputs into the process, the model assumes a discounted potential GHG reduction impact by 50% to reflect this uncertainty. Further information should be gathered on the energy inputs of this process and the lifecycle impacts of increased plastic use.

HIGH SCENARIO

- WASTE REDUCTION EDUCATION FOR BUSINESS AND APARTMENTS - Outreach support for commercial and multifamily organics diversion.**

Currently, there is no curbside organics pick-up for commercial and multi-family buildings, as they pay for and organize their own waste collection and removal. In addition, it is roughly estimated that up to half of waste from businesses, institutions, industry and multifamily buildings is hauled somewhere other than the LDRWMF, therefore an education campaign in Leduc could have a greater impact beyond the waste identified at LDRWMF. Education will be the first step to encouraging businesses to divert their organic waste, followed by outreach support to improve sorting and assess hauling costs.

MEDIUM SCENARIO

- LOWER TIPPAGE FEES FOR ORGANICS - Implement differential tippage rates for organics and other materials to incent diversion.**

Increasing the differential between organics and solid waste tippage fees will provide further incentive for businesses to sort more organics. Currently, the commercial wet waste rate is \$72/tonne and organics is \$64.50/tonne or a difference of \$7.50. Increasing the difference between the two tippage fees could motivate further organics diversion in the commercial sector.²⁹



HIGH SCENARIO

5. **ORGANICS DIVERSION POLICIES AND PROGRAMS FOR BUSINESS AND APARTMENTS.**

The City of Leduc will consider policies to divert organics from businesses and apartments. For example a waste diversion plan could be required or a separate organic waste container could be required for commercial and multi-family units.

This is the third policy/program step focused on commercial organic waste. The desired approach is to transition from education to more stringent requirements to help guide the industry to better climate-related decisions. The model uses an approach similar to the steps undertaken by the Regional District of Nanaimo (RDN) when they achieved a 48% commercial diversion rate.³⁰ They started with education and ended with a more stringent mandate. In addition, RDN implemented a landfill ban on commercial food waste.



HIGH SCENARIO

6. **ORGANICS PROCESSING FACILITY – Introduce an organics processing facility at LDRWMF.**

If the Leduc and District Regional Waste Management Authority agreed to building an organics processing facility in the future, greenhouse gas reductions would occur in two ways:

- **Avoided emissions from waste management trucks** – Greenhouse gas will be avoided by eliminating the need for trucks, loaded with organic waste, to drive from LDRWMF to the current processing facility at Penhold or the previous location near Strathmore. The model used an avoided trucking a distance of 502 kilometres.³¹
- **Avoided methane emissions from diverting additional organic waste** – As more organics are sorted out of the waste stream by residents and businesses, less GHG emissions will be generated by landfilled waste at the LDRWMF. As organics diversion policies become more common and more feasible, GHG emissions are also expected to reduce further when other communities embrace organics diversion.

Only City of Leduc’s impact on LDRWMF emissions are included in the current inventory and model.

HIGH SCENARIO

7. **VARIABLE SIZE CART PROGRAM – Implement a variable size cart program.**

Requiring consumers to pay per size of unit of garbage receptacle sends the message that landfills are not infinite and effectively reduces residential waste disposed. Studies of “pay as you throw” programs show increased waste diversion between 8% and 38%.³²

In 2005, over 200 communities in Canada and over 6,000 in the United States finance their waste disposal through variable fees charged directly to the households.³³

Exhibit 16 outlines the GHG impacts, cost effectiveness results, and implementation plan for the waste-related GHG reduction actions.

Exhibit 16

SOLID WASTE ACTIONS

Action	Start	Lead Department	Required Resources	Lifetime GHG Reductions (tCO ₂ e)	Benefit Cost Ratio	Cost per tonne (\$/tCO ₂ e)	Scenario
1. Biocover for Landfill	2019	LDRWMA	LDRWMA budget	470,100	17.4	3	Low
2. Garbage Baling	2019	LDRWMA	LDRWMA potential increase to environmental fee	255,010	3.0	18	Low
3. Waste Reduction Education for Business & Apartments	2020	Environmental Services	\$30K for 2 yrs, plus 0.5 FTE - \$44K plus \$6.5K in one-time start up	1,015	0	-61	High
4. Lower Tipping Fees for Organics	2020	LDRWMA	LDRWMA potential increase to environmental fee	3,740	0	-82	Medium
5. Organics Diversion Policies & Programs for Business & Apartments	2023	Environmental Services	TBD following Action 3	11,390	0	-11	High
6. Organics Processing Facility	2026	LDRWMA	LDRWMA potential increase to environmental fee	1,100	0	-34	High
7. Variable Size Cart Program	2026	Environmental Services	\$300K & \$20K ongoing	4,800	1.6	32	High

POTENTIAL ACTIONS FOR FUTURE CONSIDERATION

Waste-related GHG reduction action 8 has not had its GHG reductions quantified due to a higher level of uncertainty of the direct GHG reduction impacts. Given less certainty around the cost-effectiveness, these will be considered by City of Leduc as other resources become available. Nevertheless, these actions have been deemed as important to remove barriers or support other actions.

8. ADDITIONAL TYPES OF MATERIALS RECYCLED - Determine the feasibility of reduce, reuse options and recycling additional waste streams.

The City of Leduc will continue to explore the practical feasibility, market for and cost effectiveness of additional materials. The public has demonstrated interest in having metals, glass, mattresses and Styrofoam recycled, therefore Leduc will continue to investigate options to help divert these materials from the landfill.



Education & Other ACTIONS

7.7 Education and Other Actions

The actions included in this section are considered cross-cutting and will likely impact each sector. They are resourcing and/or education actions that could enable the uptake of many of the GHG reduction actions contained in this plan.

Education is the cornerstone to tackling climate change as many actions require the general public and/or businesses to change behaviour or accept a new technology. Education on climate change will need to draw upon existing resources, such as the Alberta Narratives project, on how best to frame the relevant issues.³⁴ Communication efforts will need to recognize the significance and gravity of climate change, while pointing to solutions and a path forward with benefits that extend beyond GHG reductions.

As already mentioned, successful education strategies will draw upon social marketing (including community-based social marketing techniques). Social marketing sells ideas, attitudes and behaviours (instead of commercial products) with rational arguments presented in a way that appeals to their core values. Community-based social marketing is founded on social science theories that behaviour change is most effective when delivered at the community level. Social science insights on human behaviour can more effectively achieve changes in habits and actions.

ACTIONS

1. **Create a GHG reduction education and outreach hub.**

The City of Leduc will build an education and outreach hub to communicate all of its past and present programs, policies, and projects that are covered by this plan.

2. **Introduce additional staffing resources to support the implementation of this plan.**

Given the frequency of involvement of the Environmental Services department in actions outlined in this plan, it is recommended that additional staff resources are secured. Additional staff resources would ensure high follow through of actions contained within this plan.

The Environmental Services Department requires half of a full time equivalent to ensure appropriate resourcing. Ideally, this staff person has skills in environmental education and social marketing techniques given the numerous education campaigns proposed.

A business case has been developed for staff resources to support the implementation of this plan for submission in Budget 2020.

8

Leduc GHG Reduction Targets

A GHG reduction target provides a municipality a goal to strive towards in pursuing GHG reductions. Some municipalities opt for a visionary target, often aligned with an international science-based target, to significantly motivate the municipality's climate actions. The City of Leduc wanted to set a practical, achievable target built from the bottom-up using cost-effective actions as its basis. It was also important that these actions are supported by both the public and council.

The City of Leduc have chosen an overall target of **reducing GHG emissions 3% below business-as-usual projections by 2030**. This target can also be described as: 3% above 2015 baseline year emission levels. Achievement of the City of Leduc GHG reduction target requires actions at both the corporate level and a community level.

The corresponding targets are:

CORPORATE TARGET: 20% reduction below business-as-usual by 2030 or an 8% reduction below 2015 emissions levels

COMMUNITY TARGET: 3% reduction from business-as-usual by 2030 or for emissions at 6% above 2015 levels.

The City of Leduc is considering selling some of its emission reductions from projects such as solar installed on City buildings and the biocover being installed on the LDFWMF. If the City chooses to sell their emission reductions into the offset system, they will no longer count these emission reductions towards meeting their GHG reduction target.

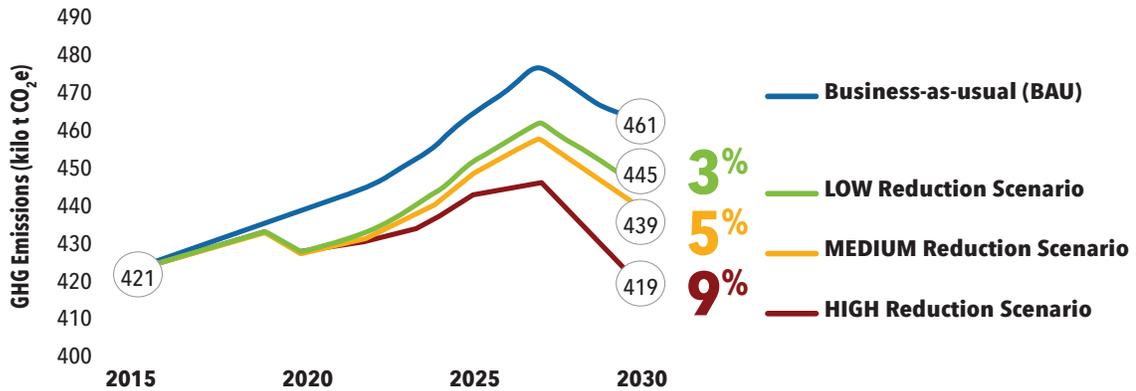
Exhibit 17

MODELLED ACTIONS Included in the High, Medium and Low Scenarios

LOW SCENARIO 3% GHG Reduction Target	MEDIUM SCENARIO 5% GHG Reduction Target	HIGH SCENARIO 9% GHG Reduction Target
LED Streetlights	Create Energy Efficiency Champions	Green Building Standard for City
Solar on LRC, Operations Buildings	Promote Efficiency and Renewable Programs, GHG Education Hub	Electric Commuter Bus
Energy Retrofits to City Buildings	City to Buy Best-in-Class New Fleet	Organics Processing Facility
Infill - High Density Development	EV Public Charging Stations and Policy	PACE (Residential & Commercial Buildings)
Mixed Use Development	Enhanced Commuter Transit	Waste Reduction Education for Business & Apartments
Biocover For Landfill	Promote Active Transport, Enhance Transit & U-Pass Marketing	Organics Diversion Policies & Programs for Business & Apartments
Garbage Baling	Promote Secondary Suites	Variable size cart program
Tree Planting	Lower Tipping Fees for Organics	New Solar for City Buildings

Exhibit 18

TARGETS for Low, Medium and High Scenarios



8.1 Scenarios

GHG reduction actions were grouped into three different scenarios (*Exhibit 17*) – high, medium and low GHG reduction scenarios. Actions are cumulative – so low and medium scenarios are also included in the high scenario. Three targets were considered for the low, medium and high scenarios (*Exhibit 18*). If all actions in this plan were implemented, Leduc would expect to achieve a 9% reduction below business-as-usual or an absolute reduction of 1% below 2015 levels.

Budgetary constraints at the time of plan approval prompted staff to take the cautionary approach to commit to a 3% target and associated low scenario actions. All medium and high scenario actions have also been included in this plan to serve as a road map for further implementation as resources become available of the next 10 years.

Finally, some actions from the medium and high scenario may be implemented given there is low or no cost to the City of Leduc (e.g. PACE, Organics Diversion Policies and Programs for Businesses and Apartments, Organics Processing Facility). In this case, the City would likely exceed their GHG reduction target.



8.2 Actions Impacts

Recall that a “wedges” diagram highlights individual emission reduction actions as wedges that collectively meet a specified target.³⁵ The size and shape of each wedge can indicate the relative contribution overtime from each action or sector. In the buildings, energy supply and land use wedge diagram, PACE has by far the greatest impact with Energy Retrofits to City Buildings, LED Streetlights, Solar on LRC, Operations Buildings, and Promoting Provincial Energy Efficiency programs having the next notable impacts (*Exhibit 19*). The impacts of the land-use actions are split between two figures - the buildings related impacts are in the buildings diagram and the transportation related emissions savings are in the transportation diagram.

For transportation related actions, the active transportation education campaign by far has the greatest GHG impact (*Exhibit 20*). Infill and mixed-use development policies also have notable effects, especially considering the buildings related portions of their impacts are in *Exhibit 19*. Enhanced Commuter Transit and Enhanced Transit Marketing merit mention. Recall that the Electric Commuter Bus action could have a greater impact if more than one bus was purchased.

Exhibit 20

TRANSPORT Wedges Diagram, 2020-2030
Based on high scenario (9%)

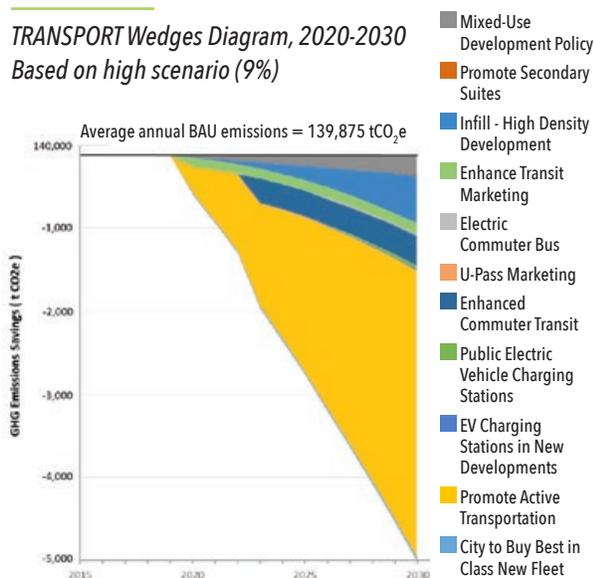
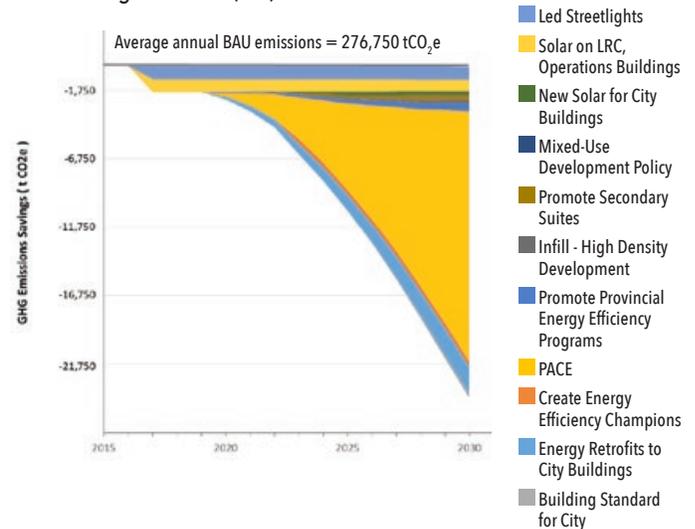


Exhibit 19

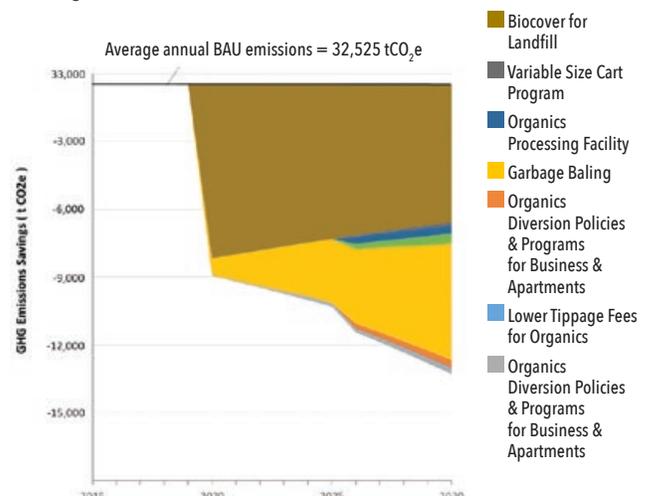
BUILDINGS, ENERGY SUPPLY & LAND USE Wedges Diagram, 2020-2030
Based on high scenario (9%)



Garbage baling and the biocover provide by far the greatest waste related impacts (*Exhibit 21*). However, attention should not be drawn away from the other waste related actions. Recall that the biocover emission reductions were likely over estimated by roughly 20%. Also, the garbage baling emission reductions are uncertain until further study or evidence is obtained.

Exhibit 21

WASTE Wedges Diagram, 2020-2030
Based on high scenario (9%)



9 Costs and Benefits

The GHG Emission Reduction Action Plan includes the program and projected expenditures for the City of Leduc outlined in *Exhibit 22*. Approval of the plan does not automatically approve these expenditures. Council will review annually and approve any proposed programs and their associated expenditures.

9.1 Expected Costs

LOW SCENARIO -
Actions to achieve a **3%**
target

Note there are no new costs associated with the actions in the "low" scenario.

MEDIUM SCENARIO -
Actions to achieve a **5%**
target

The medium scenario actions include \$1,205,000 in operating costs, \$490,500 in staff-related costs and \$722,000 in one-time costs over 11 years (2020 - 2030).

The operational costs that would continue at the end of ten years includes \$200,000 in operating for the enhanced commuter transit actions and all staffing costs.

HIGH SCENARIO -
Actions to achieve a **9%**
target

In addition to the medium costs, the high scenario actions include an expected \$185,000 in operating costs, up to \$981,000 in staff-related costs and \$1,570,000 in one-time costs over 11 years (2020 - 2030).

The operational costs that would continue at the end of ten years include \$25,000 in operating for building standards, variable sized cart program and all staffing costs.

Some costs (e.g. electric buses) are incremental to what Leduc would need to pay as compared to a new conventional bus. Costs that have already been approved or the City of Leduc does not have to pay (e.g. LDRWMA) were not included in *Exhibit 22*.

Exhibit 22

New operations, staffing and one-time costs (combined) 2020 through 2030.

	Buildings				Energy Supply	Land Use	Transit/Active Transportation			Transport	Waste	
	Green Building Standards for New City Buildings	Create Energy Efficiency Champions	Promote Efficiency and Renewable Programs, GHG Education Hub	PACE	New Solar on Existing City Buildings	Promote Secondary Suites	Promote Active Transport Enhance Transit & U-Pass Marketing	Enhance Commuter	Electric Commuter Bus	Electric Vehicle Charging Stations & Policy	Waste Diversion Education, Policies & Programs for Businesses & Apartments	Variable Size Cart Program
Low	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medium	N/A	\$40,000	\$595,000	N/A	N/A	\$10,000	\$50,000	\$1,600,000	N/A	\$122,000	N/A	N/A
High	\$297,000			\$248,500 - \$490,500	\$728,000				\$269,000		\$550,500	\$400,000
Total Medium & High	\$297,000	\$40,000	\$595,500	\$248,500 - \$490,500	\$728,000	\$10,000	\$50,000	\$1,600,000	\$269,000	\$122,000	\$550,500	\$400,000
Benefits Include	Energy cost savings	Energy cost savings	Energy cost savings	Energy cost savings	Energy cost savings	Energy cost savings	Increased fare revenue	Increased fare revenue	Avoided fuel costs	Avoided fuel costs	Potential savings depend on tipping fees at LDRWMF	

See *Appendix A* for a full breakdown of the expected operational, staffing and one-time costs for each action over 11 years (2020 - 2030).

10 Monitoring Plan

The City of Leduc will report annually against their progress towards GHG actions outlined in this plan. The indicators outlined in this section will also help the City of Leduc monitor the success of their GHG Reduction Action Plan. Monitoring will indicate the success of specific initiatives as well as the City's overall effort towards meeting their GHG reduction target. The sources for select indicators have also been provided. We also recommend a five-year review to update their GHG reduction inventory to further report against their progress.



10.1 For Future Reporting

- Leduc's GHG emissions - progress towards the overall 5% target
- Leduc's GHG emissions – Corporate
- Leduc's GHG emissions – Community
 - Obtained through inventory updates

10.2 Energy Supply

- CORPORATE: MW of installed renewable energy
 - Obtained through facility and property services department
- COMMUNITY: MW of installed renewable energy
 - Can likely be obtained through Energy Efficiency Alberta or potentially the Canadian Solar Industry Association (CanSIA)

10.3 Buildings

- CORPORATE: energy consumption per square foot
 - Obtained through facility and property services department
- Number of PACE loans
 - Can likely be obtained through Energy Efficiency Alberta
- Participation in EEA's programs (as compared to the provincial average or an average for medium sized cities)
 - Can likely be obtained through Energy Efficiency Alberta

10.4 Transportation

- Public transit GHG emissions per VKT
 - Obtained through inventory updates or Facility and Property Services
- Transit ridership
 - Obtained through Transportation Department
- Commute to work mode split
 - Statistics Canada Census

10.5 Land Use

- Density of new growth
- Amount and density of infill (not in a new subdivision)
- Dwellings within a 10-minute walk of services
- Dwellings within a 10-minute walk to a grocery store
- Dwellings within a 10-minute walk of the downtown area
- Number of secondary suites

All of these indicators would be obtained from City of Leduc Planning & Development.

10.6 Waste

- % recycling diverted
- % of organics diverted
- Distance organics travel for processing

All of these indicators would be obtained from City of Leduc Environmental Services.

11

Conclusion

The City of Leduc's GHG Reduction Action Plan builds on our already strong commitment to the environment and successful climate action projects. This "Made-in-Leduc" plan has been built with comprehensive input from staff, stakeholders and the public. Actions are focused on where to achieve cost effective GHG emission reductions – ensuring dollars have the greatest impact when expended.

Actions touch on multiple City departments reflecting the cross-discipline nature of climate mitigation. Careful consideration has gone into whether they have the resources available to pursue actions outlined in the plan.

There is a strong desire to meet, not just set, a GHG reduction target. As per usual, the City of Leduc has chosen a practical, and balanced approach – a local plan to address the global issue of climate change.



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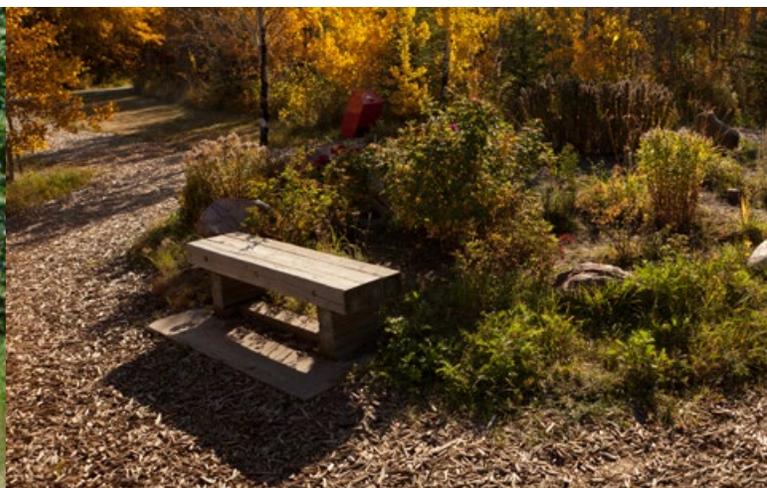
13 Footnotes

- ¹ Government of Canada. (2015, 11 30). *Frequently Asked Questions about Climate Change*. Retrieved from Government of Canada: <https://www.canada.ca/en/environment-climate-change/services/climate-change/frequently-asked-questions.html>
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- ³ National Oceanic and Atmospheric Administration, *What's the Difference Between Climate and Weather* <http://www.noaa.gov/explainers/what-s-difference-between-climate-and-weather>.
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- ⁵ Reference footnote 4.
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- ⁹ Or 1% GHG emission reductions below 2015 levels.
- ¹⁰ 26% corporate GHG reductions and 8% community GHG reductions below business-as-usual - see page 51 for more information on Leduc's GHG reduction targets.
- ¹¹ For the purposes of this figure, streetlight and water and wastewater GHGs were divided into the residential and commercial sectors according to their relative contributions in the community inventory. Corporate buildings GHG emissions were added to the commercial sector.
- ¹² Our approach differs from many wedges diagrams which show emissions increasing overtime (upwards trajectory on a graph) and use the wedges to stabilize GHG emissions overtime.
- ¹³ We calculate the cost per tonne of carbon reduced by subtracting the costs from the benefits divided by the lifetime GHG reductions (all time discounted to provide the current monetary and environmental "worth" of each value).
- ¹⁴ Environment and Climate Change Canada. (2018). *National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada*. Ottawa: Government of Canada.
- ¹⁵ This completed action was included in the Plan as it was post 2015 – the GHG inventory year. Therefore, it contributes to the City of Leduc's GHG reduction target. In addition, the idea was developed and implemented during the period the GHG Reduction Plan was being developed.
- ¹⁶ Our modelling used a conservative estimate of 30 years lifespan for a new home.
- ¹⁷ In Alberta, municipalities currently do not have jurisdiction to require greater efficiency improvements the provincial building code.





- ¹⁸ This completed action was included in the Plan as it was post 2015 - the GHG inventory year. Therefore, it contributes to the City of Leduc's GHG reduction target. In addition, the idea was developed and implemented during the period the GHG Reduction Plan was being developed.
- ¹⁹ LED streetlights rightfully fits into its own sectoral category but for ease this section has been expanded to including buildings and other infrastructure.
- ²⁰ York, D., Molina, M., Neubauer, M., Nowak, S., Nadel, S., Chittum, A., Elliott, N., Farley, K., Foster, B., Sachs, H., & Witte, P. 2013
- ²¹ Depending on Facilities Master Plan, approved budgets and future technological advancements (e.g. solar costs).
- ²² For buildings with renewable energy units on the roof.
- ²³ For buildings with thicker walls due to increased insulation.
- ²⁴ Reference footnote 23.
- ²⁵ Referenece footnote 23.
- ²⁶ Sells ideas, attitudes and behaviours (instead of commercial products) with rational arguments presented in a way that appeals to their core values. Community-based social marketing is founded on social science theories that behaviour change is most effectively achieved through initiatives delivered at the community level.
- ²⁷ These buses have seating for approximately 42 passengers.
- ²⁸ Baldasano, J. M. (2003). Environmental Performance Review and Cost Analysis of MSW Landfilling by Baling-Wrapping Technology. *Waste Management*, 796-806.
- ²⁹ Ontario Waste Management Association (OWMA). (2014). *Disposal Levies - Rethink Policy Paper Series*. Brampton: OWMA.
- ³⁰ Government of British Columbia. (2019). *Residential Organic Waste Diversion*. Retrieved from Government of British Columbia: <https://www2.gov.bc.ca/gov/content/environment/waste-management/food-and-organic-waste/organic-waste-diversion/residential-organic-waste-diversion/>
- ³¹ Assuming 50% of organic waste goes to each facility and includes the return trip.
- ³² Kelleher, M. R. (2005). *Taking Out the Trash: How To Allocate the Costs Fairly, No. 213*. CD Howe Institute.
- ³³ See reference page 31.
- ³⁴ Marshall, G. B. (2018). *Communicating Climate Change and Energy in Alberta - Alberta Narratives Project*. Oxford: Climate Outreach.
- ³⁵ Our approach differs from many wedges diagrams which show emissions increasing overtime (upwards trajectory on a graph) and use the wedges to stabilize GHG emissions overtime. We demonstrate where emissions are projected to go and how the actions would reduce these emissions to a specified level.



A APPENDIX City of Leduc Costs



This Appendix reflects the new costs that would be incurred to achieve the actions.

Note there are no new costs associated with the actions in the "low" scenario.



MEDIUM SCENARIO - Actions to Achieve a 5% target

The medium scenario actions include: **\$1,205,000** in operating costs, **\$490,500** in staffing costs and staff set up costs and **\$722,000** in **capital or one-time** costs over 11 years (2020 - 2030).

HIGH SCENARIO - Actions to Achieve a 9% target

In addition to the medium scenario costs, the high scenario actions require the following incremental costs: \$185,000 in operating costs, up to \$937,000 staff and staff start up costs and \$1,568,670 in **capital, or one-time** costs over 11 years (2020 - 2030).

The total costs to achieve the 9% target are: **\$1,390,000** in operating costs, up to **\$1,427,500** in staffing costs and staff set up costs and **\$2,290,670** in **capital, or one-time** costs over 11 years (2020 - 2030).

The year 2031 is shown in order to reflect costs that would continue at the end of 11 years.

Exhibit 23

INCREMENTAL OPERATING, STAFF AND CAPITAL EXPENDITURES FOR THE MEDIUM SCENARIO ACTIONS

													Sub-total
Action	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2020-2030
Create Energy Efficiency Champions	0	0	0	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	0	40,000
Promote Efficiency and Renewables, GHG Education Hub	80,500	74,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	595,500
City to Buy Best-in Class New Fleet	0	0	0	0	0	0	0	0	0	0	0	0	0
Promote Active Transportation	16,667												16,667
EV Charging Stations and Policy	0	0	0	0	0	0	0	0	0	0	0	0	0
Enhanced Commuter Transit - Capital	0	0	0	0	0	0	600,000	0	0	0	0	0	600,000
Enhanced Commuter Transit - Operating	0	0	0	0	0	0	200,000	200,000	200,000	200,000	200,000	200,000	1,000,000
U-Pass Marketing	16,667	0	0	0	0	0	0	0	0	0	0	0	16,667
Enhanced Transit Marketing	16,667	0	0	0	0	0	0	0	0	0	0	0	16,667
Promote Secondary Suites	0	0	0	3,333	3,333	3,333	0	0	0	0	0	0	9,999
Lower Tipping Fees for Organics	0	0	0	0	0	0	0	0	0	0	0	0	0
Public Electric Vehicle Charging Stations - Operating	0	0	0	0	0	0	0	0	0	0	0	0	0
Public Electric Vehicle Charging Stations - Capital	0	0	0	0	0	0	110,000	2,000	2,000	4,000	4,000	0	122,000
TOTAL OPERATING	80,001	30,000	5,000	13,333	13,333	13,333	210,000	210,000	210,000	210,000	210,000	205,000	1,205,000
TOTAL STAFF	50,500	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	490,500
TOTAL CAPITAL	0	0	0	0	0	0	710,000	2,000	2,000	4,000	4,000	0	722,000

Exhibit 24

INCREMENTAL OPERATING, STAFF AND CAPITAL EXPENDITURES FOR THE HIGH SCENARIO ACTIONS

Action													Sub-total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2020-2030
Green Building Standard for City - Capital	0	0	0	0	0	0	59,394	56,731	54,204	51,807	49,533	0	271,670
Green Building Standard for City - Operating	0	0	0	0	0	0	5,000	5,000	5,000	5,000	5,000	5,000	25,000
PACE	0	28,500 - 50,500	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	22,000 - 44,000	226,500 - 446,500
New Solar for City Buildings - Capital	0	0	0	248,000	240,000	240,000	0	0	0	0	0	0	728,000
Electric Commuter Bus - Capital	0	0	0	0	0	0	269,000	0	0	0	0	0	269,000
Waste Reduction Education for Business & Apartments	80,500	74,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	44,000	550,500
Variable Size Cart Program	0	0	0	0	0	0	300,000	0	0	0	0	0	300,000
Variable Size Cart Program - Operating	0	0	0	0	0	0	20,000	20,000	20,000	20,000	20,000	20,000	100,000
TOTAL OPERATING	30,000	30,000					25,000	25,000	25,000	25,000	25,000	25,000	185,000
TOTAL STAFF	50,500	72,500 - 94,500	66,000 - 88,000	717,000 - 937,000									
TOTAL CAPITAL	0	0	0	248,000	240,000	240,000	628,394	56,731	54,204	51,807	49,533	0	1,568,670

Exhibit 25

TOTAL INCREMENTAL OPERATING, STAFF AND CAPITAL EXPENDITURES FOR THE MEDIUM AND HIGH SCENARIO ACTIONS

													Sub-total
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2020-2030
MEDIUM SCENARIO OPERATING	\$80,001	\$30,000	\$5,000	\$13,333	\$13,333	\$13,333	\$210,000	\$210,000	\$210,000	\$210,000	\$210,000	\$205,000	\$1,205,000
MEDIUM SCENARIO STAFF	\$50,500	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$44,000	\$490,500
MEDIUM SCENARIO CAPITAL	\$0	\$0	\$0	\$0	\$0	\$0	\$710,000	\$2,000	\$2,000	\$4,000	\$4,000	\$0	\$722,000
HIGH SCENARIO													
HIGH SCENARIO OPERATING	\$30,000	\$30,000	\$0	\$0	\$0	\$0	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$185,000
HIGH SCENARIO STAFF	\$50,500	\$72,500 - \$94,500	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$66,000 - \$88,000	\$717,000 - \$937,000
HIGH SCENARIO CAPITAL	\$0	\$0	\$0	\$248,000	\$240,000	\$240,000	\$628,394	\$56,731	\$54,204	\$51,807	\$49,533	\$0	\$1,568,670
TOTAL MEDIUM & HIGH SCENARIOS													
TOTAL MEDIUM & HIGH OPERATING	\$110,001	\$60,000	\$5,000	\$13,333	\$13,333	\$13,333	\$235,000	\$235,000	\$235,000	\$235,000	\$235,000	\$230,000	\$1,390,000
TOTAL MEDIUM & HIGH STAFF	\$101,000	\$116,500 - \$138,500	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$110,000 - \$132,000	\$1,207,500 - \$1,427,500
TOTAL MEDIUM & HIGH CAPITAL	\$0	\$0	\$0	\$248,000	\$240,000	\$240,000	\$1,338,394	\$58,731	\$56,204	\$55,807	\$53,533	\$0	\$2,290,669



