RED DEER

- Workshop Summary Report –

September 2018

Alberta Government

All One Sky Foundation

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Introduction

Context

In terms of size, municipalities occupy a tiny fraction of the world's landmass; in Alberta, for example, small and medium population centres occupy less than 0.2 per cent of the province's landmass. In terms of climate impact, however, they leave a large carbon footprint. It is estimated that urban centres world-wide account for more than 70 per cent of global carbon dioxide (CO_2) emissions. North American cities have the largest footprints per capita.

Municipalities are also at high risk from some of the adverse impacts of climate change—both because weather and climate extremes can be especially disruptive to interconnected urban systems and because they are where much of our population live, work and raise their families. About 4-in-5 Albertans reside in cities, towns or villages.

Integral to the climate change problem, municipalities and the people that live there are also a key part of the solution. Residents—individually or collectively—can drive action to address climate change and steer the agenda for local government.

Objective

The goal of this project—the *Climate Express*—is to promote climate literacy and stewardship in small-to-medium sized municipalities in Alberta to advance action to reduce greenhouse gas (GHG) emissions. Our target audience is concerned residents with an interest in tackling climate change.

A 3-hour workshop was designed to, first, build awareness and understanding of climate change concepts, using local data, to provide the impetus for action. Participants were subsequently asked to identify both local GHG emission sources and promising opportunities to reduce those emissions through individual and collective actions. From the list of actions, participants next determined actions that would make the biggest difference in reducing local GHG emissions from buildings, personal transport, waste management and consumer goods and services, and then suggesting a pathway to seeing those actions enabled and widely adopted in their community.

This report provides a summary of the workshop held in Red Deer on June 11th, 2018. Workshops were also held in the following municipalities: Lethbridge, Medicine Hat, Grande Prairie and Leduc.

Our Climate Past and Future

The climate is changing in and around Red Deer. Analysis of Environment Canada weather station data for the region shows that over the past century, the mean annual temperature has risen 1.5 degrees Celsius (°C) (see Figure 1). Winter months have seen the greatest warming (+3.0°C), while average temperatures in summer months have risen 1.2°C.

Figure 1: Mean annual temperature (1917-2016)

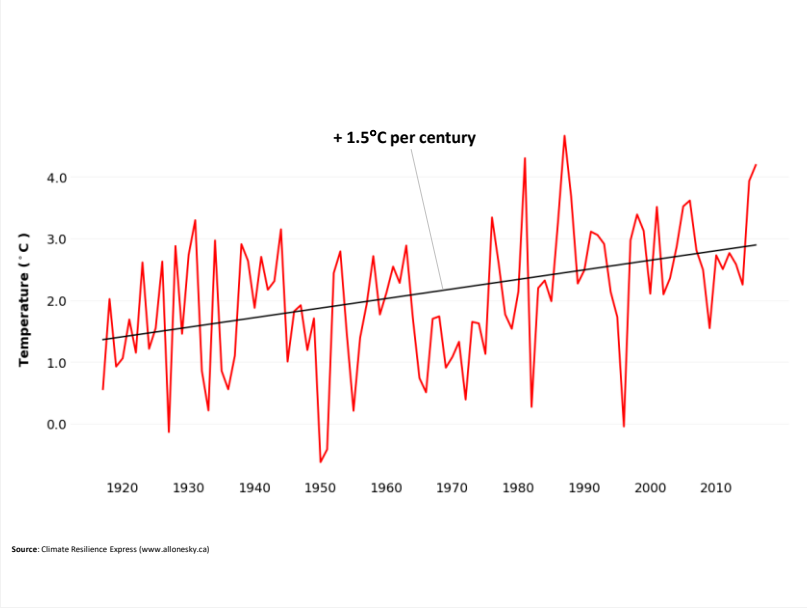
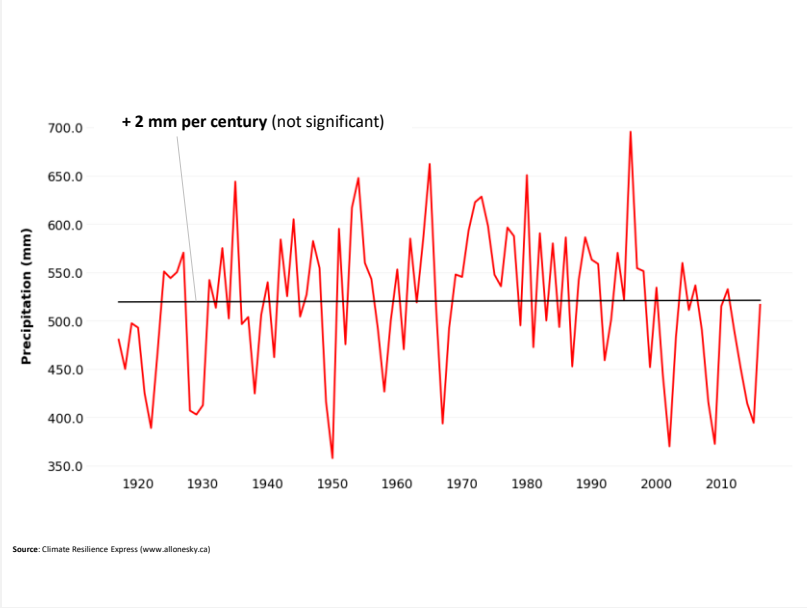


Figure 2: Mean annual precipitation (1917-2016)



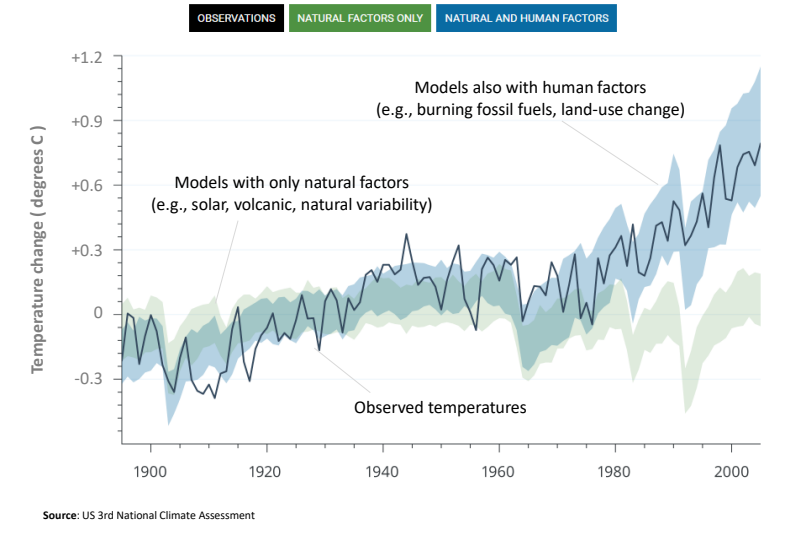
Mean annual precipitation in the region has not changed significantly over the past century (see Figure 2).

Alberta is unequivocally warming, as the observations for Red Deer indicate. But what is causing the observed warming?

Climate changes in the past have been caused by natural factors. However, the main cause of observed climate change over the past 50 years is human activities—specifically, increased emissions of heat-trapping GHGs.

This is evident in Figure 3, which shows global mean annual temperature over the last century. Considering only natural factors (the green band), simulations by climate models show a slight cooling of temperatures over recent decades. Climate models can only explain the actual observed level of warming (shown by the black line) by also including human factors (the blue band).

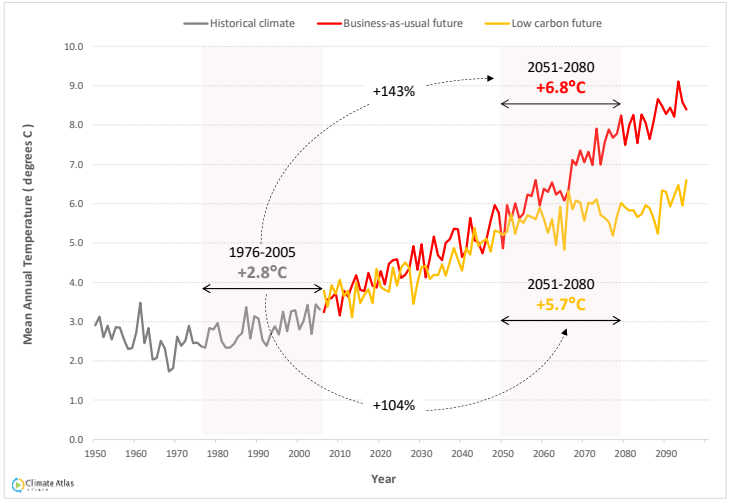
Figure 3: Contribution of human factors to observed warming



The climate is projected to continue to change over this century in response to human activities. How much more the climate will change depends on future emissions of heat-trapping GHGs and the sensitivity of the global climate system to those emissions.

To accommodate uncertainties when developing projections of future changes in the climate, scientists work with scenarios—plausible projections of what might happen, under a given set of assumptions regarding future population, energy sources, technology, GHG emissions and policies, and global temperature change. Projected mean annual temperatures (MAT) for Red Deer under two plausible climate futures are shown in Figure 4. Under a "business-as-usual" relatively high GHG emission future, MAT is projected to average +6.8°C during 2051-2080 (an increase of 143% relative to the average value of +2.8°C during 1976-2005).

Figure 4: Projected future warming for Red Deer under two different climate futures



In contrast, under a moderately ambitious "low-carbon" future, MAT is projected to average +5.7°C during 2051-2080 (an increase of 104% relative to the average value during 1976-2005).

Figure 4 provided projections of future *mean* annual temperatures for Red Deer. What about the distribution of temperatures around the mean—specifically, what about projected temperature extremes.

Figure 5 shows the frequency distribution of projected MAT for Red Deer for the "business-as-usual" climate future for three different time periods: 1976-2005 (left bell-shaped curve); 2021-2050 (middle bell-shaped curve); and 2051-2080 (right bell-shaped curve).

It is evident from the figure that the projected *mean* value for 2051-2080 (shown as "BAU mean") falls within that part of the distribution representing the warmest 2-2.5 per cent of years during 1976-2005.

Put another way, the warmest 2-2.5 per cent of years during our recent past will become the new norm by 2051-2080.

Figure 5: Frequency distribution of projected MAT for Red Deer under "business-as-usual" future

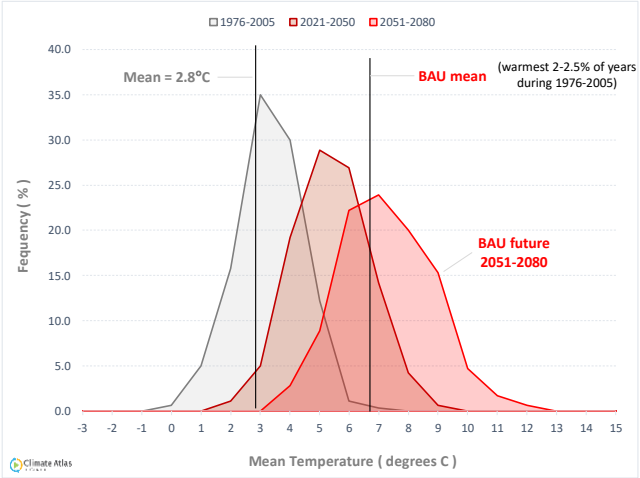
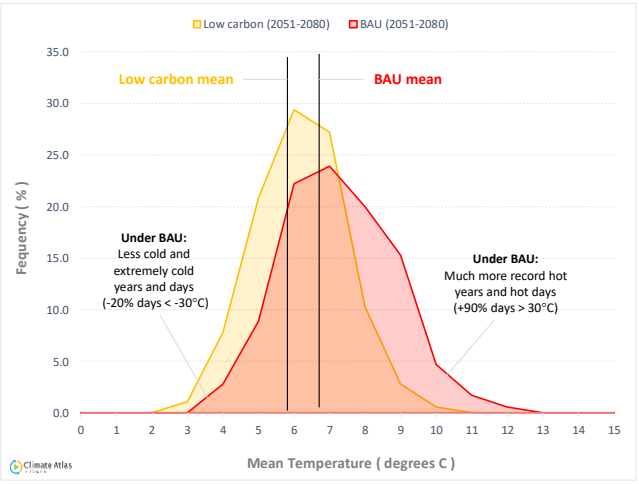


Figure 6 presents the frequency distributions of projected MAT for Red Deer for 2051-2080 under two climate futures. Under a low carbon future projected MAT for this period is 1.1°C (6.8°C less 5.7°C) lower than under the business-as-usual future (recall Figure 4). Differences in the mean temperature do not tell the full story, however.

Contrasting the two bell-shaped curves in Figure 6 provides insights into differences in temperature extremes under both climate futures. Relative to a low carbon future, under a business-as-usual, high GHG emission future Red Deer can expect much more record hot years and less cold and extremely cold years.

Figure 6: Frequency distribution of projected MAT for Red Deer under two climate futures



Furthermore, the business-as-usual future will see Red Deer experience about 90 per cent more hot days on average (with maximum temperatures exceeding +30°C) and about 20 per cent less record cold days on average (with minimum temperatures dropping below -30°C) relative to the low carbon future.

Although not shown graphically, projected mean annual precipitation (MAP) for Red Deer during 2051-2080 is expected to be 5 per cent and 7 per cent higher than during 1976-2005, respectively, under the low carbon future and business-as-usual future. In terms of precipitation extremes, under the business-as-usual future relative to the low carbon future, Red Deer is projected to experience, on average during 2051-2080, more extremely wet years and heavy precipitation days (with +10 mm of rainfall), as well as more extremely dry summers.

In summary, relative to continuing down a high GHG emissions, business-as-usual future, charting a path down a lower carbon future will reduce several climate-related risks for Red Deer, which will prove increasingly difficult to adapt to in the long-term, including:


Reduced risk of loss, damage and disruption from storms


Lower risk of wildfires


Fewer impacts from rising temperatures and record heat


Reduced risk of extreme precipitation and flooding


Lower risk of summer drought and desiccation of wetlands


Less shifts in natural habitat and species, and risk of invasive species

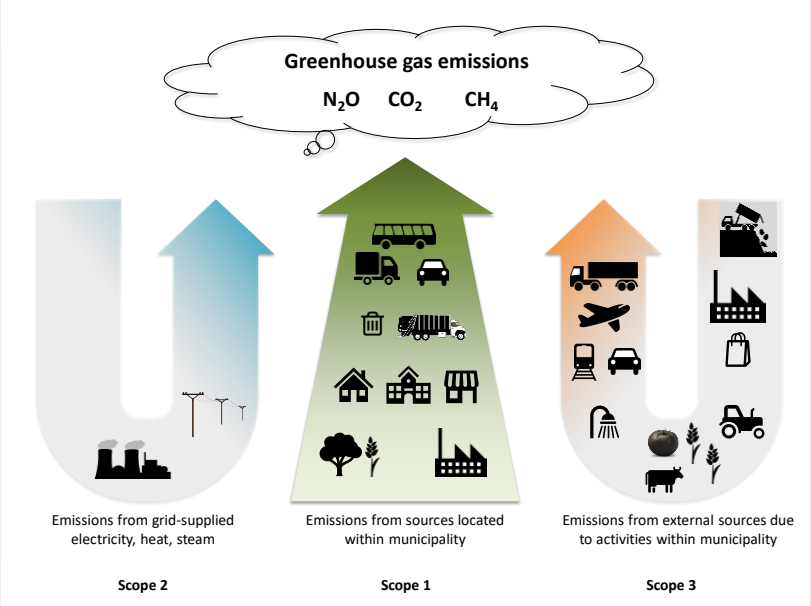
Source of GHG Emissions

The two climate futures described above for Red Deer have different GHG emission or "carbon" footprints. Relative to the business-as-usual future, total cumulative GHG emissions through 2100 are about 53 per cent less under the low-carbon future[1].

What are the main sources of GHG emissions that contribute to a municipality's carbon footprint? Sources of municipal GHG emissions are typically grouped into three "scopes" for measurement:

- Emissions from energy use within the municipal boundary, as well as the management of waste (**scope 1**);
- Emissions occurring because of the use of grid-supplied electricity, heat or cooling within the municipal boundary (**scope 2**); and

Figure 7: Sources of a municipality's carbon footprint

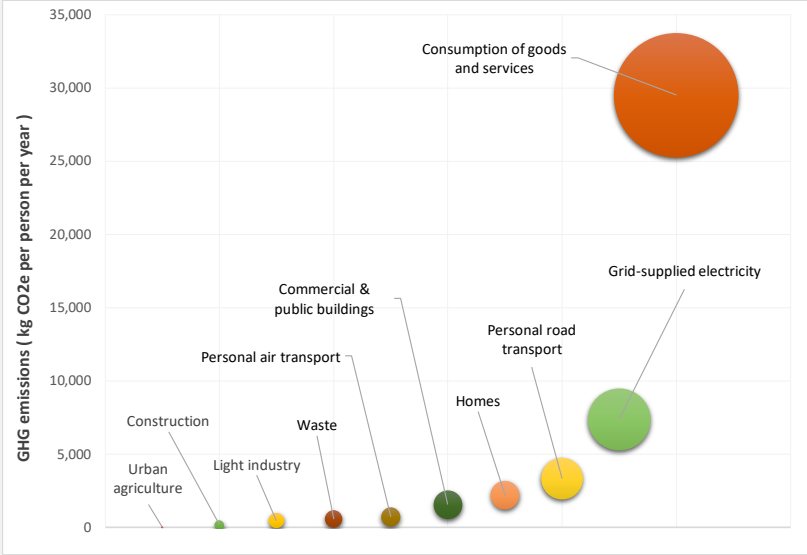


[1] There are, of course, more ambitious low carbon futures than that shown in Figure 4, requiring more significant reductions in GHG emissions, as would be the case to achieve the Paris Agreement's long-term goal of limiting global average temperature rise to below 2°C above pre-industrial levels.

- Emissions that occur outside the municipal boundary because of activities taking place within the municipal boundary—i.e., due to the consumption of goods & services (**scope 3**).

Figure 8 shows the relative contribution of different sources of GHG emissions to a typical municipality's overall carbon footprint in Alberta—the size of the bubble indicates the average quantity of emissions per capita. Carbon embedded in the goods and services consumed within, but produced outside, the municipal boundary is, by far, the largest source of emissions.

Figure 8: Typical carbon footprint of a municipality in Alberta



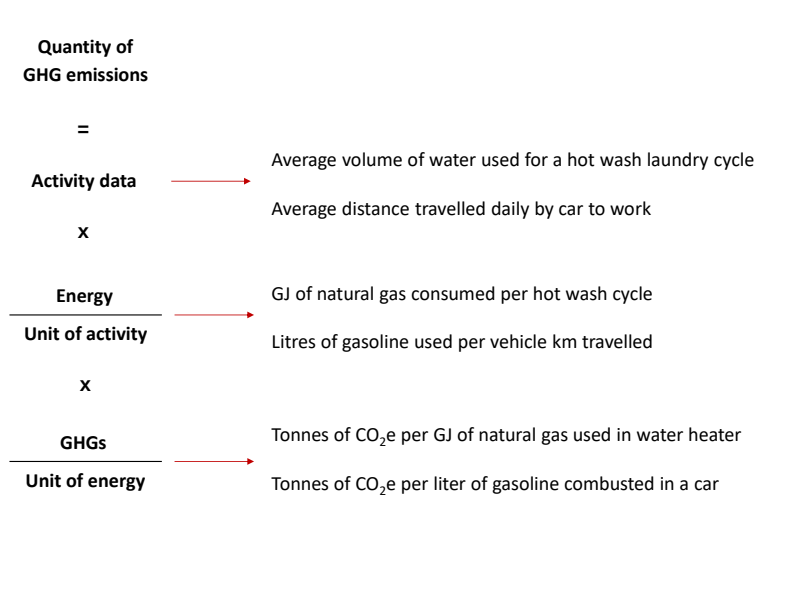
Emissions occurring because of the use of grid-supplied electricity within the municipality are the second largest source (i.e., scope 2 emissions). Scope 1 emissions—encompassing energy use across a range of sectors inside the municipal boundary—represents the third largest source of GHGs—most notably, energy use by various forms of personal transport and types of buildings, and the release of methane (CH_4) from waste management.

Reduction Strategies

In general, for most sources of GHG emissions, the total mass released to the atmosphere is the product of three factors (as shown in Figure 9):

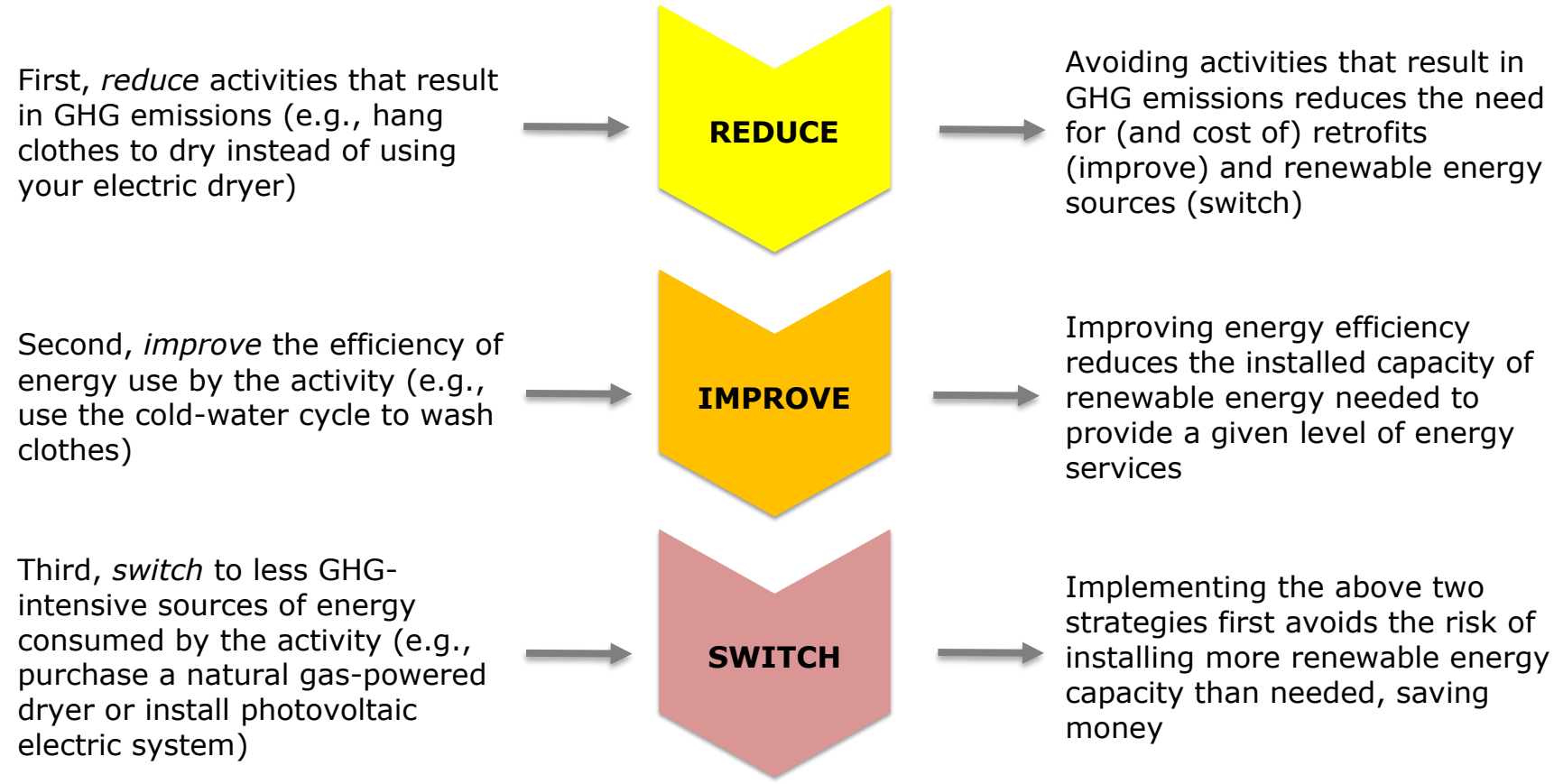
- Activity data (quantitative measures of a level of activity that results in GHG emissions);
- The energy intensity of the activity (a quantitative measure of the amount of energy used to perform an activity); and
- The carbon intensity of the energy used (the mass of GHGs released per unit of energy combusted).

Figure 9: Calculating the quantity of GHGs emitted



Sometimes, the latter two factors are combined to form an "emissions factor", which directly measures the mass of GHGs emitted relative to a unit of activity.

Each factor that determines the total mass of GHGs emitted by a source can be targeted with a specific reduction strategy, which collectively form a hierarchy (from top to bottom) for managing a municipality's carbon footprint:



At the workshop, people were divided into small groups, with each group instructed to identify actions that could be implemented—individually or collectively—in their municipality to reduce GHG emissions from four key sources: buildings (residential, business, not-for-profit and institutional), consumer goods and services, personal transport and waste management.

People were asked to identify actions across all three emission reduction strategies—reduce, improve and switch. Actions identified by people at the Red Deer workshop are provided in Figure 11.

The same groups were next tasked with evaluating the identified actions along two dimensions (by placing their actions in a matrix like that shown in Figure 10): (1) the degree of control or influence they individually or collectively have concerning the action; and (2) the number and significance of barriers to the wider adoption of the action in the community. Results of the evaluation are shown in Figure 12.

Figure 10: Matrix for evaluating GHG reduction actions

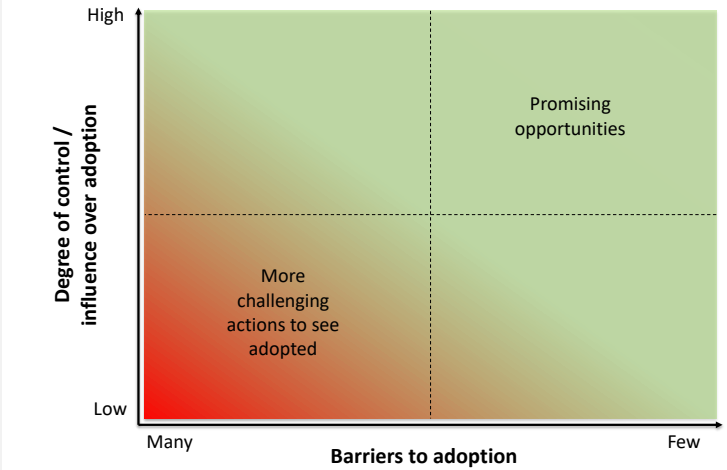


Figure 11: Individual and collective GHG mitigation actions identified at workshop

(a) Buildings		(b) Consumer goods and services	
○ Source locally and choose products with low carbon footprint ○ Lower temperature of spaces unused ○ Lighting policy – for all lights in building to be turned off at night ○ Water conservation – e.g., faster showers, full loads for dishwasher and laundry, reduce car washing ○ Build less - use space more efficiently and densify (build vertically) ○ Small-scale wind energy	○ Geothermal energy ○ Small-scale solar PV ○ Rain water cooling system ○ Consider building orientation during design ○ District energy ○ Individual (personal) climate control ○ Grey water recycling ○ Efficient lightbulbs & ballasts ○ Increase insulation to reduce heat loss ○ Green roofs, green architecture ○ Use less carbon intensive products/materials in buildings	○ Buy less or buy second hand (buy what you need and use what you buy) ○ Drink tap water with a water bottle (reusable) ○ Tool libraries & borrow tools from friends, neighbours, etc. ○ Virtual services & working from home instead of commuting ○ Grow your own food ○ Use reusable bags ○ Buy green power ○ Urban homesteading (support & educate)	○ Resist social trends (e.g., disposable fashion) ○ Reduce/improve maker spaces ○ Fix/re-build products instead of buying new ○ Repair cafés ○ Initiatives to reduce/use food waste ○ Increase support for 'closed loop' businesses ○ Create database of 'green' businesses – build recognition ○ Encourage people to purchase local
(c) Personal transport		(d) Waste management	
○ Introduce road tolls ○ Free public transportation (e.g., in exchange for donation for non-profit canned goods) ○ Car sharing (apps) ○ Telecommuting ○ National commuter week ○ Improve walkability ○ Incentives for making less trips (GPS tracking, punch pass) ○ Walk-n-roll (like Stettler) ○ 'Smart neighbours' (e.g., community food centre, no cars allowed) ○ Pedal bus	○ Stack your trips ○ Electric cars ○ Electric vehicle infrastructure ○ Driverless cars ○ Bus rapid transit and transit trains ○ Improve vehicle maintenance regimes ○ Electric bikes ○ Adoption of 'best in class' fuel efficient vehicles ○ Improve cycling infrastructure ○ Improve public transportation (free!) ○ 'Subaru dealership (passive house design)	○ Reuse/recycle construction & demolition waste ○ Donate left over food ○ Buy smart (only what you will use) ○ Sell ugly (expiring products) ○ Reduce food portion sizes or offer more options (e.g., kid's meals) ○ Buy bulk/package free ○ Reusable shopping bags ○ Generate energy from waste ○ Electric waste/garbage trucks ○ Low-flow toilets	○ Collect methane from waste water systems ○ Charge per unit of waste collected/disposed ○ Remove legal impediments to less carbon intensive practices ○ Reuse grey water ○ Less frequent waste collection ○ Expand recycling options (and what is accepted) ○ Reuse non-perishable goods, community programmes ○ Compost at home

Figure 12: Evaluation of the identified GHG mitigation actions

(a) Buildings

(b) Consumer goods and services

(c) Personal transport

(d) Waste management

Impactful Opportunities

The final activity at the workshop involved people, still in their small groups, selecting one action, or coherent package of related actions, from those identified, that the group felt would make a real difference to the carbon footprint of the municipality. Groups were free to choose actions from anywhere in their matrix, including actions that could prove challenging to take forward. For each action(s) selected, groups were also asked to identify a few 'enablers' or supporting considerations that could be part of a pathway to see the action(s) widely adopted across the municipality.

Results from the Red Deer workshop are outlined immediately below; impactful actions identified at workshops in other municipalities follow.

Red Deer

Buildings

Impactful action:

- Increase insulation in homes, commercial, not-for-profit and institutional buildings.

Supporting considerations:

- Mechanisms to encourage action: education campaign for the public; promotion of existing financial incentives being offered by EEA; provision of 'top-up' financial incentives (to leverage EEA offerings).
- Engage municipality to promote sourcing of local insulation solutions (materials, contractors).
- Advocate for the adoption of PACE by the City (may require change to Bylaws).

Waste Management

Impactful action:

- Generate energy from (organic) municipal waste.

Supporting considerations:

- Investigate sources of capital / financing for facility, including the availability of applicable incentives.
- Develop educational campaign for public, to promote relative merits of energy from waste solutions, and ultimately gain community support.
- Research and identify potential regulatory barriers.
- Research technology and location options, including a review of case studies from other, similarly sized municipalities. Also investigate potential buyers for the energy

generated and adequate sources of suitable waste streams to feed the facility (including potential partnerships with other municipalities in the region.

Consumer goods & services

Impactful action:

- Reduce food packaging and waste (by individuals and businesses).

Supporting considerations:

- Investigate the potential to relax / change rules and permissions relating to food safety that would act as barriers, including consultation with relevant stakeholders.
- Organize and host events like Feed 500, which rescues waste food from local stores and restaurants and converts it into enough meals to feed 500 people.
- Develop a better understanding of what foods are safe to eat despite appearance, storage practices etc., and educate the public on the findings. Relatedly, work with local retailers to dispel myths that 'ugly' food is inedible, and well as find alternative (consumptive) uses of such foods.
- Design, organize and host meal-planning workshops for the public, including the identification of potential partners.

Personal Transport

Impactful action:

- Enhance the cycling experience in the City ("Make Cycling Cool").

Supporting considerations:

- Investigate options to enhance Red Deer's Cyclovia event, which promotes cycling and walking for recreation and commuting on public streets.
- Design, organize, promote and host (with local bike shops) events, such as "bike repair cafes" and "build a bike from scratch workshops", as well as cycling challenges (e.g., between communities or bike shops). Also, enhance promotion of local bike clubs.
- Work with local retailers and the municipality to offer incentives for cycling – e.g., discounts or free entrance if you arrive by bicycle, prizes for getting caught cycling, stamped (cycling) cards providing free goods / services for completed card.
- Work with the municipality and interested partners to promote local cycle tours – e.g., river valley, highway-to-hill, Bower ponds.
- Develop and implement a bike pooling program for (parts of) the City (e.g., downtown).

Other Municipalities

Buildings

- Implement a Property Assessed Clean Energy (PACE) program to finance energy efficiency upgrades and renewable energy solutions for private buildings.
- Promote "smart development" (also has benefits for GHG emissions from personal transport).
- Encourage 100 per cent adoption of LED lighting for all viable indoor and outdoor applications.
- Increase the funding available for energy efficiency improvements to private buildings.

Waste Management

- "Consumption Reduction Initiative" combined with bi-weekly waste collection.
- Reduce food packaging and waste (by individuals and businesses). Also identified as impactful action for reducing footprint of consumer goods & services.
- Reduce the frequency of municipal solid waste collection.

Consumer goods & services

- "Consumption Reduction Initiative" combined with bi-weekly waste collection.
- Promote concept of, and provide support for, a "100-mile diet".
- Encourage production and consumption of locally produced food.
- Reduce potable water consumption.

Personal Transport

- Increase active transportation.
- Encourage in-fill development and increase density units in new developments.
- Rethink approach to urban design and city planning to reduce the use of private vehicles and encourage active transportation.
- Use the tax system to promote less carbon intensive transport options.

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