

# REMOTE WORK: ENVIRONMENTAL, SOCIAL & ECONOMIC OPPORTUNITIES AND RISKS

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# EXECUTIVE SUMMARY

In Edmonton, according to the [Energy Transition Strategy and the Climate Resilient Edmonton - Adaptation Strategy and Action Plan](#), the transportation sector consumes the most energy (42%), followed by commercial (23%) and residential (19%) buildings in the City. At the same time, according to Statistics Canada, 39% of jobs in Alberta have the potential to be done remotely (Statistics Canada, 2020). As many Albertans have been working from home due to the COVID-19 pandemic, it has become clear that this kind of large-scale shift in the way we work can have a significant influence on private vehicle use, congestion, commuting patterns, commercial building usage, and real estate markets. Well-formed remote work policies and programs may therefore present a tangible way for individuals and communities to reduce their energy use in both the transportation and building sectors and is a strategy that could be included in climate action plans to help reach municipal GHG emissions reduction targets.

The City of Edmonton (CoE) is leading the way, as one of the first major Canadian municipalities to develop and launch a Remote Work Program (RWP) for employees and account for the environmental benefits. Reference to this innovative program was recently included in the City of Edmonton's Community Energy Transition Plan that was revised and approved by council in April 2021.

*The Remote Work: Environmental, Social & Economic Opportunities and Risks* was funded through the Cities IPCC Legacy Research Grant that was administered by the Alberta Ecotrust Foundation, and was delivered by the Alberta Energy Efficiency Alliance (AEEA), RFS Energy Consulting, SAIT, and Dunsky Energy Consulting. The project aimed to assess the positive and negative impacts of instituting work-from-home policies through an environmental, social and economic lens to support the CoE's RWP and its climate commitments. More specifically, some of the aspects of remote work that the research team

sought to better understand to inform the current program along with future policy included:

- What potential GHG emission reductions can be realized through remote work in the City of Edmonton?
- What social indicators should be considered to ensure a health and equitable remote work environment?
- What are the economic impacts on individuals, households and communities as more people shift to working from home?
- What information, resources and/or community feedback is required to inform future policy?

An in-depth thematic scan, literature review, and gap analysis was conducted to uncover the current state of research around remote work. Through these activities, lack of available relevant Canadian data became apparent and several prevailing themes emerged; namely, costs to employees and employers, productivity, health and safety, and training and support.





# EXECUTIVE SUMMARY

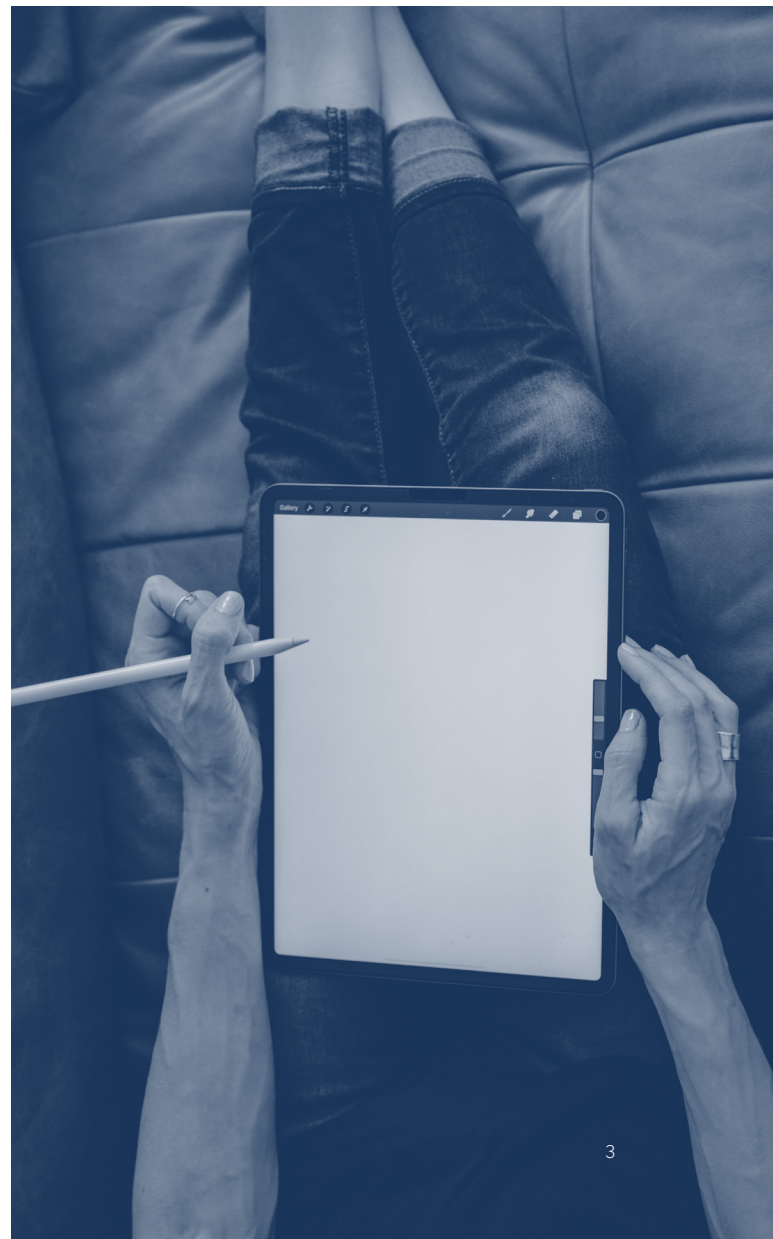
Next, the potential greenhouse gas (GHG) emissions savings through reduced commuting from CoE's teleworking policy was assessed and modelled. The results pointed to the potential for direct, commute-related reductions from the City of Edmonton (CoE)'s proposed teleworking policy to be 1,300 tCO<sub>2</sub>e / year - which is equivalent to reducing 1.5 tCO<sub>2</sub>e / per year / per employee, or taking 280 passenger vehicles off the road. While these direct effects can be estimated, the broader impacts of remote work policies on GHG emissions are still uncertain and complex. The initial analysis invites further research on indirect effects, including rebound effects, increases in home energy use, additional daily mobility, relocation, lifestyle changes, and office energy use.

An employee survey was developed for and administered to validate the themes identified through desktop research and to provide relevant and granular recommendations to CoE. The survey was sent to over 1,300 employees potentially eligible for permanent remote work and provided a wealth of information on productivity, mental and physical health, household costs, and barriers to program adoption.

Benchmarking against other Canadian municipalities was identified as key in reducing barriers of adoption and increasing internal support for the RWP. Through CoE outreach, over 20 municipalities from seven provinces across Canada expressed interest in collaborating and sharing information on remote work policy, and the informal Municipal Working Group (MWG) was established. The immediate and overwhelming response itself indicates the need for benchmarking and information-sharing between communities as 'back to work' looms post-COVID and employees across Canada demand additional flexibility.

The City of Edmonton's existing program, along with the information and recommendations

outlined in this report, can provide other Canadian communities with a helpful starting point to developing and implementing remote work policies that include social, environmental and economic considerations and best practices. Remote work programs that are designed to maximize the benefits and weigh and mitigate the risks, have the potential to contribute significantly to reducing GHG emissions at a community level through reduced transportation, and can be integrated into municipal climate action plans as a tangible tool for reaching energy and GHG reduction targets both locally and nationally.



# BACKGROUND

The Cities IPCC Legacy Research Grant Program aims to help advance knowledge around how the City of Edmonton can become an energy sustainable and climate resilient city. This resiliency requires efforts of all residents and organizations, and the jarring effects of the pandemic provide an opportunity to look at policy development and the behavioural pattern shifts required to meet these goals.

The COVID-19 pandemic had an extraordinary impact on the way our economies function, the way we move around our cities, the way we interact with people, and the way we work. The digital revolution was put to the test as we came to rely on technology to retain our jobs. The onset of telework as a way of life opens doors to explore the effects of this new world, many of which have received little attention thus far in research or policy development. The lack of available resources to guide organizations and employees successfully and efficiently through telework, along with the desire to evaluate future effects, prompted a localized review of the economic, environmental, and social benefits and risks of telework policies in Canada.

The City of Edmonton (CoE) is a leader in flexible work policy and practice exploration and offered a valuable opportunity to further research telework by building upon existing resources. Prior to the pandemic, the city conducted a study with external partners on options for facility usage, IT infrastructure needs, remote work options, and internal restructuring to promote a more flexible workforce. While these results were presented and reviewed by the city, the pandemic quickly forced a “temporary” remote work order in March 2020. The most important measures became physical distancing and a return-to-work plan for employees and facility usage, thereby focusing attention on a permanent remote work program to aid in the transition. Surveys of employees and executive leadership personnel, along with feasibility study recommendations, jurisdictional

scanning, and external analysis by multiple task teams formed the basis of a formal Remote Work Program for “out-of-scope” and management-level employees which launched in October 2020.

This research is designed to complement and support the City of Edmonton’s RWP with additional data, analysis, and feedback from employees on the impacts of remote work. Recognizing that any new policy or program can potentially have both positive and negative impacts, and that these could be environmental, social, or economic in nature, the research team developed preliminary research questions using these three lenses as a guide. The rationale for this approach, and its assumed significance to the City, is described below:

**Through an environmental lens, the research sought to understand the potential GHG emission reductions gained by reduced commuting by municipal staff to align with the City’s Energy Transition Strategy and Action Plan and contribute to the goal of reaching carbon neutrality by 2050 (City of Edmonton, 2021). Research conducted prior to the COVID-19 pandemic did not consider the potential emissions reductions that telework could provide at the scale and pace that we have seen over the past year and a half. In April 2020, according to the International Energy Agency (IEA) “major cities saw a drop in rush-hour congestion of 65% to 95%” as telework was mandated. The environmental impact of telework provides an opportunity for the city to reach energy transition goals and formulate new habits that promote climate resiliency.**

**By evaluating the economic implications, the City would have a better understanding of potential shifts in costs associated with teleworking for both the municipality and**

# BACKGROUND

its staff, including the potential for reduced urban infrastructure costs due to shifts in building usage patterns.

Finally, the research team wanted to understand the social impacts of telework, including benefits, best practices, as well as any potential risks from a climate justice perspective. According to a report, titled "Energy Costs and the Canadian Households", 21.2% of Albertans are in a state of energy poverty (Fraser Institute, 2016). If employees are required to work from home, employers need to understand the potential socioeconomic challenges staff may face (internet access, family responsibilities, higher energy bills, adequate space etc.) to ensure efforts to reduce GHGs keep potential impacts to vulnerable groups at heart.

It was anticipated that recommendations from this research would support the City's current policy planning and development efforts around telework, and would also assist future climate adaptation and emergency preparedness planning and measures if future climate or health events require telecommuting as we have seen through the COVID-19 pandemic.

As the research themes were intentionally broad, the focus of this initial project was to provide a high-level overview of central themes within remote work, with an in-depth analysis of select social, economic and environmental impacts.





# OBJECTIVES

This research was designed to help inform the City of Edmonton of the risks and opportunities (economic, environmental, and social) associated with a municipal work-from-home policy. The expected contributions of the research included:

- A comprehensive scan of the benefits and drawbacks of implementing a work-from-home policy, with a focus on key social, environmental, and economic considerations;
- Preliminary calculations for potential transportation-related GHG emissions reductions from increased telecommuting;
- Estimated transportation GHG impacts for a percentage of residents of Edmonton switching to remote work based on data from publicly available sources;
- Recommendations for energy efficiency education strategies, such as an Energy Efficiency Work-from-Home Guidebook to minimize the energy burden on staff; and
- A set of recommendations and best practices to inform future policy that can be enacted quickly in the face of future climate or health-related events.



# PROJECT PARTNERS AND KEY ACTIVITIES

## Alberta Energy Efficiency Alliance (AEEA)

The Alberta Energy Efficiency Alliance (AEEA) is a diverse, member-based non-profit society with a mission to advance and maximize energy efficiency in the province of Alberta. The Alliance creates forums for members and non-members to collaborate, increases knowledge of energy efficiency practices and opportunities, and acts as a common voice for energy efficiency support in the province. The goal of the AEEA is to reduce the barriers to the adoption of energy efficiency technology and activities, recognizing that there is a need for all orders of government, businesses, non-profit organizations and individuals to realize the benefits of energy efficiency.

With over 40 members currently, AEEA members represent a vast array of trades, skills, and positions within the energy efficiency industry including utilities, municipalities, independently-owned businesses, service providers, educational institutions, engineering firms, and Alberta industry associations. AEEA brought together a number of its members to deliver the *Remote Work: Environmental, Social & Economic Opportunities and Risks* research project. Each member was selected for their specific strengths, knowledge and experience.

The role of AEEA in this project was that of grant administrator. Activities included general oversight, regular updates, sign-off on change requests, and acceptance of final deliverables.

## RFS Energy Consulting

RFS Energy Consulting (RFS Energy) offers decades of experience bringing demand-side management portfolios to market across Canada. RFS Energy acted as the Project Management team on this project and was the main point of contact with CoE. Key responsibilities included all stakeholder outreach, research oversight, content and survey tool development, subcontractor management and oversight, budget and

information gathering, as well as delivery and sharing of final deliverables.

## Dunsky Energy Consulting

Dunsky Energy Consulting (Dunsky) provides strategic analysis and counsel dedicated exclusively to accelerating the clean energy transition. Dunsky has deep experience in quantifying GHG reduction opportunities from buildings and transportation, including recently modelling the impact of the City of Edmonton's work from home policy, and would lead the analysis of GHG reduction and cost savings potential from transportation and buildings for this project.

Within this project, Dunsky Energy Consulting contributed research and quantitative analysis on estimated transportation-related GHG impacts of telework for a subsection of CoE employees, as well as analysis of studies on indirect GHG impacts of telework.





# PROJECT PARTNERS AND KEY ACTIVITIES

## Southern Alberta Institute of Technology

Southern Alberta Institute of Technology (SAIT) is a renowned educational institution focused on action-based learning, solution-focused research, and industry partnerships to shape the next generation of inventors, entrepreneurs and pioneers. This project specifically involved the The Green Building Technologies (GBT) team, made up of architects, environmental professionals, industrial engineering designers and fabrication trades. Their industry experience helps ensure that projects align with the needs of private sector partners, thus transforming the green building industry in Alberta. SAIT and the GBT team value collaborations with many institutions, trade associations and non-governmental organizations.

SAIT acted as a research advisor on the project, and key activities included conducting a literature

review and gap analysis of the economic, environmental, and social impacts of telework, as well as supporting deliverable completion and review.

## City of Edmonton

The City of Edmonton (CoE) acted as the beneficiary of the research grant. Key activities included providing existing data and guiding the project team to ensure research complements existing work and objectives. All survey content, communication documents and materials, and final deliverables will receive final approval to ensure they meet CoE standards and guidelines.

Full corporate profiles for delivery partners are included in Appendix A.





# METHODOLOGY

Each project partner contributed key components in the execution of the project. Leveraging unique skill sets and competencies allowed for a more comprehensive review of the key themes within telework. A collaborative, mixed-methods approach was used to collect and analyze qualitative and quantitative data and provide project inputs. The inputs used to identify

and assess both the risks and opportunities associated with adopting remote work policies are shown in the table below (Figure 1), along with the lead organization and activity timeline. Each of these inputs, along with their own unique methodologies, are presented as subsequent sections within this document.

INPUT	ACTIVITY	PROJECT PARTNER	2020			2021				
			OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1. Thematic Scan, Literature Review, and Gap Analysis	Compile Remote Work Program data from CoE including planning documents, employee surveys, application guides, communication documents, and feedback	RFS								
	Conduct qualitative interviews and gather input via meetings from CoE stakeholders in various departments	RFS, SAIT, DUNSKY								
	Collect primary data through desktop research and a literature review of relevant sources	SAIT								
2. CoE Employee Survey	Administer a survey to CoE employees to gather both qualitative and quantitative data on salient remote work topics	RFS								
3. GHG Emissions Analysis	Provide calculations for potential GHG emission reductions from reduced commuting associated with remote work	DUNSKY								
4. Municipal Benchmarking	Engage several major Canadian municipalities to gauge landscape of remote work research, policies, barriers, and opportunities	RFS								

Figure 1: Partner Inputs and Activities.

# INPUT 1: THEMATIC SCAN, LITERATURE REVIEW AND GAP ANALYSIS

## Overview

The goal of the first project input, Thematic Scan, Literature Review, and Gap Analysis, was to uncover the current state of program development, identify emerging research on select topics, and highlight gaps in knowledge and data which would be useful in making recommendations on remote work policy. Key activities related to this input included gathering Remote Work Program details and context from CoE, engaging SAIT to conduct a literature review of relevant sources on remote work, and completing a gap analysis to refine key topics within the three core project themes; economic, social, and environmental impacts of remote work.

## Methodology

### A. THEMATIC SCAN

Building upon the initial research questions, RFS Energy collected sources through a preliminary scan before engaging SAIT. These documents created a starting point for the literature review and initial conversations with CoE.

To better understand the relevance of remote work to CoE, the project team gathered data and insights through in-depth discussions and document sharing with CoE. Documents included previous studies contracted by CoE, key messaging documents shared with leadership, all RWP guides and application documents, webinars provided for CoE employees, high-level employee data, available transportation and GHG emissions data, and qualitative information on the current state of the RWP at the CoE. Key topics of consideration emerging from this engagement included support and training, equipment costs, productivity, IT infrastructure, health and safety (including mental health support), culture and engagement, and communication. These topics provided the initial guide for further review of resources conducted by SAIT and would also feed

into the development of the employee survey, where the CoE RWP is further discussed.

### B. LITERATURE REVIEW

Guided by the initial thematic scan, SAIT conducted a thorough literature review on the topic of remote work, including both Canadian and international sources both current and pre-pandemic.

The following considerations were made before the literature review began:

- As Dunsky focused on the potential GHG emissions reduction related to transportation, the literature review focused less on environmental aspects of remote work.
- To provide as much up-to-date information as possible, focus was placed on more recent research sources aside from a few that remained highly relevant. One example is a report from 2014 observing a Chinese travel agency that implemented a remote work program and closely monitored its performance over the course of 9 months (Bloom et al., 2015).
- Less focus was placed on the building and infrastructure aspects of remote work to remain within scope of the project.
- Productivity was identified as a key topic due to prominence in available research and initial CoE feedback, as well as the notion that productivity as a resource would be an important economic consideration for employers.

The data was organized into three categories based on preliminary research themes: *social*, *environmental*, and *economic*.

The social category includes impacts such as health and safety, training and support, team collaboration, innovation, and communication.

# INPUT 1: THEMATIC SCAN, LITERATURE REVIEW AND GAP ANALYSIS

The environmental category, mainly researched by project partner Dunsky, includes aspects such as energy usage, GHG emission reductions, and also building footprint and retrofit considerations.

Finally, the economic category pertains to the financial and operational aspects of remote work including productivity and costs related to equipment, facilities, and utilities.

## Gap Analysis

Using the data collected from the literature review, SAIT conducted a gap analysis to compare these research findings with CoE's most recent employee survey (version dated June 2020) and Remote Work Program guide (version dated September 2020).

The broad spectrum of topics is partially illustrated in Figure 2.

The variety and depth of each topic presents many paths for future research, however the scope of this project necessitated focus on key topics within each theme. The gap analysis highlights current research on the following topics:

### Economic

- Equipment, Facility, and Utility Costs
- Productivity

### Environmental

- Transportation-related GHG Emissions Reductions<sup>1</sup>

### Social

- Training and Support
- Health and Safety

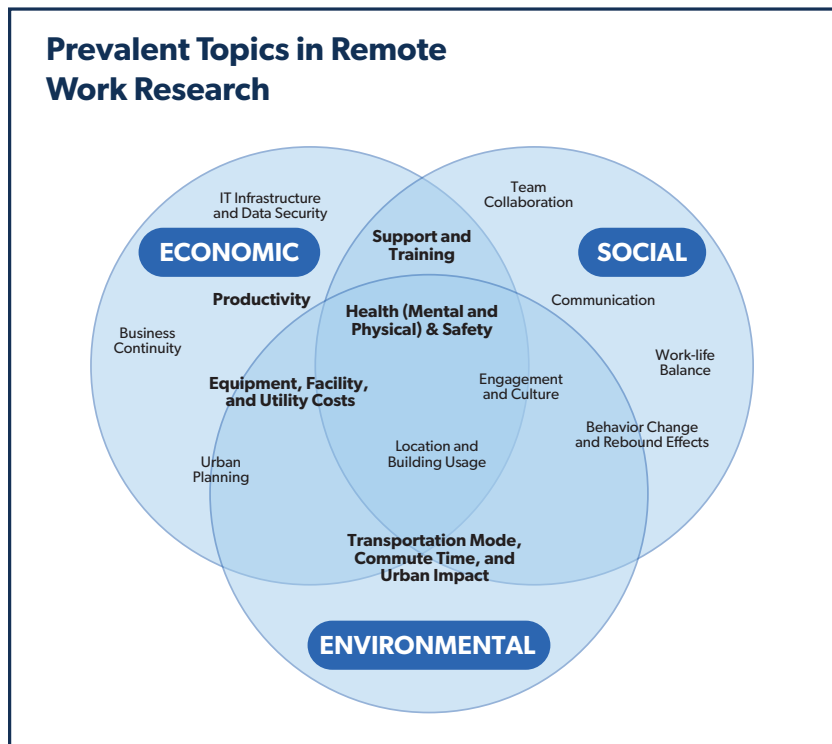


Figure 2: Prevalent Topics in Remote Work Research.

<sup>1</sup> Completed by Dunsky Energy Consulting. See Input 3: GHG Emissions Impact Analysis

# INPUT 1: THEMATIC SCAN, LITERATURE REVIEW AND GAP ANALYSIS

## Key Findings

Several recommendations emerged from the project's data collection phase and are outlined below in relation to the 3 project themes:

### A. Economic Considerations

#### COST SHIFTS

For the purpose of this document, the cost category has two contexts: employee cost and employer cost. The first pertains to costs incurred on employees as they adjust to, set-up for, and practice remote work. These costs predominantly include equipment, supplies, and utilities. Of the three stated cost sources, equipment and supplies were expressed as concerns in the July 2020 CoE Work from Home employee survey. The majority of research found recommends offering financial support in some way to employees, whether that be a reimbursement program, equipment that can be "borrowed" to be used remotely and returned at termination, or one-time spending limits. It is also recommended that this resource be tailored by role and/or individual need, as some employees/business units will require more resources and/or preparation than others.

Second, the scope of employer costs more widely varies compared to employee costs. One example mentioned in the survey response was the restructuring of the communications network to properly support the increase in company network usage. It is highly possible that changes like this will need to be made to some extent for the majority of businesses implementing remote work programs, and this is not limited to IT systems; buildings and spaces will similarly require changes. As large organizations shift to remote work, each of these changes will incur some kind of cost. As a result, it is highly recommended that changes be forecasted and identified as early as possible to allow for financial planning. Furthermore, using IT infrastructure as an example, it is possible that internal business units may need

to change or adapt to the new needs presented by remote work programs. This can include the hiring of more IT support and changes (i.e. mergers) to departments to allow for continuity of productive work.

Lastly, survey responses and research alike consistently expressed employees' gratitude for the added time and financial savings from the reduction of commuting.

#### PRODUCTIVITY

Overall, research confirms the popular theory that working remotely maintains or improves productivity. Many survey responses also stated that focus and task-completion rates improved. That being said, results are dependent on several factors, as explained below.

The most difficult factor to quantify is a person's demeanor and work ethic. While some people thrive on working alone and motivating themselves, others struggle, and this is rarely consistent as most people have fluctuations in motivation. The ability to focus can be dependent on the individual or a variety of external factors. Nevertheless, overall research sources remarked that telework circumstances had a direct affect on productivity.

Environmental factors and type of work are examples of external factors that can be easily linked to remote work success and productivity. Environmental factors include the physical work space and its surrounding elements, including family and other residents sharing the employee's space. Distractions, comfort, level of stress, and more are all direct results of how a workspace allows an employee to perform. When undistracted, employees and management reported an increase in productivity as they were able to maintain focus and more efficiently complete tasks when they were in the office surrounded by colleagues. Alternatively, both research and survey responses mention that the

# INPUT 1: THEMATIC SCAN, LITERATURE REVIEW AND GAP ANALYSIS

reduction of commute time had a positive effect on productivity as this added time in their day allowed them to better take care of tasks outside of work which reduced stress felt while working.

Another factor in productivity analysis is considering the type of work being performed. Some duties are amenable to remote work while others might be less so, or even impossible. Examples of ideal work include IT, research, certain education, writing, banking, and any work that is heavily computer-dependent. Examples of less ideal work include retail, certain sales, organizing very large groups, or work that requires access to a specific location and/or resource. While this may seem obvious, the type of work being performed should be reviewed and planned for prior to being included in a remote program and policy to ensure employees can effectively perform work duties. Another option is to create different levels within the policy that address this difference in scope of work by addressing their individual needs.

One final topic that is important to consider when encouraging employee productivity is a suggestion several research sources made: flexibility. Some of the research sources engaged and interviewed employers who had previously developed and implemented remote work programs within their organizations. In doing so, they have collected information on their experiences through employee feedback and observation. From this, many companies who successfully implemented programs during the 2020 pandemic stated they will continue offering remote work after the pandemic is finished, the majority of which leaned towards a split or “choice” schedule where portions of the week, month, or other amount of time are split between home and office. In doing so, nearly all parties stated they will likely implement a split work schedule where employees will alternate between working from home and commuting to the office throughout the week. Reasons for this include

employee satisfaction (thus higher productivity), and reduced leasing, maintenance, and resource costs.

## **B. Social Considerations**

### **TRAINING AND SUPPORT**

Of the topics discussed in the Gap Analysis, training and support was the most relational to other topics. Both research and survey responses stated that proper training and support is integral for setting both employees and management up for success in the large-scale adjustments associated with remote work.

Of all the training categories, technological training was requested the most in survey responses. IT infrastructure, new tools, and new processes (i.e. internet connectivity, multiple communication platforms, virtual meetings, virtual work phones, etc.) have changed how employees work day to day and additional, ongoing support is required.

### **HEALTH AND SAFETY**

It should be noted that the effects of COVID-19 on remote work practice differ from those under normal, non-pandemic circumstances. Mental health was an extremely common topic throughout both research and survey responses, and many sources state that the global overtone of uncertainty is directly in relation to how people are perceiving remote work. While mental health will always have a connection to working from home due to its remote and isolated nature, the extreme circumstances of COVID-19 should be taken into consideration when discussing the severity of mental health effects of working remotely.

Similar to productivity, a person’s demeanor, physical capabilities, and environment can have large effects on their health when working from home. Whether these effects are positive or negative is largely dependent on the person and their environment. Certain parties in research

# INPUT 1: THEMATIC SCAN, LITERATURE REVIEW AND GAP ANALYSIS

expressed safety concerns due to circumstances at home such as domestic violence or poverty, and traditionally speaking, commuting to an office or external location for work provided an escape. On the other hand, certain individuals with physical disabilities stated remote work was an improvement as their home was better outfitted to meet their needs. Prior to referring an employee to such a program, these circumstances should be considered when possible; this may depend on the employee's comfort or ability to disclose sensitive information.

Regarding mental health, research and survey responses both suggested maintaining communication between co-workers to aid with the feeling of isolation and remoteness. This can be achieved through message boards, chat software, and video calls, among other strategies. Furthermore, organizing social events was also suggested (more so in survey responses), such as in the form of recurring lunch sessions or monthly online group social meetings. Contrarily, a noteworthy amount of survey responses reported an improvement in mental health while working from home as certain social stresses had been removed, implying not all effects are negative.

Finally, regarding physical well-being, research suggests considering the environmental conditions of employees' home workspaces. While the majority of office spaces are maintained and cleaned, the same may not be true for people's personal circumstances outside of work areas. On the other hand, certain office spaces may be housed in buildings with poor indoor air quality where an employee can open a window at home. There may be more noise at home or it can be significantly more quiet than in an open office space. These conditions, depending on severity, can have large impacts on an employee's health. This effect is called sick building syndrome (SBS) and can include any effect a building and its spaces might have on its occupants. As research at this stage of the project was concentrated on

other topics, further research is recommended to prepare appropriate health guides, programs, policies, and support for employee health in relation to their workspaces.

## C. Environmental Considerations

While the literature review and Gap Analysis focused less on environmental considerations due to Dunsky's role in producing preliminary GHG emission reduction analysis, there were some resources that point to environmental considerations as they overlap with economic considerations. Several research sources observed cost savings for employers as office space use declined, the largest example being that energy and water usage shifted to employees' homes. To best maximize these potential GHG emission reductions, office space should be retrofitted or designed to support low-traffic periods. Examples include motion-sensored and scheduled lighting systems, and efficient heating and ventilating systems. As a whole-building example, the implementation of more robust, or smarter, building management systems (BMS) that have the capability to be programmed in advance for different building use scenarios can significantly reduce the wasted consumption of building resources.

The thematic scan, literature review, and gap analysis allowed the project team to determine what information is available to guide CoE in their continued development of the RWP as well as learn about topics that weren't prevalent in initial discussions. As it pertains to this project, relevant information and resources gathered in this phase were used as the basis of survey development, engagement with municipalities, and deliverable development. Additionally, the initial research and subsequent source updates provide a strong base for moving forward with additional research on recommended topics in the future.



# INPUT 2: EMPLOYEE SURVEY

## Overview

An employee survey was developed in collaboration with the City of Edmonton to ensure the project provided tangible results to support management through the evolving path of remote work. As a national leader in this field prior to the pandemic, CoE had commissioned and completed feasibility studies and surveys on flexible work options such as hoteling space, activity-based remote work, and space-planning policy effectiveness. This documentation, in conjunction with stakeholder meetings and feedback on process and methodology, helped the research team gauge where additional support was needed. Specifically, the objective of this employee survey was to build upon existing work done by the city and provide a current snapshot of the positive and negative factors affecting CoE employees' remote work experience.

## Methodology

Themes uncovered through literature review and gap analysis were used to guide the development of survey questions. Building upon external research allowed for comparison and validation of theories on topics such as employee productivity, workload and hours, organizational support, equipment and energy burdens, and work-life balance within remote work.

CoE provided results and methodology from previous engagement surveys as well as the Flexible Work Practices survey used in development of the RWP. The content was used to refine potential survey questions and determine change in attitudes, challenges, and opportunities as mandated remote work continued. The structure of the survey was designed to follow previous templates as well as elicit candid responses and anecdotes.

The survey was distributed in March 2021 to 1,300 out-of-scope<sup>2</sup> and management-level employees representing multiple divisions and diverse working groups including City Operations, Integrated Infrastructure Services, Employee Services, Financial and Corporate Services, Corporate Strategic Development, City Manager's Office, Citizen Services, Communications and Engagement, and Office of the City Auditor. A third-party survey administrator was used to ensure compliance with CoE privacy practices.

Multiple-choice survey questions covered topics such as number of direct reports, number of unionized staff, adults in household, dependents in household, and CoE department. These answers will provide CoE with a more granular picture of their employee base and be presented in a focused report.

Question type, structure, and phrasing was a collaborative effort amongst experienced CoE teams as well as project partners. As such, the design focused on reducing survey fatigue amongst employees, collected pointed information about items specific to CoE, and grouped together themed statements on remote work.

While including demographic data in the survey questions was seen as a way to assess telework policies and programs through a social equity lens, we were not able to include demographic markers (age, ethnicity, gender etc.) due to FOIP considerations. Although the CoE out-of-scope employees do not necessarily represent a diverse cross-section of Albertans or Canadians due to the clustered nature of their employment responsibilities and compensation, there are differences in personal situations that could promote social equity if explored further (i.e. age groups feeling different burdens that may not be represented at the time of policy development).

We were not able to collect comprehensive/statistically significant information on changes

<sup>2</sup> Defined as those employees whose work is excluded from a bargaining unit or union for reasons as defined by the Labour Relations Code

# INPUT 2: EMPLOYEE SURVEY

in home energy use (such as utility bill data and behavioural patterns) through this survey, as these types of questions were seen to be too intrusive. The survey did, however, include an open-ended question about energy use where survey respondents could voluntarily share anecdotal information about home energy use.

## Key Findings

The survey returned over 900 responses and 3,378 comments within open-ended question formats. The mixture of multiple choice, open-ended, and agreement level questions allowed for a clear analysis of statistics related to Remote Work Program participation, costs, and commute, yet also provided insight into more subjective categories such as team collaboration, meeting effectiveness, productivity, physical and mental health, and work-life balance. Results from 5 key questions are presented below as they correspond to the highest survey comment

rate, represent key themes in background research, and link to recommendations for policy development or future research.

## A. City of Edmonton Remote Work Program: Current Participation Rates

As organizations look to formalize remote work policies in the coming months, key motivations and barriers to participation should be reviewed. The City of Edmonton's formal Remote Work Program launched in October 2020 and is continuously accepting applications for permanent remote work status. As of survey completion in March 2021 roughly 250 applications have been received. The survey asked employees about specific reasons about their application status as well as giving the opportunity to provide insight as to why they had not applied (Figure 3).

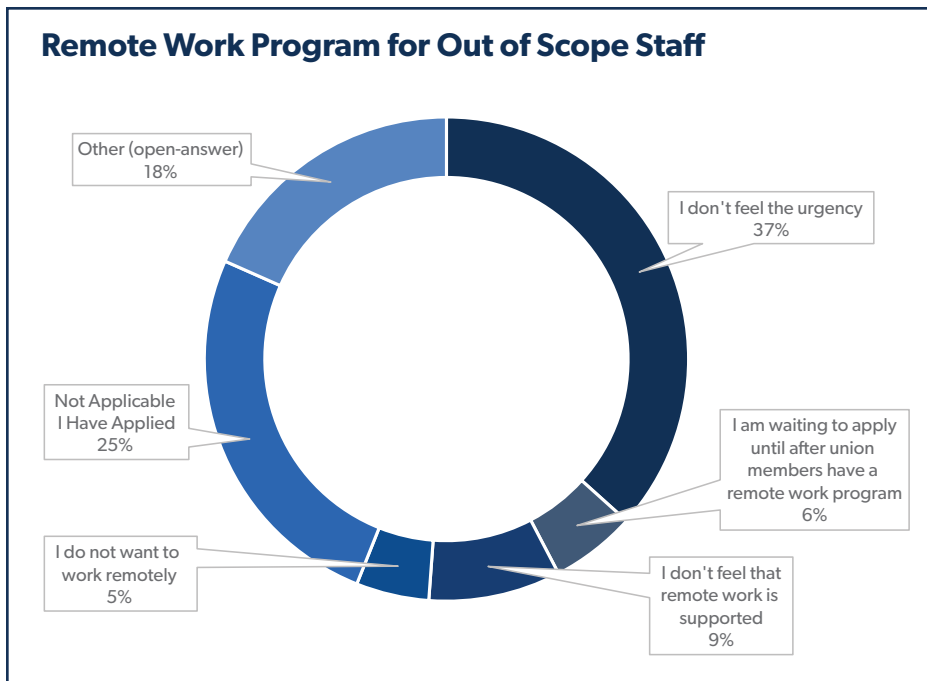


Figure 3: Have you applied for or are you currently enrolled in the Remote Work Program for Out of Scope Staff?

# INPUT 2: EMPLOYEE SURVEY

“I’M INTERESTED IN THE FLEXIBILITY OFFERED BY THE REMOTE WORK PROGRAM. I WOULD NEED TO SEE WHAT IS BEING OFFICIALLY COMMUNICATED POST-COVID IN TERMS OF ENCOURAGEMENT FOR WORK FROM HOME AND SUPPORTS FOR MANAGERS AND EMPLOYEES ALIKE.”

While employees are still under Covid protocols and await clarity on additional safety measures, there is an understandable lack of urgency to apply to the program. Value can be found in the segment of respondents (18%) who provided comments on individual context, questions, and suggestions for RWP participation.

## Key Findings

- Clarify which employee groups are eligible to apply for the program. Many employees who work on teams with in-scope employees value transparency on whether their team is able to participate.
- Evaluate working remotely vs. managing remotely, and if some categories will have different options and supports.
- Clarify whether primary work location would be forfeited. The stability and comfort of having a desk and personalized setup is an asset for some employees.
- Develop clear parameters around mandatory days in-office vs. working remotely, and elaborate on if these can be changed at any point.
- Develop clear language around permissible work locations and duration at each location. This should encompass CoE locations as well as locations outside the employee’s residence (such as cabins, coffee shops, or co-working spaces).
- Ensure there is consistency across leadership groups in the promotion and approval process of the program.
- Use the same language when fielding questions or providing information to employees about the program. Develop a strong resource base for supervisors to deal with nuances that may arise.

# INPUT 2: EMPLOYEE SURVEY

## B. Potential to Enhance Remote Work Experience

Employees were asked what items positively impact their remote work experience. The question was crafted to gauge efficacy of current practices while also eliciting suggestions for improvement through the comment option. Respondents provided scores pointing to both immediate action items and larger-scale reform of policies incorporating flexible hours and locations to enhance their work experience. As the CoE builds upon previous work in flexible work practices, these scores and corresponding employee feedback can help form policy decisions on flexible space and hours, tool implementation, and equipment allocation. Scoring was on a scale of 1-5, from which averages were taken and scaled for analysis (Figure 4).

### Key Findings

- Consistent access to IT support and CoE systems has been a challenge, but adaptive

solutions have been found. The learning curve with new tools and processes seems to be flattening. Maintain a strong communication connection to IT teams security, equipment, and application issues. A ticketing system or issue log can help leadership decide if additional support or compensation should be discussed.

- Funding for ergonomic equipment could be a consideration in benefits packages, not just a policy.
- Remote work has allowed employees time to find productivity tools and techniques that work for them. Consider developing a forum where these tools can be shared, and be flexible with implementing solutions that are presented by employees.
- There isn't a one-size-fits-all solution for remote work arrangements. Ensure managers are equipped with as much information about where they can provide their employees leeway within a policy to accommodate individual and team needs.

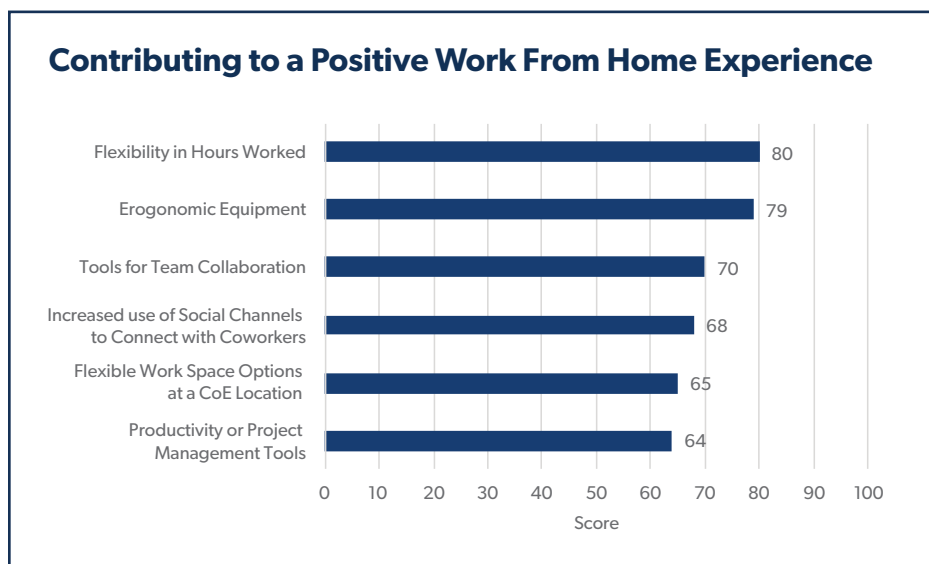


Figure 4: From the list below, how impactful are each of these items in contributing to a positive work from home experience?

# INPUT 2: EMPLOYEE SURVEY

## C. Employee Insights: Tips for Effective Remote Work

“THERE IS A PEACE OF MIND THAT ALSO COMES WITH BEING IN YOUR HOME WHEN IT WOULD OTHERWISE BE EMPTY ALL DAY. I’M ABLE TO WATCH OVER THE LARGEST ASSET I OWN, I CAN MEET A DELIVERY PERSON, I’M IMPACTING THE ENVIRONMENT FAR LESS. IT IS CERTAINLY A NET POSITIVE TRANSITION.”

The survey asked employees to provide their own tips for a positive and effective remote work experience. Over 533 responses ranged from candid personal insights to tips that could be shared to help their team or organization. The responses below provide a summary of major buckets within this survey question.

- Book shorter meetings. Instead of 1 hr, use 30 min to allow yourself time to prepare before and digest after.
- Segregate “task time” and “meeting times” where possible and communicate this plan to your team. Don’t answer your email or messenger during task time or you’ll find you have to reschedule it.
- Ask yourself if you’re “checking in” with team members because you want them to know you’re there or because you need their support or input. Everyone has a different plate and distractions, even well-meant, can disrupt flow quite easily.
- Stand up and walk around every hour. Set a timer and stick to it.
- Explore digital tools to help you learn, even if your team doesn’t use them. Ex: Mural for whiteboard process flows and pomodoro for focused work time.
- Invest in good computer hardware (camera, speakers, light adjustment). The amount of time spent on meetings warrants quality setups.
- Like working in an office, we still need to practice and maintain good work ethics including respect, integrity, self-motivation, responsibility, accountability and discipline while working remotely.
- Enjoy hot lunches and the time to step away from your computer as you would in the office.
- Use the scheduling function for email. People have a hard time not responding right away, but that doesn’t mean it should be encouraged. Respect for others is paramount as we blend personal and professional lives.



# INPUT 2: EMPLOYEE SURVEY

- Set response time expectations because it often feels like people are expecting a response within minutes.
- Where possible, find an “accountability partner” on your team or in your organization.
- Use task-tracking tools rather than time-tracking tools.
- Ask leaders to clarify their expectations. Everybody is in different shoes and they may think they’ve been clear with their goals when you think they’re fuzzy.
- Focus on outcomes-based performance as opposed to ‘hours worked’ performance. Set clear deliverables and associated deadlines with team members. Team members agree to the objectives and deadlines based on their work style and own productivity level, and then as a leader I back off, check-in on progress where warranted, offer support where required, and trust that my out-of-scope staff can manage their own competing priorities to deliver on time.
- Continue to learn from leaders who are working in industries that are very used to remote work - IT, Healthcare, national & multinational organizations where leaders have reports in different regions.
- Enable conversations; setting and re-setting for clear performance is going to be more critical than ever.
- Use a shared calendar and be aware of deadlines, other priorities of team members, and time blocked off for focused work.
- Replace your commuting time with something you couldn’t otherwise do. Spend time with your family or pets, read a book, listen to music, and then approach your work with a positive attitude.





# INPUT 2: EMPLOYEE SURVEY

## D. Cost Impact on Employees

“WHILE THE UTILITY BILLS HAVE INCREASED SOMEWHAT, IT HASN'T BEEN OVERLY BURDENSOME AND IS MORE THAN OFFSET IN THE SAVINGS ON TRANSPORTATION COSTS.”

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“I CAN'T SAY HOW MUCH IS LINKED TO ME WORKING FROM HOME OR HAVING MY KIDS AT HOME DURING THE SCHOOL SHUT-DOWNS. AND EVEN SO, IT'S NOT ENOUGH OF AN INCREASE TO DETER ME FROM WANTING TO WORK FROM HOME. ANY INCREASE IS STILL OUTWEIGHED BY THE DECREASE IN COMMUTING COSTS.”

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“COST HAS INCREASED BUT NOT A CONCERN, I BELIEVE THIS TO BE INCLUDED WITH THE OPPORTUNITY TO BE FLEXIBLE.”

# INPUT 2: EMPLOYEE SURVEY

Costs related to remote work can affect both employees and employers. As companies are looking at remote work arrangements, important points to consider will be the balance of remote and office work, the potential reduction of costs that could be seen through enacting policies, and employee satisfaction, comfort, and safety. The greatest cost impacts reported through the survey responses are utilities (87) home office supplies and equipment (83), the impact of reliable broadband upgrades (72), and childcare (47). While transportation scored the lowest (6), it should be noted that employees were not asked if costs had increased, but to rate on a sliding scale the observed changes in household costs (Figure 5).

## Key Findings

- A flexible work plan could be designed to include flexible spending (with re-working of overall benefits) and incentives based on the individual needs.
- Costs are partially transferred- less eating out at downtown restaurants means more spending on groceries, decreased wear and tear on vehicle is transferred to home appliances, transportation costs are partially transferred to utility bills and home comfort expenses.
- The amount of office supplies used before was not necessary and should be considered as a cost reduction for the employer.
- Overall, any increase in costs is negligible when compared to the benefits of working remotely.

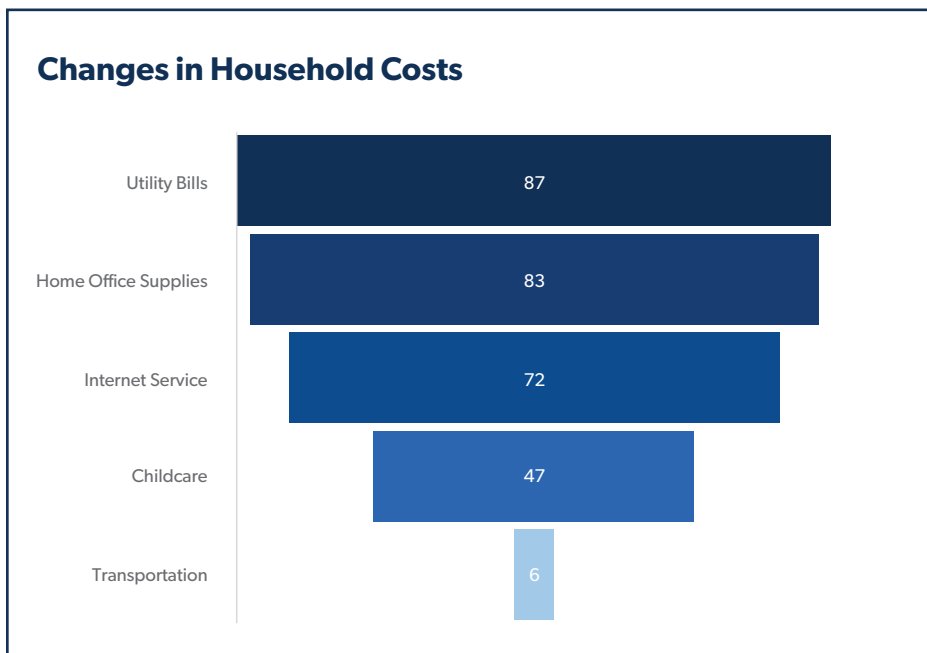


Figure 5: While working from home, have you experienced any changes in household costs related to the following categories?

# INPUT 2: EMPLOYEE SURVEY

## E. Employee Pulse: Overall Experience with Remote Work

“BEING FORCED TO FIND NEW WAYS TO COLLABORATE AND ENGAGE TEAMS HAS PROMOTED MORE PROBLEM-SOLVING IN OTHER AREAS. ADAPTING HAS LED TO A NEW WAY OF THINKING”

Employees were asked to score the amount they agreed with a series of statements commonly referenced around remote work (Figure 6). While each topic warrants its own discussion, the theory was to gather a relative “pulse” on how CoE employees have experienced remote work. No additional context was provided in the survey, but an option to comment on any of the statements was given. This section garnered 824 comments from employees and provided a wealth of experiential information.

### Key Findings

- While individual productivity has increased (76/100), and employees believe their teams are monitoring productivity well (92/100), there is a fear of group productivity waning without interaction with other groups or divisions. However, there is a greater opportunity to cross-collaborate when you don’t need to coordinate meetings in a physical space, and this concern could be mitigated by promoting cross-collaboration and sharing of information and accomplishments across teams.
- Virtual meetings allow you to learn more about people as you tangentially enter their home. This is comforting for some and stressful for others. Consider being flexible with the use of

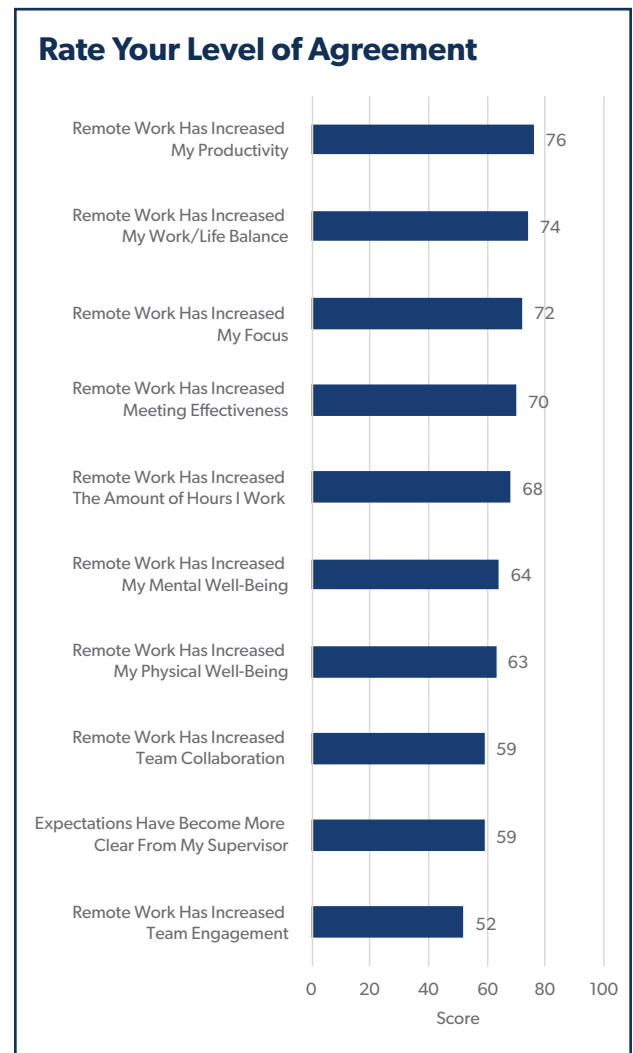


Figure 6: Rate your level of agreement with the following statements.

# INPUT 2: EMPLOYEE SURVEY

camera settings and backgrounds to ease this concern.

- The ability to “read a room” has diminished, and with that some insights and vulnerability are lost. Moving forward, consider having in-depth and sensitive discussions in person to maintain the human aspect.
- Mental and physical health are strong concerns that, although layered with the impact of Covid, should be addressed by employers and supervisors at each level. Support systems for these concerns should be clearly provided to each supervisor and reinforced on a regular basis.

The results of the CoE employee survey provide validation on the feasibility of a permanent remote work policy. Suggestions from employees, combined with resources from external research, provide an actionable path towards employee and employer satisfaction. Once the permanent program is in place, possibilities arise surrounding how the CoE can further benefit from the new environment of remote work. The following section introduces a key benefit and call to action in the measurement of GHG emissions related to working from home.

“WITH THE FLEXIBILITY TO ADJUST MY HOURS, AND HAVING MY WORKSPACE AT MY FINGERTIPS, I FIND THAT I END UP CONTRIBUTING MORE “VALUE” TIME THAN I WOULD NORMALLY IF I HAD TO COMMUTE TO THE OFFICE TO DO THESE TASKS. I ACTUALLY DON’T MIND WORKING A BIT MORE, AS THE ADDITIONAL TIME THAT I WORK COMES FROM THE TIME THAT I SAVE FROM COMMUTING. SOME OF THAT SAVED TIME GOES TO MY LOVED ONES AS WELL, SO EVERYONE BENEFITS.”

# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

## Overview

The project sought to quantify the potential greenhouse gas (GHG) emissions savings through reduced commuting from CoE's teleworking policy. As described in Edmonton's Change for Climate declaration, the City's ultimate goal is to define a path for "transitioning from 19 tonnes of emissions per person per year to 3 tonnes per person per year by 2030".

The following section has been prepared by Dunsky Energy Consulting - Refer to Appendix C for a copy of the complete report.

**The potential for *direct*, commute-related reductions from the City of Edmonton (CoE)'s proposed teleworking policy is 1,300 tCO<sub>2</sub>e / year.** These reductions are a result of anticipated reductions in staff commutes to and from work, and are further described in section 2.2 below.

The reader should note that this assessment of *direct* reductions – the scope of our work – does not account for indirect impacts.

- **The indirect GHG impacts of teleworking are uncertain and complex – particularly in the long term.** The literature suggests that indirect impacts of teleworking could significantly reduce commuting GHG savings, or even *increase emissions* (Hook et al, 2020), as represented in Figure 7.
- A recent study conducted for the French government (ADEME and Greenworking, 2020) – presented in a following textbox – found that a shortlist of rebound impacts (increased daily mobility, home relocation, teleconference use, home energy use) could *reduce* the direct GHG savings from commuting by 31%. The study emphasizes that these results are preliminary, as several important rebound impacts (e.g., new long-distance mobilities) are expected to materialise in the mid-to-long term and could significantly alter the net GHG impact of teleworking

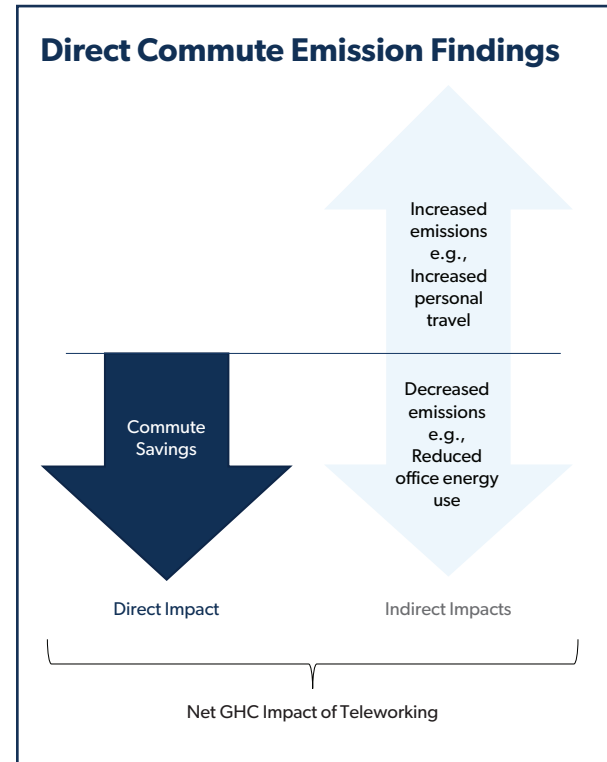


Figure 7: Illustration of Potential Net GHG Impacts of Teleworking.

# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

– potentially generating net increased GHG emissions.

- Overall, we believe that the magnitude of indirect impacts could reduce, offset, or even reverse direct emissions savings. While the City of Edmonton is pursuing a teleworking policy for a broad set of reasons (social, economic, environmental), it would be premature to conclude both the magnitude *and directionality* of the net GHG emissions impact from teleworking.

As mentioned above, our study focused on quantifying the direct commute savings from CoE’s new policy. The key results of this modelling are presented in Figure 8 and Figure 9.

- **The pre-COVID commute of all City employees represents direct emissions of 14,900 tCO<sub>2</sub>e per year.** This is equivalent to 1.5 tCO<sub>2</sub>e / per year / per employee, roughly 9% of an average Edmontonian’s emissions (City of Edmonton, 2019).
- **Implementing a teleworking policy would reduce direct commuting GHG emissions by 70% for teleworking employees.** This would reduce their average commute emissions to an estimated 0.5 tCO<sub>2</sub>e / per year – a 1.08 tCO<sub>2</sub>e / per year saving per employee. However, as noted previously, the rebound impacts could offset those savings significantly.
- **Edmonton’s teleworking policy could reduce direct commute GHG emissions by 1,300 tCO<sub>2</sub>e / year.** This represents a 9% reduction in CoE employees’ direct total commuting emissions, as not all employees are eligible or will choose to telework. This direct commute emission saving is equivalent to taking 280 passenger vehicles off the roads.

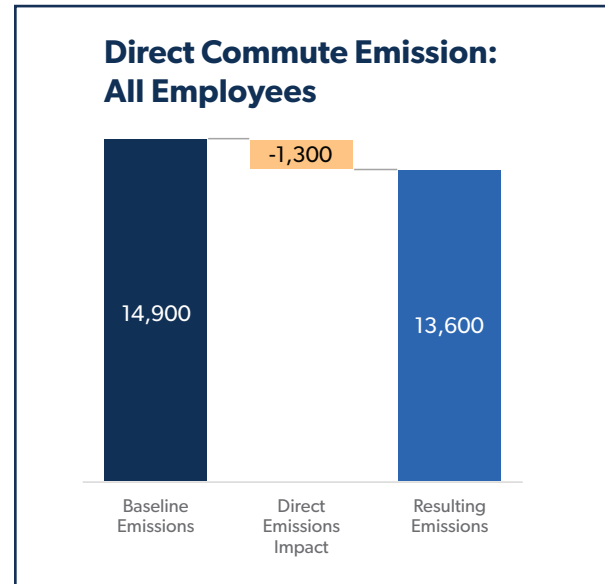


Figure 8: Direct Commute Emissions: All Employees (tCO<sub>2</sub>e/yr).

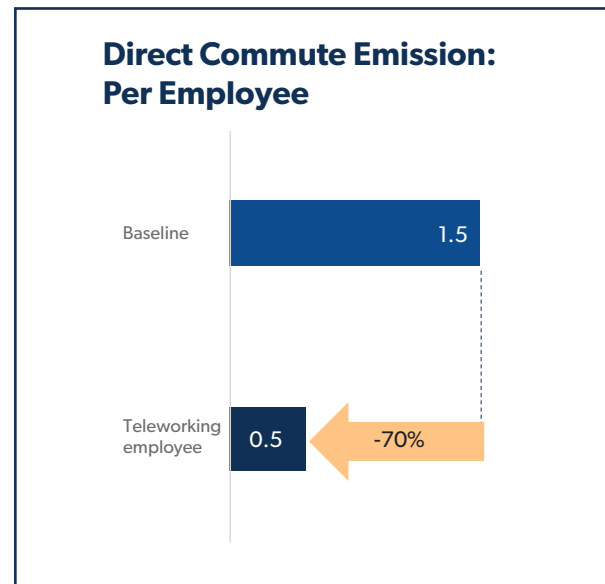


Figure 9: Direct Commute Emissions: Per Employee (tCO<sub>2</sub>e/yr).



# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

## Indirect Effects of Teleworking: An Unclear Long-Term View

A 2020 study by the French Ecological Transition Ministry and greenworking sought to identify and quantify potential rebound effects of teleworking on GHG impacts. The study finds that **the rebound effects from teleworking are numerous and varied; and that several effects which**

**currently have little impact may become more significant in the mid-to-long term.**

Figure 10 presents key effects identified, as well as their impact (notionally or as a percentage of commute emission savings, considered the primary direct effect of a teleworking policy, and estimated at 271 kg CO<sub>2</sub>e/ weekday in this study). Negative values decrease emissions; positive values increase emissions.

EFFECT	EXAMPLE/DESCRIPTION OF EFFECT	ESTIMATED IMPACT ON GHG EMISSIONS (% OF COMMUTE EMISSIONS)
Direct Impact		
Commute Reduction	Reduced commute to the office, as employee works from home.	-100%
Indirect Effects (short-term)		
Office Energy Use	Office energy use decrease as employees work from home, sometimes leading to downsizing.	-2.4% to -107%
New Daily Mobility	Increased daily non-work travel by employee or family members (e.g., due to car being available).	+24.9%
House Energy Use	Increased energy use at home on teleworking days.	+7.6%
Video Conferencing	Increased video conferencing use.	+1.1%
Relocation	Employee moves further from work, increasing distance on commute days.	Null in short-term; may significantly increase emissions in long term
Indirect Effects (long-term)		
Traffic Congestion	Reduced commuting at AM/PM peak may reduce congestion and related emissions.	May reduce
Virtual Professional Network	Reduced internal and external work trips (e.g., to visit clients, attend conferences).	May reduce
New Long Mobilities	Increased weekend trips and/or long-distance leisure travel.	Could significantly increase in long term (e.g., +400%)
Extended Professional Ge-ographic Zone	Occasional much further work-trips, as teleworking allows professionals to cover larger catchment area.	Could increase in long term
Increased Purchasing Power	Economic savings from commuting reallocated to carbonized purchases.	Could increase in long term
Increased Home Surface	Increased home footprint for home office use (construction, increased lighting / heating).	Could increase in long term
Centralized Headquarters	Closing of regional offices, creating longer occasional commute for regional employees.	Could increase in long term
New Equipment	Purchase of additional equipment (e.g., computer, second monitor).	Undetermined
Digital Work	Reduced paper / office supplies-use due to virtual office.	Undetermined
Lifestyle Changes	Variety of effects, from reduced food waste to increased e-commerce purchases.	Undetermined

Figure 10: Indirect Effects of Teleworking.

# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

## Methodology

Our high-level methodology, used to quantify the potential GHG emission savings through reduced commuting from the City of Edmonton’s teleworking policy, is described in Figure 11.

The calculation methodology relies on three key sets of input assumptions, which are described in the following sections:

- **Employee Characterization**  
How many employees does the City of Edmonton have, and how do they commute?

- **Emissions intensity of commute modes**  
How polluting are the different modes of transport that Edmontonians use to commute?
- **Expected Policy Uptake**  
How many employees are expected to take advantage of the policy, and how many days per week would they telework?

As noted previously, indirect and rebound effects were not included in our scope of work; as such, the emissions impact reported herein is limited to *Direct Emission Reductions*.

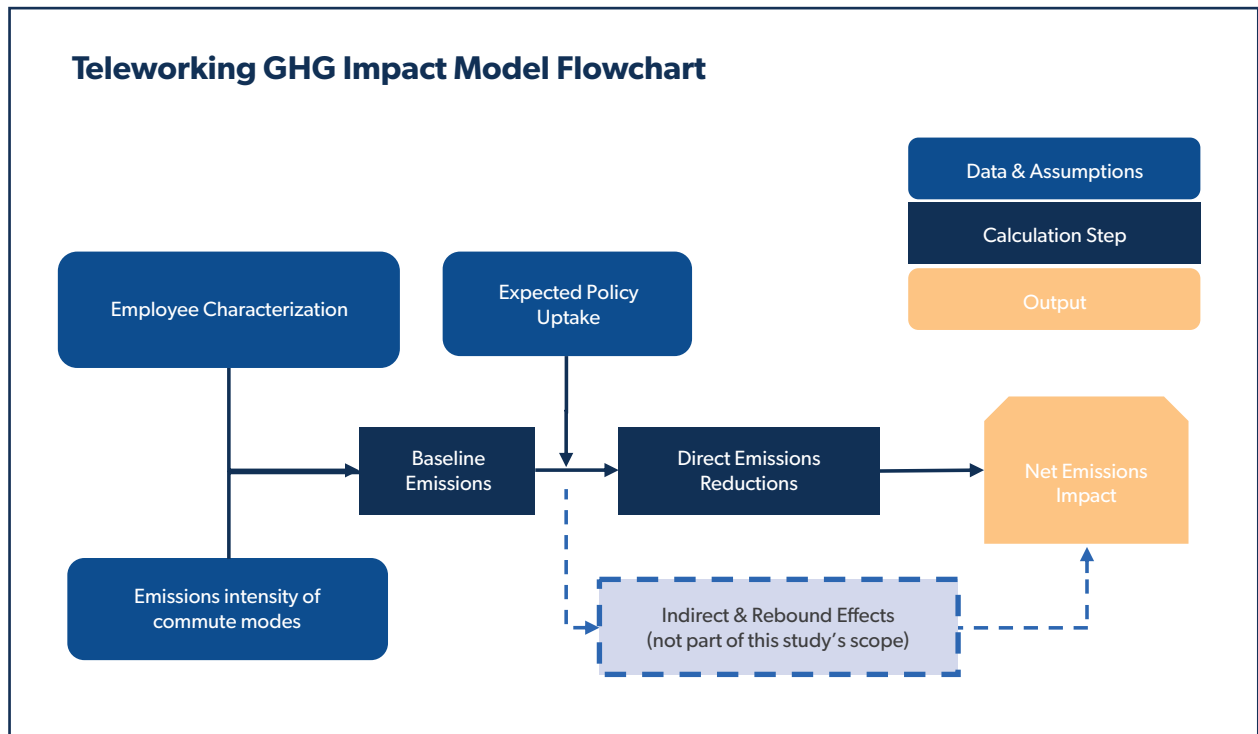


Figure 11: Teleworking GHG Impact Model Flowchart.

# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

## GHG Impact Potential

This section provides a high-level discussion of the major findings from our analysis, regarding the potential direct GHG impacts of the policy.

## Employee Characterization

In our analysis, we used Statistics Canada’s 2016 Census to characterize the typical city employee commute (average trip length and mode distribution), based on the usual journey to work in Edmonton.

As shown in Figure 12, most journeys to work in Edmonton (81%) are completed with passenger vehicles (car, truck, or van). The next most prevalent journey to work mode is public transit (12%), followed by active transport (5%). Using a passenger vehicle is also the highest emitting mode of travel in Edmonton, emitting an average 0.00024 tCO<sub>2</sub>e per passenger-kilometre travelled - almost double the emissions intensity of public transport. This high emissions intensity is in part due to the low occupancy of passenger vehicles. According to Statistics Canada, the average passenger vehicle occupancy in Edmonton’s commute is 1.07 persons by car. This means that the vast majority of Edmontonians who drive to work are alone in their car. As a point of comparison, this occupancy is similar to other Canadian cities like Calgary (1.07), Toronto (1.09) and Winnipeg (1.10) (Statistics Canada, 2017).

For the two reasons stated above - largest mode share and highest emissions intensity - **passenger vehicle journeys (by car, truck, van) are the highest source of transportation GHG emissions amongst employees’ commutes.** As shown in Figure 14 (Interest in Teleworking on next page), this mode represents 92% of employees’ transportation emissions.

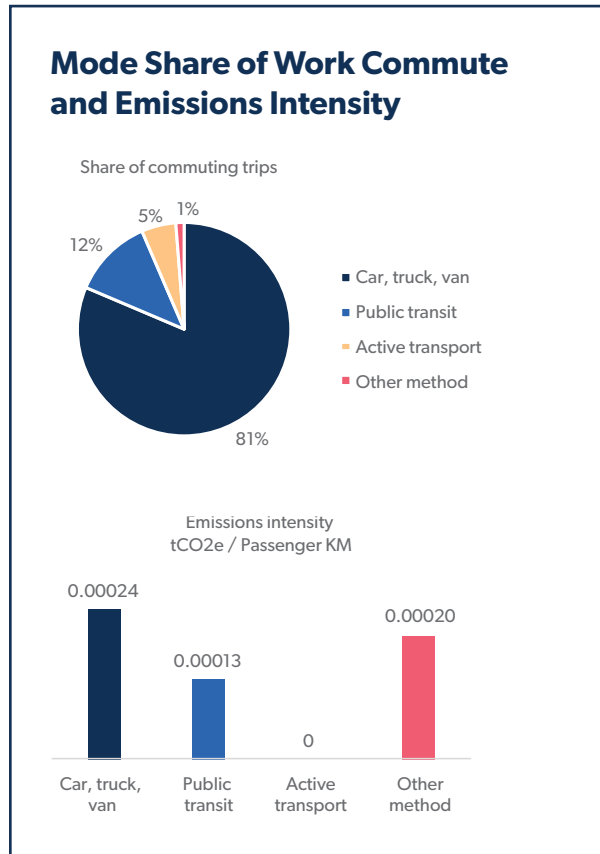


Figure 12: Mode Share of Work Commute (% of commute trips, Edmonton) and Emissions Intensity (by Mode)  
Source: StatsCan Census 2016.

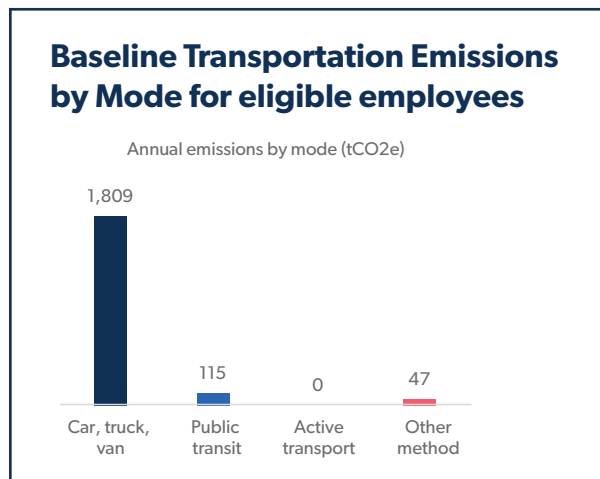


Figure 13: Baseline Transportation Emissions by Mode for Eligible Employees.

# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

## Policy Impact

In our model, we assume that the Remote Work program will lower direct commute emissions by reducing the number of days eligible employees commute to work. We assume that on days when teleworking employees do work from the office, their typical daily commute will stay the same. In our model, the direct commute impact of the policy therefore depends on three factors:

- How many employees are eligible for the policy;
- The proportion of eligible employees who will take advantage of the policy; and
- How many days per week, on average, participants will work from home.

To estimate the expected policy uptake, we used the results of the Flexible Work Practices Survey, conducted by the City of Edmonton in 2020. As shown in Figure 14, most respondents in the survey (94%) declared they would work remotely one or more days per week under the policy. Based on these results, we have estimated that 1,196 of the 1,272 eligible employees would participate in the program; and that eligible employee commute days would be reduced by 66% annually.

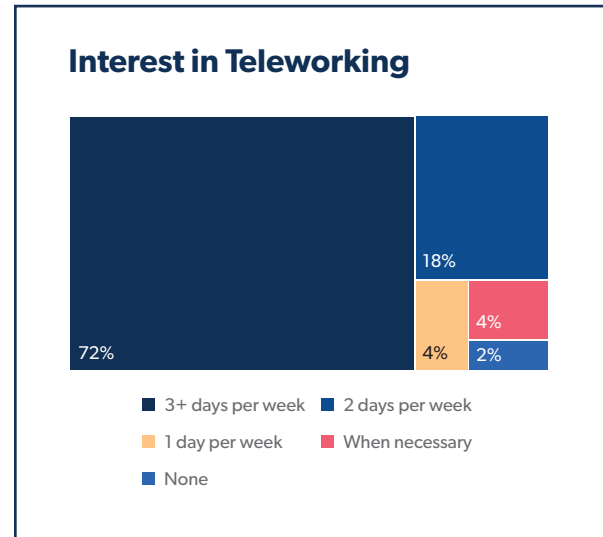


Figure 14: Interest in Teleworking (COE Flexible Work Practices Employee Survey, 2020).

# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

## Key Data Sources / Assumptions

This section presents the key data sources and assumption used in our analysis of direct commute emission savings.

- **Number of employees (total & eligible for the policy):** provided by City of Edmonton.
- **Commute mode and average distance:** Statistics Canada, 2016 Census of Population, Edmonton.
- **Emissions intensity of modes**
  - **Car, truck, vans:** Calculated based on Edmonton Motorized Vehicle Registrations (Government of Alberta, 2020); Natural Resources Canada's Comprehensive Energy Use Database (Transportation Sector – Alberta) for fuel consumption and share of trucks on the road (Natural Resources Canada 2019); and Canada's national inventory report (NIR) (Government of Canada, 2020) for emission factors.
  - **Public transit:** Calculated based on Natural Resources Canada's Comprehensive Energy Use Database (Transportation Sector – Alberta) and Alberta's electricity emissions intensity.
  - **Active transport:** Assumed to be zero.
  - **Other method:** Calculated based on Natural Resources Canada's Comprehensive Energy Use Database (Transportation Sector – Alberta).
- **Expected policy uptake:** proportion of employees using the policy and number of teleworking days from City of Edmonton report Flexible Work Practices Survey: Insights and Analysis (August 2020).

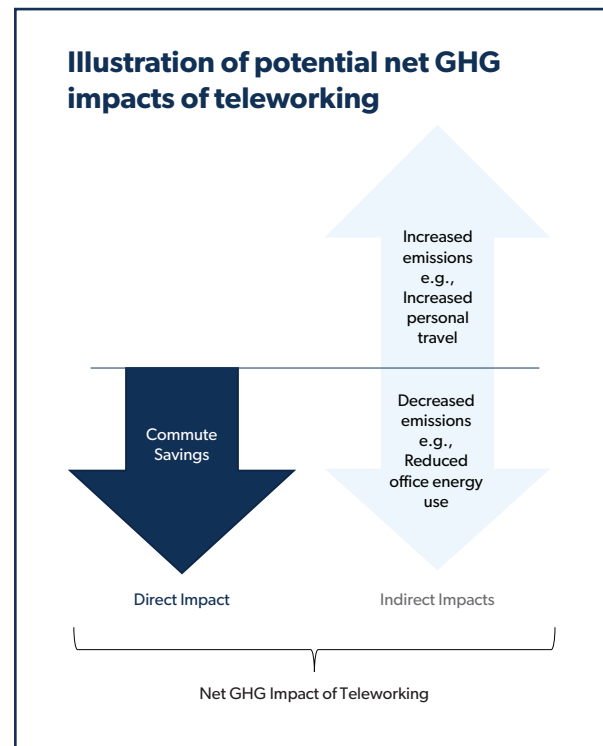


Figure 15: Illustration of Potential Net GHG Impact of Teleworking.

## Opportunities for Further Analysis in Relation to GHG Modelling

### INDIRECT IMPACTS

It is important to note that our quantitative analysis focuses exclusively on direct commute impacts (depicted as the dark blue arrow in Figure 15); but excludes rebound impacts of teleworking (depicted as the light blue arrows), which may affect net GHG savings from the policy. We recommend these factors are investigated in a follow-up research project, to draw better conclusions on the overall GHG impacts of the teleworking policy.



# INPUT 3 – GHG EMISSIONS IMPACT ANALYSIS

A summary of factors that could influence the GHG impact of a teleworking policy is presented in the textbox on page 7. As identified by Hook, Court, et al. in their 2020 systematic review of the energy and climate impacts of teleworking, the broader impacts of teleworking policies are uncertain and complex. Several studies analyzed found that teleworking will trigger rebound effects such as increased home energy use or changes to household transportation behaviour (e.g., increased car usage), which may reduce GHG savings or even produce overall increased GHG emissions.

## OTHER CAVEATS

Beyond the scope limitation discussed above, our study includes the following caveats:

- We make use of average Edmonton journey to work information from the 2016 Census rather than specific **City of Edmonton employee travel to work data**. Collecting data on the journey to work of current City staff may help paint a more accurate picture of the direct commute GHG savings of the policy.
- The **COVID-19 pandemic** has fundamentally changed many aspects of the world and may have lasting impacts over the coming years. The exact impacts are impossible to predict at this point, but considerations could include the following:
  - The City's teleworking survey was completed while many staff are already working from home, potentially skewing the results towards a higher willingness to telework permanently; this interest may wane once offices are able to re-open.
  - The latest data available for travel to work is the 2016 Census. As a result of the pandemic, some employees may look to move further out of the city with consequential increases to average commute distance. This would enhance the potential GHG reductions if those commuters chose to telework.
- The **uptake of the teleworking policy** is estimated based on survey results. The actual savings will depend on the actual uptake, which can be monitored during policy implementation.
- We do not account for **natural changes in GHG emission intensities of transportation modes** in our model. However, intensities are likely to change in the coming years due to several factors. For example, the intensities of car, truck, and van emissions, as well as public transportation, are likely to decrease, as Edmonton implements its electric vehicle (EV) Strategy and EV uptake increases (City of Edmonton, 2018). Simultaneously, plans to green Alberta's electricity grid, should reduce GHG emissions from electricity and therefore EVs (Government of Alberta, 2018). Some gas vehicle efficiency improvements are also expected.
- Beyond the rebound impacts of the teleworking policy on employee travel behaviour, **natural changes in commute modes and distances** may occur, which are not accounted for in our analysis.

# INPUT 4 - MUNICIPAL WORKING GROUP

## Overview

Building on the CoE employee survey and the GHG emission impact analysis, the concept of benchmarking against other Canadian municipalities was identified as key in reducing barriers of adoption and increasing internal support for the remote work program. The lack of recent and relevant Canadian data to inform and shape the development and implementation of remote work policies and programs was clear and demonstrated through the literature review as well as conversations with municipal representatives from across Canada.

To gather additional information related to remote work from the municipal sector the CoE

sent a note to over 35 municipalities requesting participation and data sharing on work from home policy development. The response was overwhelming with over 20 municipalities from 7 provinces expressing interest in collaborating and sharing information (Figure 16). The informal Municipal Working Group (MWG) was established as a response and currently includes communities ranging in size from St Albert, Lethbridge and Saskatoon to Vancouver, Calgary, Winnipeg, Ottawa and Toronto - representing approximately 100,000 employees across Canada. The immediate response itself indicates the need for benchmarking and information sharing between communities as 'back to work' post COVID looms and employees across Canada demand additional flexibility.



Figure 16: Municipal Working Group Participation by Province/Territory.

# INPUT 4 - MUNICIPAL WORKING GROUP

The Municipal Working Group meets regularly to share best practices, resources and discuss all topics relating to remote work. Town hall meetings were created initially to discuss the status of Remote Work Programs at a high level, but quickly morphed into a series of focused meetings around specific topics as the need for collaboration and deeper conversations became apparent. To date, meeting topics have included productivity, facility location flexibility (allowances and boundaries), and equipment costs & reimbursement, each selected based on municipal group interest.

Ahead of the first MWG meeting, participants were surveyed on the status of their respective RWP to compare to data collected from the CoE survey, determine a baseline and general understanding of the stage of RWP development of each community and the group. Survey questions included questions relating to:

- performance management systems,
- employee surveys,
- challenges in implementing a RWP,
- whether any external consultants or researchers had been involved in RWP planning, and
- whether any studies or analysis had been completed on the GHG emissions reduction potential.

## Key Findings

Collaboration between communities has flourished through the MWG with all participants at different places in the development of work from home program development. Recent Canadian polling data indicates over 80% of workers would prefer to adopt a flexible work arrangement (PWC, 2020 Canadian Pulse Survey) with municipalities being no different with over

85% of respondents on a City of Edmonton survey supporting a flexible work program.

The MWG has provided a forum to share and collaborate to ensure better programming and reduced design time per community - Anecdotally, one community mentioned that remote work was not a consideration until statistics on the number of Canadian municipalities moving forward with remote work from the group were brought back to leadership. The sharing of data enabled the senior leadership perspective to change from an “absolute no” to a “maybe” which has led to further investigation into the option of remote work for staff.

Those pushing forward with programming are trying to integrate considerations on facility planning, flexibility for employees, equity while navigating internal processes. Through discussions it became apparent that an additional barrier to adoption is the topic of remote work extending across various departments and functions within each organization, including: HR, facility management, environment and oftentimes special working groups established to address modernizing workplace culture as part of larger strategies to attract and retain talent.

Through conversation it also became clear that remote work program development not only crosses over and is led by a number of different departments depending on the community, but as best practice should include the assessment and data gathering of the following criteria:

- Location
- Eligibility
- Health, Safety & Wellness
- Financial Considerations
- Technology / Equipment
- Insurance
- Application / Approval Process

## SHARED DOCUMENTS AND QUALITATIVE FEEDBACK

Out of 18 municipalities surveyed in February 2021, only 2 had finalized RWPs that would be in place post-Covid and an additional 3 are in the process of obtaining executive buy-in and approval. All remaining responses stated interest internally to explore programming and the need to create a policy that reflects changes to the current remote work needs and expectations of employees and managers.

Program materials, and results of employee surveys were shared by 6 municipalities (includes CoE) for their respective communities. Comparative analysis proved challenging between communities with raw data sharing limitations due to privacy concerns and varying survey tool designs. Nevertheless, while raw data was not shared, the results consistently showed a desire by employees in communities across Canada to continue post COVID with some form of flexible remote workplace and consensus was that a hybrid approach could support work/life balance while maintaining or increasing productivity and employee satisfaction in the future.

The following provides a breakdown of qualitative data gathered through conversation across Canada, quantitative data gathered through surveying participants of the Municipal Working Group and shared survey data by 6 communities:

### A. Economic Considerations

#### RESOURCES, FACILITIES & EQUIPMENT COSTS

- **Performance:** Over 76% of CoE employees believe that their own productivity has increased which is the highest category increase followed by work-life balance taken from the CoE employee survey. In comparison, shared data from communities consistently

shows high levels of staff stating their personal productivity is the same or greater working from home with some communities measuring over 90% and the City of Saskatoon measuring 91% of employee respondents reporting their productivity as the same or greater working from home.

- **Perception:** 5 communities (not including CoE) in a breakout group during a Municipal Working Group meeting unanimously agreed to the statement that productivity was not a concern at the employee or manager level, but in general only at a senior leadership level. The stigma of productivity and work from home has decreased since COVID, but continues to exist especially when it comes to using tax dollars to pay municipal employee salaries and ensuring the best use of public funds.
- **Equipment:** Concerns regarding cost reimbursement for home office equipment, reliability of networks and applications, and access to shared resources were salient across employee surveys
- **Facility Space Size and Design:** The opportunity of downsizing facility space to save operational costs and retrofitting design to allow for more collaboration is under consideration by the majority of group participants. The City of Toronto has published a business and implementation plan discussing the benefits of remote work as it applies to capital assets (City of Toronto, 2020). They plan to downsize facilities by 33% over 5 years. The cost savings from lease, capital and operating owned facilities have been calculated at \$30.5M/year and \$1.2B over 25 years, and “represents 25 to 30 percent savings on current annual costs for the office portfolio, and an annual return on investment of 12 percent (once the Program is fully implemented)”.

“BY WORKING FROM HOME I AM ABLE TO ELIMINATE THE TRAVEL TIME TO AND FROM WORK, WHICH IS ABOUT AN HOUR AND A HALF PER DAY. HAVING THIS EXTRA TIME IS SO VALUABLE TO ME. I FIND IT ALLOWS ME TO GET A LITTLE MORE SLEEP, WHICH AIDS IN PRODUCTIVITY. ALSO, THIS EXTRA TIME ALLOWS ME TO EXERCISE, WHICH HELPS WITH MY MENTAL HEALTH, AND ALSO SPEND MORE TIME WITH MY FAMILY.”

~ City of Edmonton Employee

- **Community Impact:** Most communities are in the midst of assessing potential cost savings opportunities, but are concerned with the future impacts to the downtown core, implications to local businesses, and the unknown impacts on urban planning.
- **Location Flexibility:** With municipalities owning or leasing multiple facilities across their communities, the topic of flexible work locations arose through conversation, and is being considered by some communities for additional flexibility, emission reduction opportunity and reduced commuting time for employees upon return to work. This could mean that when employees do head into the office, they would have the flexibility to select the closest municipal office location instead of a traditional location that may be further and require longer commuting times and emissions output.

## B. Social Considerations

### WORK LIFE BALANCE, RELATIONSHIP BUILDING AND TEAM COLLABORATION

- **Communication:** While employees rated isolation and lack of communication with co-workers as a concern, they stated that communication with supervisors is regular. With 82% of CoE employees reporting a positive experience working from home, it is recommended that supervisors managing staff continue to ensure regular communication, but also receive additional training and new tools to better support teams and encourage co-worker engagement and communication.
- **Work Life Balance:** Other communities provided qualitative statements from staff mentioning that remote work left them feeling empowered and supported a greater sense of work-life balance goals.
- **Hiring strategies:** With many private organizations expected to take advantage of remote work cost savings post pandemic, the overall sentiment from the MWG was that



remote work could help to support hiring strategies to ensure competitiveness, including broadening of the talent pool, and additional flexibility increasing job attractiveness.

## C. Environmental Considerations

- **Value Proposition:** Through conversations, the vast majority of municipalities participating in the Municipal Working Group have indicated that the environmental benefits have been considered internally but are not the driving factor in decision-making for the adoption of a remote work program. One notable exception is The City of Toronto, which plans to reduce its total office space by 33% over the next five years under its ModernTO program and touts reduced GHG emissions as a major motivating factor behind this move.
- **Greenhouse Gas (GHG) Emission Modelling:** The majority of participants acknowledge the environmental opportunity that remote work could represent in each community, with 2 communities having quantified the opportunity and being able to share data. Another participating community in Eastern Canada has dedicated resources and time to modelling and current preliminary calculations appear to be in line with the research findings reported for the City of Edmonton.

## Opportunities for Further Research

Municipalities are leaders in their communities enabling the opportunity to lead by example in the space of remote work. The following topics have been identified as areas where further analysis and research could help to support deeper understanding and wider adoption of

remote work in communities and sectors across Canada.

- **Community Impact Analysis:** The impact that remote work has post-COVID across cities in Canada is unknown and requires additional research to assess economic, urban planning, zoning and tax implications.
- **Additional Benchmarking:** Surveying across communities, including the status of work from home programming and key factors such as:
  - Specific preferences on # of days in office vs. at home
  - Desire or need to work with specific team members, and how scheduling this collaboration could occur
  - Desire to maintain the same workspace vs. share space
  - Location preference for office, if regional choices are provided
  - Satisfaction or engagement as the state of the pandemic changes; marking the social changes against previous surveys
- **Deepened and Region-specific Modelling:** Modelling specific to each region with the integration of indirect impacts and scaling up across the community through supporting local businesses with the tools and knowledge to enable remote work adoption. Ultimately having the information to inform current energy plans and possibly integrate into long term community energy plans and municipal GHG emission targets.

What was made clear through the Working Group meetings is that one size does not fit all. Communities across Canada are at different stages of thinking, developing and rolling out remote work policies - from providing employees the option of full-time flexibility with no commitment to office time post-pandemic to

# INPUT 4 - MUNICIPAL WORKING GROUP

allowing only a small percentage of staff to remain at home permanently post-pandemic. Still other communities are opting to provide staff with the option to apply to a program with limited flexibility - where approvals are required and location preferences are limited - or where remote work is used as a benefit for staff. Communities across the country are exploring remote work as a more permanent option for municipal employees, with varying degrees of corporate support and a wide range of program details.

While the vast majority of communities across Canada are in the midst of attempting to quantify opportunities, risks, employee expectations to

plan and facilitate what back-to-work will look like for staff post-pandemic, and whether that includes telework or not. The City of Edmonton leads by example having launched their Remote Work Program for out-of-scope employees in October 2020 and including their program in the April 2021 approved [City of Edmonton's Community Energy Transition Plan](#). However, from conversation with the MWG, much work is left to be done across all Canadian communities, including Edmonton to establish a deeper understanding and quantify the environmental, economic and social impacts, and how these align with current municipal climate commitments and corporate priorities.

“THE OTTAWA CLIMATE CHANGE MASTER PLAN ‘LEADING BY EXAMPLE’ IS CRITICAL TO SET THE PACE, SPUR INNOVATION, AND CATALYZE COMMUNITY ACTION.”



# RECOMMENDATIONS

*The Remote Work: Environmental, Social & Economic Opportunities and Risks* research project funded by the City of Edmonton (CoE)'s Cities IPCC Legacy Research Grant, administered by Alberta Ecotrust Foundation, and carried out in partnership with the AEEA, RFS Energy Consulting, SAIT and Dunsky Energy Consulting, highlights an overall lack of existing Canadian data related to the positive and negative implications of remote work. Furthermore, it points to the need for additional research to effectively support Canadian municipalities and businesses in developing and adopting remote work policies and programs to maximize the associated benefits and minimize the risks.

In the aftermath of the COVID-19 pandemic, it seems that the stigma around working from home - namely that those who work remotely are not as productive as their office-bound coworkers - is changing. Employees have new expectations about workplace flexibility now that they have had a chance to experience remote work first-hand. It is anticipated that more and more employers will follow in the footsteps of the CoE and offer staff the option to work from home post-pandemic.

As we see this shift in the workforce, it is important to understand the associated economic, social, and environmental implications. The following pages summarize key recommendations that emerged from the research that were seen to be the most relevant to and actionable by the CoE. Some of these recommendations can be acted upon immediately, while others may require further research.

## Economic Considerations

The two themes related to the economic impacts of remote work that prevailed in the research were employee productivity and changes in the movement and activity of citizens in city centres - especially the downtown core.

Gaining a better understanding of the economic impacts - both those impacting the CoE directly through potential cost increases or savings and those impacting the community at large will allow the CoE to make more informed decisions around remote work policies. This is especially true when, as experienced during the COVID-19 pandemic, the City may need to enact a remote work mandate across the community quickly in response to an emergency situation such as a pandemic or a natural disaster like poor air quality from rampant wildfires.

Staff working efficiently and effectively from home can be a positive economic benefit to the CoE, opening up opportunities for cost savings from facility downsizing and/or lower utility costs due to lower energy and water usage for instance. On the flip side, there is a risk of increased costs related to resourcing if performance and productivity drop as a result of working remotely. Due to the significant potential economic benefits that the municipality could realize through increased telework, most of the recommendations in this section relate to optimizing employee satisfaction and performance to ensure continued levels of productivity remain, as outlined below:

- Identify and provide training, tools and support resources for management staff to build and manage effectively remote teams.
- Assess and possibly revise current performance management tools and practices to ensure alignment with new hybrid workplace arrangements - ensure staff has clear understanding of expectations focused around outcome based metrics. Consider implementing on-going 360 performance review systems to gain a better sense of employee performance from the perspective of direct supervisors, as well as peers and direct reports.
- Quantify staff performance and productivity through deeper analysis, including assessing

# RECOMMENDATIONS

and offsetting inequalities to reduce impacts from management staff stigma that may exist around employees who work remotely.

- Assess economic impact of remote work on both commercial and residential sectors within a community (including, but not limited to tax and zoning implications, changes in energy and water usage, changes in operational and maintenance costs of commercial properties, cost-savings on municipal infrastructure from reduced peak demand and individual purchasing habits).
- Conduct further analysis of facility usage and energy profiles to identify downsizing opportunities and retrofit considerations, as well as design adjustments to better accommodate more collaborative work space when staff are in office.

## Social Considerations

While the research highlighted several social benefits of remote work - such as greater work life balance, productivity, it also pointed to potential risks - particularly concerns related to staff feeling isolated, stressed and/or disconnected (mental health), and increases in personal costs (energy usage). It is expected that these social impacts are not experienced equally across demographic groups, or between departments or organizations - some groups may be more vulnerable to these impacts than others. The key will be to first understand, and then take into consideration data to better address the unequal nature of these impacts when developing remote work policies and programs community wide.

Key recommendations for understanding and proactively mitigating the social impacts of remote work that may be valuable to the CoE are summarized below:

- Develop proactive support systems for all employees working remotely to mitigate the potential social risks. These support systems could include developing an online information portal for staff to access free mental health resources, providing ongoing training to managers to better equip them to support remote staff effectively through regular check-ins and employee engagement activities, for instance.
- Understand and assess the impacts of remote work programs and policies on equity, diversity and inclusion (EDI) through additional and ongoing data collection. This could include conducting more in-depth surveys to a larger group of CoE employees capturing demographic information, expanding survey participation to the wider Edmonton community and/or sharing data and lessons learned through the Municipal Working Group.
- Integrate EDI considerations into existing remote work policies and programs, and reassess and update regularly, if this is currently not the process.
- Educate staff who are working remotely on how to reduce their energy use (and related costs) through energy efficiency behaviour changes by providing them with an Energy Efficiency Guidebook for Remote Work Program Participants (Appendix D), as well as information on available energy conservation programs and services.
- Consider supplying or allowing staff to be reimbursed for energy saving products such as LED bulbs, power bars and smart thermostats to offset home energy cost increases.
- Consider adopting a flexible or hybrid remote work model that includes standards around minimum or set days that departments groups meet in person to encourage collaboration, engagement and maximize the social benefits and minimize the associated risks and drawbacks.

# RECOMMENDATIONS

## Environmental Considerations

The modelling conducted by Dunskey Energy Consulting concluded that the CoE's telework policy (refer to Input 3 - GHG Emissions Impact Analysis) could reduce direct commute GHG emissions by 1,300 tCO<sub>2</sub>e / year - the equivalent of taking 280 passenger vehicles off the road. While it is clear that more comprehensive research is needed to assess the full environmental impacts of the CoE's remote work policies and programs, these initial findings point to the potential that telework could have on achieving municipal GHG reduction targets if integrated into community energy planning efforts.

Since only transportation-related environmental impacts were assessed through this research - we recommend that the CoE builds on this project and models the direct and indirect impacts on GHG emissions of (including but not limited to) changes to:

- commercial building usage (from downsizing, space redesign & optimization, energy saving retrofits);
- individual/family residential energy usage; and,
- neighbourhood-level commuting patterns.

More specific recommendations for the CoE to consider related to the environmental impacts of remote work are summarized below:

- Integrate indirect impacts such as facility management (and related operational GHG emissions) and neighbourhood commuting patterns throughout residential areas into GHG models and potential savings calculations.
- Outline the environmental best practices of telework most relevant to CoE and identify appropriate standards for facility downsizing, space usage and re-design post pandemic.

- Develop and share tools and knowledge that will guide Edmonton businesses and residents in adopting their own work from home practices.
- Further analyze energy usage at an individual level to more accurately assess the impacts of remote work on community energy targets; and generate additional modelling specific to each region with the integration of indirect impacts and scaling up across the community through supporting local businesses with the tools and knowledge to enable remote work adoption.
- Use GHG savings calculations and data related to remote work to inform current community energy planning and consider how to include telework as an activity that can help achieve municipal greenhouse gas emission targets.

## Remote Work Across Canada

What became clear through this research project, from the desktop research, to the employee surveys and the Municipal Working Group, is that remote work in some form is here to stay. Not only is there a lack of relevant data for Canadian municipalities and businesses to draw from, but because they had to pivot so quickly to having staff working remotely due to the COVID-19 pandemic, they lacked the time, resources and capacity to develop thorough policies and programs that take economic, environmental and social factors into consideration in their design.

Recommendations on how the CoE, as a national leader, can continue to meaningfully contribute to building effective remote work policies and programs at a national level are summarized below:

- Continue to support and participate in the Municipal Working Group to facilitate information & resource sharing, minimize



# RECOMMENDATIONS

duplication and encourage the adoption of remote work across Canada.

- Benchmark remote work data across a variety of Canadian communities and share results between jurisdictions to contribute to building Canadian data and optimizing policy and program development.
- Assess and lead potential broader overarching support at the national level to ensure communities across Canada support not only civic employees, but also residents and businesses in developing, adopting and scaling up telework across Canada by sharing resources and lessons learned.

Further conversation, analysis, modelling, and research remain essential for communities across Canada, including the City of Edmonton, to realize the full environmental, social and economic benefits of remote work. Additional research will help to understand and reduce adoption barriers by informing policies and program design and ultimately increase corporate buy-in by municipalities and the greater business community across Canada.

The City of Edmonton's existing program, along with the information and recommendations outlined in this report, will provide other Canadian communities with a helpful starting point to develop and implement remote work policies that include social, environmental and economic considerations and best practices. Remote work programs that are designed to maximize the benefits and mitigate the risks have the potential to contribute significantly to reducing GHG emissions at a community level through reduced transportation, and can be integrated into municipal climate action plans as a scalable, tangible tool for reaching energy and GHG reduction targets both locally and nationally.



# Appendix A: Project Partner Information

## Alberta Energy Efficiency Alliance Corporate Profile



Established in 2007, the Alberta Energy Efficiency Alliance (AEEA) is a diverse member-based non-profit society with a mission to advance and maximize energy efficiency in the province of Alberta. Our members include utilities, municipalities, program designers and implementers, educational institutions, training organizations, engineering firms, product and service providers, and other Alberta industry associations. The Alliance creates forums for members and non-members to collaborate, increases knowledge of energy efficiency practices and opportunities, and acts as a common voice for energy efficiency support in the province. The goal of the AEEA is to reduce the barriers to the adoption of energy efficiency technology and activities, recognizing that there is a need for all orders of government, businesses, non-profit organizations and individuals to realize the benefits of energy efficiency.

# Appendix A: Project Partner Information

## RFS Energy Consulting Corporate Profile

RFS Energy Consulting (RFS Energy) specializes in research, design, and planning advisory services to forward climate change policy and action across Canada. The organization prides itself on being an equal opportunity employer currently guided by strong female Indigenous leadership.

Together the team at RFS Energy offers decades of experience designing and delivering municipal and province-wide residential, rural and remote, low-income and business programming across Canada. Core competencies include implementation and marketing, procurement design and facilitation, energy efficiency and remote work policy and program subject matter expertise, strategic advisory support, and program management.

Leveraging the team's years of program management and implementation experience, RFS Energy is focused on translating planning, design and research into impactful and sustainable action to reduce greenhouse gas emissions in Canada by:

- Supporting utilities and governments across Canada in moving planning to program design through to procurement and in-market launch;
- Working with think tanks and academia to move research to action; and
- Advising municipalities on steps to move plans from concept to implementation planning and procurement development.



**RFS ENERGY  
CONSULTING**  
RFS. ENERGY

# Appendix A: Project Partner Information

## Dunsky Energy Consulting Corporate Profile



Dunsky Energy Consulting is a leading Canadian firm specialized in the design, evaluation and analytical support of leading climate change and energy initiatives across North America. Founded in 2004, Dunsky's staff has extensive experience in identifying and assessing greenhouse gas (GHG) emission reduction and energy efficiency opportunities, whether they involve new technologies, advanced industry practices or innovative market strategies. Dunsky's work includes assessing energy savings opportunities (through appropriate deemed savings, algorithms or energy modelling); conducting GHG reduction potential studies (as well as measure-specific market opportunity studies) for clients across Canada and North America; conducting cost-effectiveness analyses using the full array of industry tests; designing effective programs to accelerate market adoption of low-carbon opportunities; and advising clients on complex regulatory and policy issues. Over time, Dunsky has developed a broad array of low-carbon strategies, ranging from very deep, bottom-up assessments to light, top-down reviews. Dunsky's practice covers both Canada and the U.S. Within Canada, we have supported governments at all levels (municipal, provincial, and federal) and across all geographies. Our municipal work has targeted climate and energy planning for communities of all sizes, from remote, rural communities (such as those across Newfoundland and Quebec), to the nation's largest innovator cities (such as Toronto and Montreal).

Our expertise is focused primarily on energy efficiency and demand response, renewable energy, and climate change. Specifically:

- **OPPORTUNITIES ANALYSIS:** We help our clients evaluate opportunities related to GHG emission reduction, energy efficiency and demand response, whether they

involve new technologies, advanced industry practices or improved market strategies such as financing and building labelling.

- **STRATEGIES & POLICIES:** We help our clients develop effective strategies and policies to promote energy efficiency and mitigate climate change. We advise clients on strategic planning, including defining policy, regulatory and evaluation frameworks, setting goals, determining first principles, choosing threshold criteria, measuring results, and establishing effective management and delivery infrastructures.
- **PROGRAM DESIGN & EVALUATION:** We help our clients design, implement and evaluate cutting-edge programs, with an aim to helping them achieve their goals and enhance their offerings moving forward.
- **STAKEHOLDER FACILITATION:** We are known for our clear communication with stakeholders, facilitating sessions with everyone from policy makers, to subject-matter experts, to the general public in a clear, compelling way that goes beyond consultation to real engagement.

Our work has covered all market sectors and segments, including municipal services, high performance buildings in the residential and commercial/industrial sectors, and community energy. In all that we do, we take a 360° perspective to help our clients navigate complex issues and options.

# Appendix A: Project Partner Information

## Sait Green Building Technologies Corporate Profile



SAIT's Green Building Technologies (GBT) team is made up of architects, environmental professionals, industrial engineering designers and fabrication trades with credentials ranging from master tradesperson to Masters Degrees. Their industry experience helps ensure that projects align with the needs of private sector partners, thus transforming the green building industry in Alberta. The GBT team has also welcomed PhDs and subject matter experts from SAIT and other colleges and universities to assist with projects. The team collectively has relevant experience in the following areas:

- Architecture
- Residential/Commercial/Industrial Design
- Construction Process Improvement
- Net-Zero + Energy Positive Design
- Building Science
- Codes, Standards and Product Evaluation
- Material Properties and Assemblies
- Solar-Thermal and Photovoltaic Systems
- Renewable energy generation, collection, storage, design, installation, operation
- Energy Simulation and Optimization
- Conservation/Environment
- Water Catchment, treatment and application
- Green Roofs, Living Walls
- Product development, prototyping, fabrication
- Standard Compliance Testing
- Data Monitoring and Analysis
- Applied Research
- Mechanical Engineering
- Comparative Performance Analysis

SAIT Polytechnic and the GBT team retain ties and collaborations with many institutions, trade associations and non-governmental organizations, including but not limited to: University of Calgary Faculty of Environmental Design, Alberta Building Envelope Council, Alberta Association of Colleges and Technical Institutes, Association of Community Colleges of Canada, Alberta Association of Architects, Saskatchewan Research Council, Royal Architectural Institute of Canada, Polytechnics Canada, Net-Zero Home Coalition, Built Green Canada, Canada Green Building Council, Cold Climate Housing Research Centre, CANMET, and CMHC.

Our governmental collaborations include, but are not limited to, the Natural Sciences Research Council (NSERC), Natural Resources Canada (NRCAN), and the Government of Alberta (Municipal Affairs & Housing, Agriculture & Rural Development, Finance, Advanced Education & Technology, AB Innovates.)

As a NSERC TAC (Tech-Access Centre), we regularly engage both government and non-government agencies to assist in guiding industry towards sustainability and higher-efficiency goals.



# Appendix B: SAIT Literature Review and Gap Analysis



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## City of Edmonton Work from Home Research

Investigating methods and recommendations to develop a remote work policy

Prepared by:

SAIT ARIS Green Building Technologies:

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February 3, 2021

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## Methodology

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### A. Research Matrix

Work From Home (WFH) research topics were selected based on several metrics. First, RFS had collected a series of resources prior to engaging the GBT team. This initial collection of documents included journals, reports, and websites, and are found in rows 5 to 14 of the *Research Matrix*. These initial documents provided the GBT team with a starting point on the literature review.

Second, the following considerations were made prior to continuing research:

- Few documents discuss environmental (i.e.: greenhouse gas emissions (GHGs) and energy consumption) aspects resulting from WFH as project partner Dunsky was tasked with researching these topics.
- To provide more recent and updated information, focus was placed on more recent research sources aside from a few that remained highly relevant. As an example, a report from 2014 observing a Chinese travel agency who implemented a WFH program and closely monitored its performance was included in the research.
- Less focus was placed on the building aspect of WFH application and more on the human aspect in order to remain within scope of the project's current goals. Building aspects, such as design, programming and retrofitting, are explained in the *Future Research Opportunities* portion of this report.
- Productivity was identified as a key research topic per client request. In order to successfully present the completed WFH policy plan to stakeholders, explaining the effects of WFH on maintaining or increasing employee productivity would greatly help in the programs success and adoption.

Once these considerations were identified, the second phase of research began. The documents and research sources identified in this stage are found in rows 15 and onwards.

All research has been organized into 3 categories: social and health, environmental, and economical. Social and health pertains to the cause and effect WFH has on the social aspects of work and impacts on health and safety to employees and employers; mental health is a key topic here. The environmental factor as it relates to transportation was mainly researched by project partner Dunsky, however some research documents did mention some of these topics such as GHG reductions due to less commuting. Finally, economic factors pertain to the financial and operational aspects of WFH programs, and this is where the requested topic of productivity would be categorized, alongside other factors such as cost and profits.

### B. Gap Analysis

Upon completion of the *Research Matrix*, the *Gap Analysis* was created to compare research findings against the City of Edmonton's (CoE) most recent WFH Survey results (version dated June, 2020) and WFH Guide (version dated September, 2020.) This information was compiled into another matrix to support the *Research Matrix*.

The *Gap Analysis* has been organized into 5 categories: cost, training and support, health and safety (support and effects), productivity, and policy. These categories were created from a combination of breaking down the 3 factors from the *Research Matrix* into more specific research topics and also by client request such as added focus on the productivity and policy categories.

Each category was then filled in with information pulled directly from each source. Little to no information was edited to ensure the information being compared was done so in an exact manner so as to avoid confusion when referencing sources.

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## Recommendations

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Completion of the *Research Matrix* and subsequent *Gap Analysis*, we have identified several recommendations that should be applied towards future work of the CoE WFH policy and program to conclude a comprehensive review. These recommendations were identified during the cross-comparison of the 3 sources in the *Gap Analysis*: research, the CoE WFH Survey responses, and the CoE WFH Guide. Please note the versions of each source used in the *Gap Analysis* as they are dated in the file. As future surveys and guides are completed, it will be pertinent to remember which versions were used in this study.

### C. Cost

Cost generally has two sides in this context: employee cost and employer cost. The first pertains to costs incurred on employees as they adjust to WFH. These costs predominantly include equipment, supplies, and home resources (energy and water.) Of the three stated, equipment and supplies were expressed as concerns in the July 2020 WFH employee survey. The majority of research found recommends offering financial support in some way to employees, whether that be a reimbursement program, equipment that can be “borrowed” to be used remotely, or one-time spending limits. It is also recommended that this resource be tailored by role and/or individual need, as some will require more resources and/or preparation than others.

Second, employer costs can widely vary. One example mentioned in the survey response was the restructuring of the communications network to properly support the increase in network usage. Changes like this will definitely need to be made to some extent, and this is not limited to IT systems; buildings and spaces will similarly see changes. As large organizations shift to WFH and each of these changes will likely incur some kind of cost, both capital and organizational.

On the topic of savings, it should be noted that several research sources expressed a savings for employers as office space was used less; energy and water usage shifted to employees’ homes. To best maximize these savings, office space should be retrofitted or designed to support low-traffic periods. Examples include motion-sensored and scheduled lighting systems, and efficient heating and ventilating systems.

Greenhouse gas emissions have shifted from the employer facilities to the employees’ home. Utility usage is higher at home though commuting-related emissions are down. This indicates that the way we conduct emissions quantification, and associated costs, needs to be reviewed.

Lastly, survey responses and research alike expressed employees being grateful for the time and financial savings from the reduction of commuting.

### D. Training and Support

Of the 5 categories in the *Gap Analysis*, Training and Support was the most cross-applicable to all categories. Both research and survey responses stated that communication was integral in setting employees up for success. In terms of productivity, regular communications should be maintained between management and employees to ensure goals and work tasks are clear. Training and support were stated as very important from both management and employees, especially regarding how to adjust to WFH work processes (i.e.: guidance on how work tasks might change from in the office to WFH.) Employees should also state their expectations regularly.

Of all the training categories, technological training was requested the most in survey responses. IT infrastructure, new tools, and new processes (i.e. internet connectivity, multiple communication platforms, virtual meetings, virtual work phones, etc.) have changed how employees work day to day and additional, ongoing supports are required.

Regarding health, consistent communication and support between co-workers and management is integral in helping those feeling too isolated. More on this in the following section.



## E. Health and Safety (Support and Effect)

Prior to explaining this section, it should be noted that the effects of COVID-19 on WFH practice is largely considered to be different than WFH practice under more normal and less stressful circumstances. Mental health was an extremely common topic throughout both research and survey responses. Some research sources stated that under the abnormal circumstances of the pandemic, mental health issues rose due to the amount of uncertainty and global panic. This has had a direct connection to how people are perceiving working from home. While mental health will always have a connection to WFH due to its remote and isolated nature, the extreme circumstances in the last year should be taken into consideration when discussing the severity of mental health effects from WFH.

Similar to productivity, a person's demeanor, their physical capabilities, and their environment can have large effects on their health when WFH. Whether these effects are positive or negative is largely dependant on the person and environment. In one example, certain parties expressed safety concerns due to circumstances at home. Traditionally, commuting to an office would be an escape from said dangers. On the other hand, certain individuals with physical disabilities stated WFH was an improvement as their home was better outfitted to meet their needs. Prior to referring an employee to a WFH program, these circumstances should be considered when possible.

Regarding mental health, research and survey responses both suggested maintaining communication between co-workers to aid with the feeling of isolation and remoteness. This can be achieved through message boards, chat software, and video calls, among other strategies. Furthermore, organizing social events was also suggested, such as in the form of reoccurring lunch sessions or monthly group social meetings. Contrarily, a noteworthy amount of survey responses reported an improvement in mental health while WFH as certain social stresses had been removed, implying not all effects are negative.

Finally, regarding physical well-being, research suggests considering the environmental conditions of employees WFH stations. While the majority of office spaces are maintained and cleaned, the same may not be true for people's personal work spaces. Some office spaces may be housed in buildings with poor indoor air quality where an employee can open a window at home. There may be more noise at home or it can be significantly more quiet than in an open office space. These conditions, depending on severity, can have large impacts on an employee's health. This effect is called sick building syndrome (SBS) and can include any effect a building and its spaces might have on its occupants. As our research at this stage of the project was concentrated on other topics such as productivity, only 1 article was included regarding SBS in the *Research Matrix*. We strongly recommend researching this topic further in future segments of the project.

## F. Productivity

Overall, research suggests that WFH does lead to an increase in productivity, or at least maintains it. A good amount of survey responses also stated having an easier time focusing and completing tasks. That being said, results are dependant on several factors, as detailed below.

The most difficult factor to quantify is a person's demeanor, or work ethic. While some people thrive on working alone and motivating themselves, others struggle, and this is rarely consistent as most people have fluctuations in motivation. Nevertheless, several research sources remarked this had a direct affect on productivity success.

Easier to quantify factors include environmental factors and type of work. Environmental factors include the physical work space and its surrounding elements, including family and other residents sharing the employee's space. Distractions, comfort, level of stress, and more are all direct results of how a workspace allows an employee to perform. When undistracted, employees and management reported an increase in productivity as they were able to maintain focus and more efficiently complete tasks when they were in the office surrounded by colleagues. Alternatively, both research and survey responses mention that the reduction of commute time had a positive effect

on productivity as this added time in their day allowed them to better take care of tasks outside of work which left them less stressed while working.

The last major factor is considering the type of work being performed; some work is ideal for WFH practice while others might be less so, or even impossible. Examples of ideal work includes IT, research, certain education, writing, banking, and any work that is heavily computer dependant. Examples of less ideal work includes retail, certain sales, organizing very large groups, or other work that requires access to a specific location and/or resource. While this may seem obvious, the type of work being performed should be reviewed and planned for prior to being included in a WFH program and policy to ensure employees can effectively perform work duties.

One final topic that is important to consider when encouraging employee productivity is a suggestion several research sources made: flexibility. Some of the research sources engaged or interviewed employers who had developed and implemented WFH programs within their organizations. In doing so, they have collected information on their experiences through employee feedback and observation. From this, many companies who successfully implemented programs during the 2020 pandemic stated they will continue a WFH program even after the pandemic is finished. In doing so, nearly all parties stated they will likely implement a split work schedule where employees will alternate between WFH and commuting to the office throughout the week. Reasons for this include employee satisfaction (thus higher productivity), and reduced leasing, maintenance, and resource costs.

## G. Policy

Comments on policy were mostly collected through research as survey questions were more tailored to employee impressions and reactions to WFH conditions. Much of the research collected around policy reinforces topics mentioned in the other four categories. For this reason, it is easiest explained in point form:

- Provide flexible work (i.e.: split WFH and office schedules) options when possible to give employees some control over their circumstances; this will positively benefit productivity and moral;
- Maintain regular communication between management and employees to ensure expectations are communicated and updated regularly by both parties;
- Encourage employees to communicate amongst themselves by organizing and facilitating social events on a regular basis;
- Scale policy to each workforce (i.e.: department or team policies) as many teams differ in their work tasks and needs;
- Include incentives for both employers and employees that would encourage the adoption of a WFH policy and program;
- Make the policy resilient and adaptable to be applicable to future use; the circumstances of the 2020 pandemic are quite unique and should not influence every aspect of the future policy.

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## Future Research Opportunities

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As mentioned above, due to the current scope of the project and limited time, several research topics had been identified as needing further investigation. The following are topics we recommend be researched in future stages of the project as they will be integral in completing a comprehensive and successful WFH policy and program.

### H. Health Impacts

SBS is defined as the effect a physical space or building has on an occupant, leading to negative results such as headaches and poor respiratory symptoms often due to poor ventilation, light access, and noise pollution. The topic around health and well-being of employees was very briefly touched upon in the *Research Matrix* but poses a very impactful effect on employees as they work in their personal spaces remotely.

How should policy speak to this concern? What measures can be taken to improve all personal work spaces to a certain minimum level if needed? What are the largest causes of employee health degradation due to the space they are working in?

### I. Adaptable Building Design

Over the past year, a major concern had been identified in the use of commercial space worldwide. As employees were sent home for significant periods of time, office and commercial spaces alike sat vacant. In the majority of these cases and especially in the first few months of the pandemic, these buildings remained operating, consuming energy to maintain heating, ventilation, and lighting despite the lack of occupants. Very quickly, the design and adaptability of these spaces was questioned.

Another area for consideration is, when we return to office spaces, what are our workforce needs? Employees are expected to WFH at different degrees – frequently, occasionally and not at all. Employers will need to scale back the size of their offices and introduce shared workstations and other strategies to accommodate.

Other questions to consider - Should all buildings be retrofitted? What design considerations need to be made for future emergencies? What retrofitting or new builds are within this project's scope? What are the environmental, financial, and health impacts of these considerations?

### J. Energy and Technology Accessibility

As more employers adopt WFH policies, resources will be increasingly needed across a wider area rather than be concentrated into office buildings. These resources include energy, water, and technology (including internet and phone). This can prove difficult to impossible for some individuals depending on their location and accessibility to these resources. In many cases in the past year, connectivity issues were a frequent problem due to poor internet access or increased loads on service providers. In a more extreme example, remote locations have intermittent power outages, or limited access altogether.

If WFH is to become the new norm, what services will need to be updated? At what cost and to what extent? These considerations will have major impacts on policies at both the employer and the community-scale.

# Appendix C: Dunsky Energy Consulting – GHG Emissions Impact Analysis



# Teleworking's Impact on GHG Emissions

Assessing the City of Edmonton's Employee  
Teleworking Policy

February 22, 2021

**Prepared for:**  
RFS Energy Consulting





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## About Dunsky

Dunsky provides strategic analysis and counsel focused exclusively on helping our clients accelerate the clean energy transition, effectively and responsibly.

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**Expertise**

- Buildings
- Renewables
- Mobility

**Services**

- QUANTIFY Opportunities
- DESIGN Strategies
- EVALUATE Performance

**Clients**

**GOVERNMENTS**      **UTILITIES**      **SOLUTION PROVIDERS**

With a focus on buildings, renewables and mobility, Dunsky's team of 40 supports our clients – governments, utilities and others – through three key services: we **quantify** opportunities (technical, economic, market); **design** strategies (programs, plans, policies); and **evaluate** performance (with a view to continuous improvement).

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# 1. INTRODUCTION

On September 28, 2020, the City of Edmonton launched a Remote Work Program for Out-of-Scope and Management-level employees that will provide greater flexibility in work location and work scheduling. In parallel, the City launched a research project to assess the positive and negative impacts of instituting teleworking policies for City of Edmonton (CoE) employees, and by extension, the Edmonton community. The research includes environmental, economic, and social considerations, with the goal of informing future policy.

As part of this project, the City sought to quantify the potential greenhouse gas (GHG) emissions savings generated by the policy through reduced transportation for commuting. As described in Edmonton's Change for Climate declaration, the City's ultimate goal is to define a path for "transitioning from 19 tonnes of emissions per person per year to 3 tonnes per person per year by 2030".

**This report presents the results of our analysis to quantify the potential direct greenhouse gas (GHG) emissions savings through reduced commuting from CoE's teleworking policy.** Our study is organized in the following two sections:

- **Key Findings:** Presents a summary of results, including the estimated potential direct greenhouse gas (GHG) emissions impact from the policy due to reduced commuting.
- **Appendix:** Discusses our methodology and data sources. In this section we also discuss areas for improvement and extension of the analysis.

The full calculations and results of our analysis are included in the appended Excel model.

It is important to note that this study does not quantify the GHG reductions associated with the

## Scope Limitations: Direct vs. Net Impacts

This initial project focuses on the direct impacts of teleworking on commuting GHG emissions. However, teleworking is complex. Indirect impacts could increase emissions, in turn reducing, neutralizing or even reversing direct GHG savings. Further analysis is required to estimate the net climate benefits resulting from the policy.

City's current temporary work-from-home policy put in place for the COVID-19 pandemic, but rather the potential impact of the new permanent policy under development.

## 2. KEY FINDINGS

### 2.1 – Overall Findings

The potential for *direct*, commute-related reductions from the City of Edmonton (CoE)'s proposed teleworking policy is 1,300 tCO<sub>2</sub>e / year. These reductions are a result of anticipated reductions in staff commutes to and from work, and are further described in section 2.2 below.

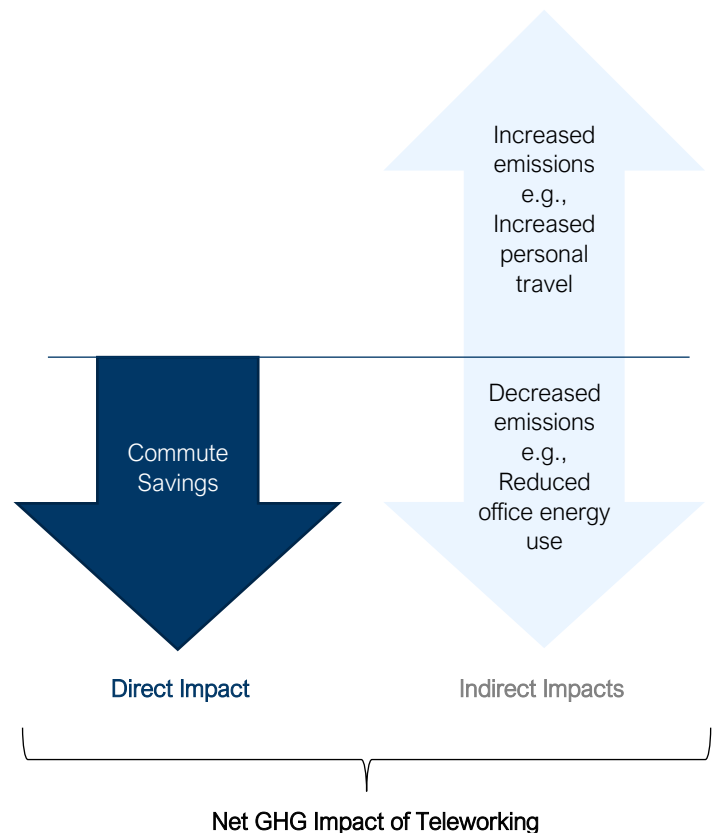
The reader should note that this assessment of *direct* reductions – the scope of our work – does not account for indirect impacts.

- The indirect GHG impacts of teleworking are uncertain and complex – particularly in the long term. The literature suggests that indirect impacts of teleworking could significantly reduce commuting GHG savings, or even *increase emissions*<sup>1</sup>, as represented in Figure 1.
- A recent study conducted for the French government<sup>2</sup> – presented in a following textbox – found that a shortlist of rebound impacts (increased daily mobility, home relocation, teleconference use, home energy use) could *reduce* the direct GHG savings from commuting by 31%. The study emphasizes that these results are preliminary, as several important rebound impacts (e.g., new long-distance mobilities) are expected to materialise in the mid-to-long term and could significantly alter the net GHG impact of teleworking – *potentially generating net increased GHG emissions*.
- Overall, we believe that the magnitude of indirect impacts could reduce, offset, or even

reverse direct emissions savings. While the City of Edmonton is pursuing a teleworking policy for a broad set of reasons (social, economic, environmental), it would be premature to conclude both the magnitude and *directionality* of the net GHG emissions impact from teleworking.

- We recommend policymakers assess the full impact of teleworking before basing policy decisions on the scale of these benefits.

Figure 1: Illustration of potential net GHG impacts of teleworking



<sup>1</sup> Hook, Andrew et al. 2020. A systematic review of the energy and climate impacts of teleworking. Environ. Res. Lett. Retrieved from: <https://iopscience.iop.org/article/10.1088/1748-9326/ab8a84> ; and O'Brien W, Yazdani Aliabadi F. 2020. Does telecommuting save energy? A critical review of

quantitative studies and their research methods. Energy Build. Retrieved from:

<https://pubmed.ncbi.nlm.nih.gov/32834440/>

<sup>2</sup> Greenworking and ADEME. 2020. Étude sur la caractérisation des effets rebond induits par le télétravail. Retrieved from: <http://www.ademe.fr/mediatheque>

## 2.2 – Direct Commute Emission Findings

As mentioned above, our study focused on quantifying the direct commute savings from CoE’s new policy. The key results of this modelling are presented below and in Figure 2 and Figure 3.

- **The pre-COVID commute of all City employees represents direct emissions of 14,900 tCO<sub>2</sub>e per year.** This is equivalent to 1.5 tCO<sub>2</sub>e / per year / per employee, roughly 9% of an average Edmontonian’s emissions<sup>3</sup>.
- **Implementing a teleworking policy would reduce direct commuting GHG emissions by 70% for teleworking employees.** This would reduce their average commute emissions to an estimated 0.5 tCO<sub>2</sub>e / per year – a 1.08 tCO<sub>2</sub>e / per year saving per employee. However, as noted previously, the rebound impacts could offset those savings significantly.
- **Edmonton’s teleworking policy could reduce direct commute GHG emissions by 1,300 tCO<sub>2</sub>e / year.** This represents a 9% reduction in CoE employees’ direct total commuting emissions, as not all employees are eligible or will choose to telework<sup>4</sup>. This direct commute emission saving is equivalent to taking 280 passenger vehicles off the roads.

Figure 2: Direct Commute Emissions: All Employees (tCO<sub>2</sub>e/yr)

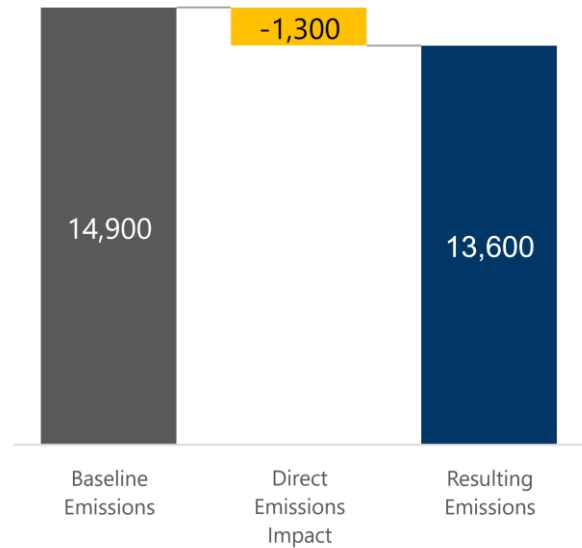
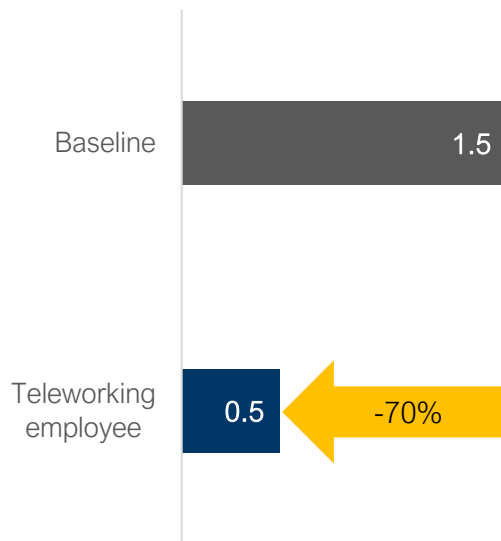


Figure 3: Direct Commute Emissions: Per employee (tCO<sub>2</sub>e/yr)



<sup>3</sup> Based on 17.2 t/person from the 2019 [City of Edmonton Community Emissions](#).

<sup>4</sup> 1,272 of the City’s 9,592 employees are currently eligible for the teleworking policy; of these, we estimate that 1,196 will telework on average 3.5 days per week.

## Indirect Effects of Teleworking: An Unclear Long-Term View

A 2020 study by the French Ecological Transition Ministry and greenworking sought to identify and quantify potential rebound effects of teleworking on GHG impacts. The study finds that **the rebound effects from teleworking are numerous and varied; and that several effects which currently have little impact may become more significant in the mid-to-long term.**

The table below presents key effects identified, as well as their impact (notionally or as a percentage of commute emission savings, considered the primary direct effect of a teleworking policy, and estimated at 271 kg CO<sub>2</sub>e/ weekday in this study). Negative values decrease emissions; positive values increase emissions.

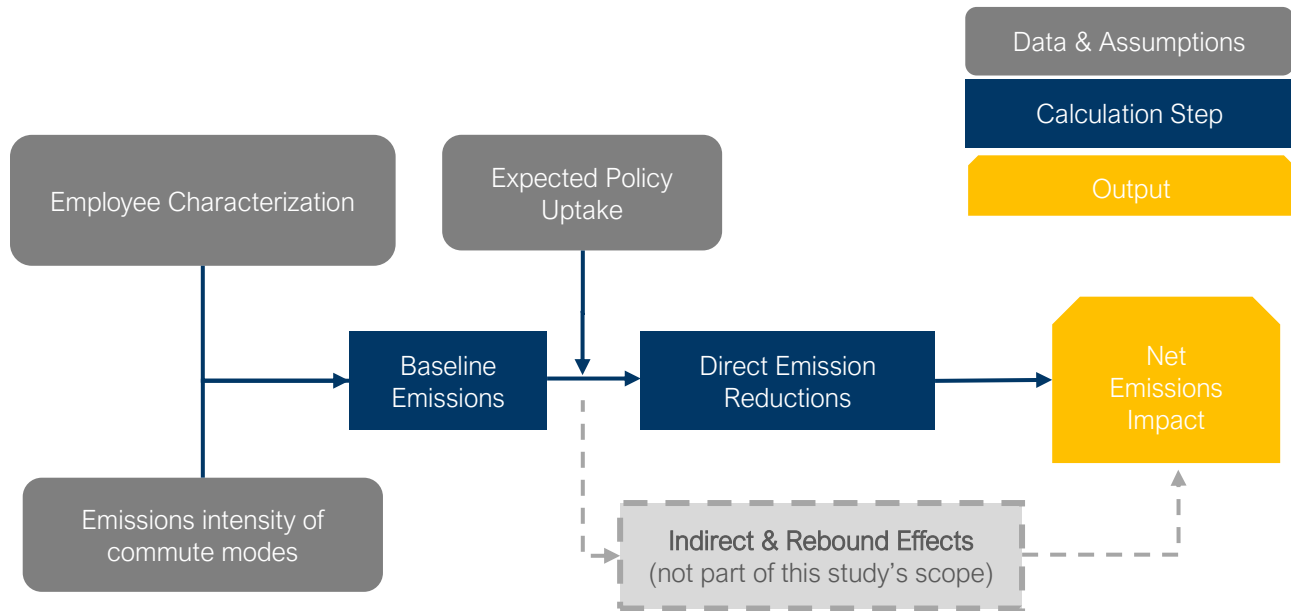
Effect	Example/description of effect	Estimated Impact on GHG emissions (% of commute emissions)
Direct Impact		
Commute Reduction	Reduced commute to the office, as employee works from home.	-100%
Indirect Effects (short-term)		
Office Energy Use	Office energy use decrease as employees work from home, sometimes leading to downsizing.	-2.4% to -107%
New Daily Mobility	Increased daily non-work travel by employee or family members (e.g., due to car being available).	+24.9%
House Energy Use	Increased energy use at home on teleworking days.	+7.6%
Video Conferencing	Increased video conferencing use.	+1.1%
Relocation	Employee moves further from work, increasing distance on commute days.	Null in short-term; may significantly increase emissions in long term
Indirect Effects (long-term)		
Traffic Congestion	Reduced commuting at AM/PM peak may reduce congestion and related emissions.	May reduce
Virtual Professional Network	Reduced internal and external work trips (e.g., to visit clients, attend conferences).	May reduce
New Long Mobilities	Increased weekend trips and/or long-distance leisure travel.	Could significantly increase in long term (e.g., +400%)
Extended Professional Geographic Zone	Occasional much further work-trips, as teleworking allows professionals to cover larger catchment area.	Could increase in long term
Increased Purchasing Power	Economic savings from commuting reallocated to carbonized purchases.	Could increase in long term
Increased Home Surface	Increased home footprint for home office use (construction, increased lighting / heating).	Could increase in long term
Centralized Headquarters	Closing of regional offices, creating longer occasional commute for regional employees.	Could increase in long term
New Equipment	Purchase of additional equipment (e.g., computer, second monitor).	Undetermined
Digital Work	Reduced paper / office supplies-use due to virtual office.	Undetermined
Lifestyle Changes	Variety of effects, from reduced food waste to increased e-commerce purchases.	Undetermined



## 3.1 – Methodology

Our high-level methodology, used to quantify the potential GHG emission savings through reduced commuting from the City of Edmonton’s teleworking policy, is described in the following flowchart.

Figure 4: Teleworking GHG Impact Model Flowchart



The calculation methodology relies on three key sets of input assumptions, which are described in the following sections:

- **Employee Characterization**  
How many employees does the City of Edmonton have, and how do they commute?
- **Emissions intensity of commute modes**  
How polluting are the different modes of transport that Edmontonians use to commute?
- **Expected Policy Uptake**  
How many employees are expected to take advantage of the policy, and how many days per week would they telework?

As noted previously, indirect and rebound effects were not included in our scope of work; as such, the emissions impact reported herein is limited to *Direct Emission Reductions*.

## 3.2 – GHG Impact Potential

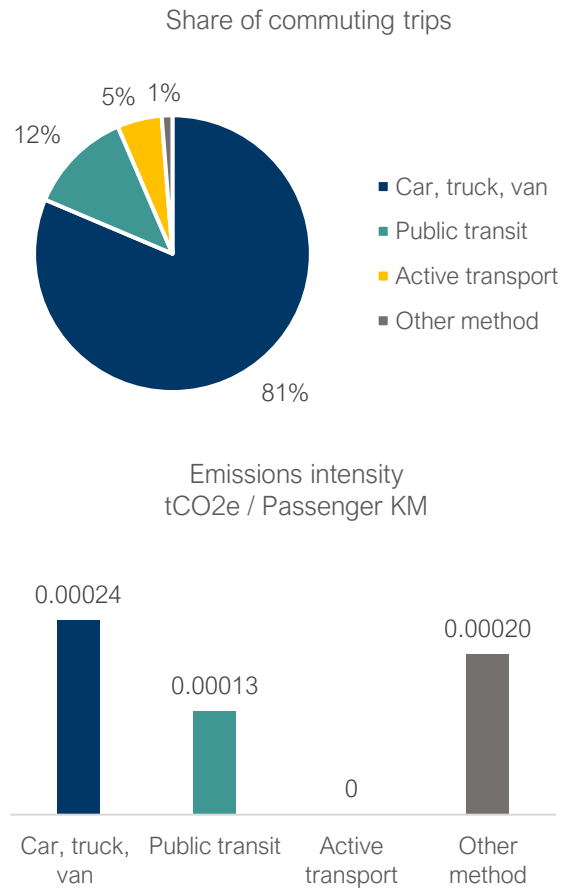
This section provides a high-level discussion of the major findings from our analysis, regarding the potential direct GHG impacts of the policy.

### 3.2.1 – Employee Characterization

In our analysis, we used Statistics Canada’s 2016 Census to characterize the typical city employee commute (average trip length and mode distribution), based on the usual journey to work in Edmonton.

As shown in Figure 5, most journeys to work in Edmonton (81%) are completed with passenger vehicles (car, truck, or van). The next most prevalent journey to work mode is public transit (12%), followed by active transport (5%). Using a passenger vehicle is also the highest emitting mode of travel in Edmonton, emitting an average 0.00024 tCO<sub>2</sub>e per passenger-kilometre travelled - almost double the emissions intensity of public transport. This high emissions intensity is in part due to the low occupancy of passenger vehicles. According to Statistics Canada, the average passenger vehicle occupancy in Edmonton’s commute is 1.07 persons by car. This means that the vast majority of Edmontonians who drive to work are alone in their car. As a point of comparison, this occupancy is similar to other Canadian cities like Calgary (1.07), Toronto (1.09) and Winnipeg (1.10)<sup>5</sup>.

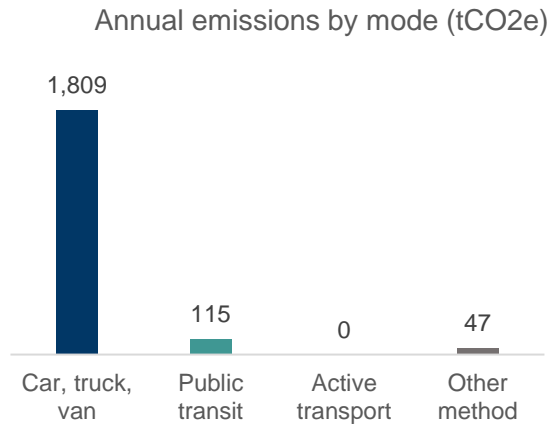
Figure 5: Mode Share of Work Commute (% of commute trips, Edmonton) and Emissions Intensity (by Mode) Source: StatsCan Census 2016.



For the two reasons stated above - largest mode share and highest emissions intensity - **passenger vehicle journeys (by car, truck, van) are the highest source of transportation GHG emissions amongst employees’ commutes.** As shown in Figure 6, this mode represents 92% of employees’ transportation emissions.

<sup>5</sup> Statistics Canada, 2016 Census of Population, Statistics Canada Catalogue no. 98-400-X2016326.

Figure 6: Baseline Transportation Emissions by Mode for eligible employees

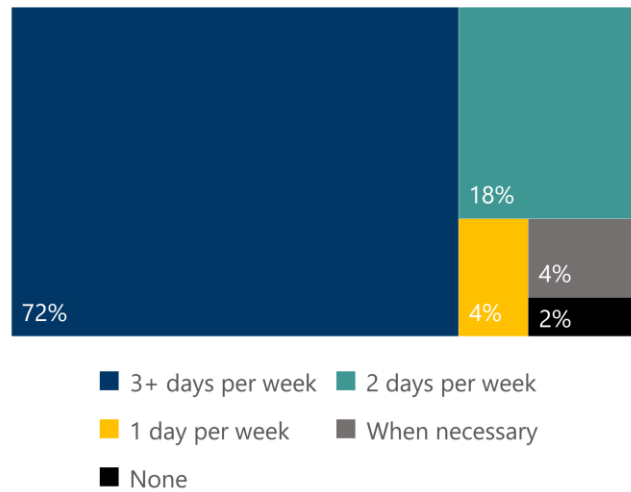


### 3.2.2 – Policy Impact

In our model, we assume that the Remote Work program will lower *direct commute* emissions by reducing the number of days eligible employees commute to work. We assume that on days when teleworking employees *do* work from the office, their typical daily commute will stay the same<sup>6</sup>. In our model, the *direct commute* impact of the policy therefore depends on three factors:

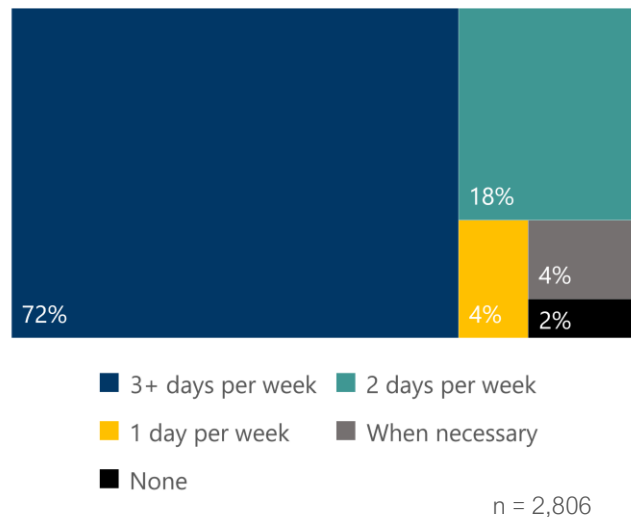
- How many employees are eligible for the policy;
- The proportion of eligible employees who will take advantage of the policy; and
- How many days per week, on average, participants will work from home.

To estimate the expected policy uptake, we used the results of the Flexible Work Practices Survey, conducted by the City of Edmonton in 2020. As shown in Figure 7



, most respondents in the survey (94%) declared they would work remotely one or more days per week under the policy. Based on these results, we have estimated that 1,196 of the 1,272 eligible employees would participate in the program; and that eligible employee commute days would be reduced by 66% annually.

Figure 7: Interest in Teleworking (COE Flexible Work Practices Employee Survey, 2020)



<sup>6</sup> This assumption and its limitations are discussed further in the methodology section.

### 3.2.3 – Key Data Sources / Assumptions

This section presents the key data sources and assumption used in our analysis of direct commute emission savings.

- **Number of employees (total & eligible for the policy):** provided by City of Edmonton.
- **Commute mode and average distance:** Statistics Canada, 2016 Census of Population, Edmonton<sup>7</sup>.
- **Emissions intensity of modes**
  - **Car, truck, vans:** Calculated based on Edmonton Motorized Vehicle Registrations<sup>8</sup>; Natural Resources Canada's Comprehensive Energy Use Database (Transportation Sector – Alberta) for fuel consumption and share of trucks on the road<sup>9</sup>; and Canada's national inventory report (NIR) (2020) for emission factors<sup>10</sup>.
  - **Public transit:** Calculated based on Natural Resources Canada's Comprehensive Energy Use Database (Transportation Sector – Alberta) and Alberta's electricity emissions intensity.
  - **Active transport:** Assumed to be zero.
  - **Other method:** Calculated based on Natural Resources Canada's Comprehensive Energy Use Database (Transportation Sector – Alberta).
- **Expected policy uptake** proportion of employees using the policy and number of teleworking days from City of Edmonton

<sup>7</sup> Statistics Canada, 2016 Census of Population, Statistics Canada Catalogue no. 98-400-X2016326.

<sup>8</sup> Detailed data provided by the City of Edmonton; public dataset available at <https://open.alberta.ca/publications/number-of-motorized-vehicles-registered-in-alberta-as-of-march-31-years>

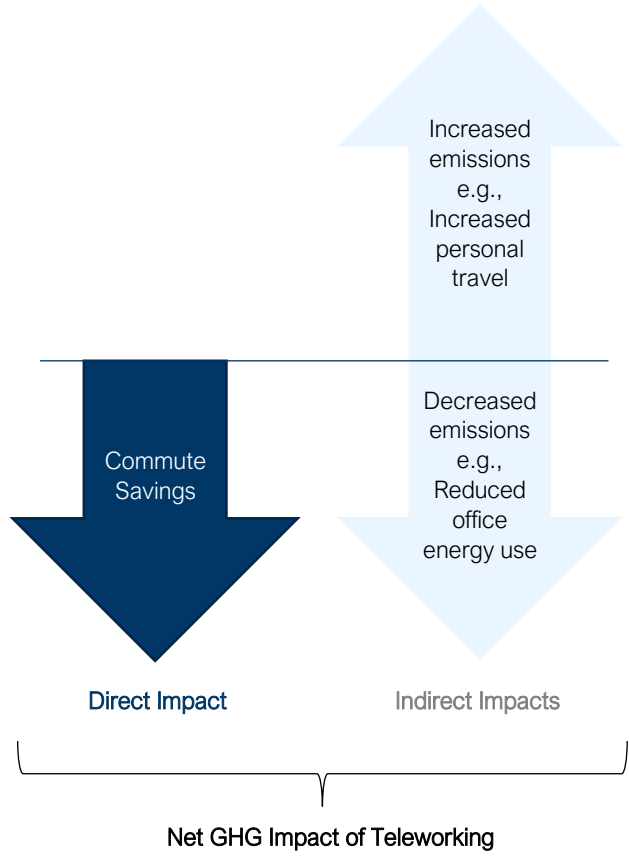
report Flexible Work Practices Survey: Insights and Analysis (August 2020).

### 3.2.4 – Opportunities for Further Analysis

#### 3.2.4.1 – Indirect Impacts

It is important to note that our quantitative analysis focuses exclusively on direct commute impacts (depicted as the dark blue arrow in Figure 8); but excludes rebound impacts of teleworking (depicted as the light blue arrows), which may affect net GHG savings from the

Figure 8: Illustration of potential net GHG impacts of teleworking



<sup>9</sup> Natural Resources. Comprehensive Energy Use Database (2020). Table 21 & 37. [https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends\\_tran\\_ab.cfm](https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_tran_ab.cfm)

<sup>10</sup> Canada. National inventory report (NIR) (2020). Table A6.1–13.

policy. We recommend these factors are investigated in a follow-up research project, to draw better conclusions on the overall GHG impacts of the teleworking policy.

A summary of factors that could influence the GHG impact of a teleworking policy is presented in the textbox on page 7. As identified by Hook, Court, et al. in their 2020 systematic review of the energy and climate impacts of teleworking, the broader impacts of teleworking policies are uncertain and complex<sup>11</sup>. Several studies analyzed found that teleworking will trigger rebound effects such as increased home energy use or changes to household transportation behaviour (e.g., increased car usage), which may reduce GHG savings or even produce overall increased GHG emissions.

#### 3.2.4.2 – Other Caveats

Beyond the scope limitation discussed above, our study includes the following caveats:

- We make use of average Edmonton journey to work information from the 2016 Census rather than specific **City of Edmonton employee travel to work data**. Collecting data on the journey to work of current City staff may help paint a more accurate picture of the direct commute GHG savings of the policy.
- The **COVID-19 pandemic** has fundamentally changed many aspects of the world and may have lasting impacts over the coming years. The exact impacts are impossible to predict at this point, but considerations could include the following:

- The City's teleworking survey was completed while many staff are already working from home, potentially skewing the results towards a higher willingness to telework permanently; this interest may wane once offices are able to re-open.
- The latest data available for travel to work is the 2016 Census. As a result of the pandemic, some employees may look to move further out of the city with consequential increases to average commute distance. This would enhance the potential GHG reductions if those commuters chose to telework.
- The **uptake of the teleworking policy** is estimated based on survey results. The actual savings will depend on the actual uptake, which can be monitored during policy implementation.
- We do not account for **natural changes in GHG emission intensities of transportation modes** in our model. However, intensities are likely to change in the coming years due to several factors. For example, the intensities of car, truck, and van emissions, as well as public transportation, are likely to decrease, as Edmonton implements its electric vehicle (EV) Strategy and EV uptake increases<sup>12</sup>. Simultaneously, plans to green Alberta's electricity grid, should reduce GHG emissions from electricity and therefore EVs<sup>13</sup>. Some gas vehicle efficiency improvements are also expected.

<sup>11</sup> Hook, Court, et al. A systematic review of the energy and climate impacts of teleworking (2020). <https://iopscience.iop.org/article/10.1088/1748-9326/ab8a84/pdf>

<sup>12</sup> City of Edmonton. Edmonton's Electric Vehicle Strategy. (2018).

[https://www.edmonton.ca/city\\_government/documents/PDF/EdmontonElectricVehicleStrategy.pdf](https://www.edmonton.ca/city_government/documents/PDF/EdmontonElectricVehicleStrategy.pdf)

<sup>13</sup> Government of Alberta. 2018. Transitioning Alberta to a Greener Grid. Retrieved from: <https://open.alberta.ca/dataset/6d1a4c64-e18a-40db->

- Beyond the rebound impacts of the teleworking policy on employee travel behaviour<sup>14</sup>, **natural changes in commute modes and distances** may occur, which are not accounted for in our analysis.

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<sup>14</sup> As noted above, the distribution of modes used, and daily distance travelled to work may change because of

the teleworking policy (e.g., if employees move further away, given the ability to work remotely for part of the week).





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# Appendix D: Energy Efficiency Guidebook for Remote Work Program Participants

# REFERENCES

- ADEME and Greenworking. (2020). *Étude sur la caractérisation des effets rebond induits par le télétravail*. Retrieved from The bookstore of the Ecological Transition Agency: <http://www.ademe.fr/mediatheque>
- Bloom, N. L. (2015). Does working from home work? Evidence from a Chinese Experiment. *The Quarterly Journal of Economics*, 165-218.
- City of Edmonton. (2018). *Edmonton's Electric Vehicle Strategy*. Edmonton. Retrieved from City of Edmonton: [https://www.edmonton.ca/city\\_government/documents/PDF/EdmontonElectricVehicleStrategy.pdf](https://www.edmonton.ca/city_government/documents/PDF/EdmontonElectricVehicleStrategy.pdf)
- City of Edmonton. (2019). *The City of Edmonton's Community GHG Emissions*. Retrieved from Change for Climate Tableau Public Data: <https://public.tableau.com/app/profile/change.for.climate/viz/TheCityofEdmontonsCommunityGHGEmissions/Dashboard2>
- City of Edmonton. (2021, April 20). *Edmonton's Community Energy Transition Strategy and Action Plan*. Edmonton: City of Edmonton. Retrieved from City of Edmonton: [https://www.edmonton.ca/city\\_government/documents/PDF/EnergyTransitionStrategy2021-04-20.pdf](https://www.edmonton.ca/city_government/documents/PDF/EnergyTransitionStrategy2021-04-20.pdf)
- City of Toronto. (2020). *ModernTO - Workplace Modernization Program Business Case and Implementation Plan Update*. Toronto: Corporate Services.
- Conference Board of Canada. (2021). *Working Through COVID-19- Remote Work Support Survey*. Retrieved from <https://www.conferenceboard.ca/focus-areas/human-resources/2020/working-through-covid-19/remote-work-support/>.
- Curran, E. (2021, 4 21). *Work From Home to Lift Productivity by 5% in Post-Pandemic U.S.* Retrieved from Bloomberg Economics: <https://www.bloomberg.com/news/articles/2021-04-22/yes-working-from-home-makes-you-more-productive-study-finds>
- Fraser Institute. (2016, March 15). *Energy Costs and Canadian Households: How Much Are We Spending?* Retrieved from Fraser Institute: <https://www.fraserinstitute.org/studies/energy-costs-and-canadian-households-how-much-are-we-spending>
- Government of Alberta. (2018). *Transitioning Alberta to a Greener Grid*. Edmonton: Government of Alberta.
- Government of Alberta. (2020, 7). *Motorized vehicle registrations : select municipalities as of March 31*. Retrieved from Publications: <https://open.alberta.ca/publications/number-of-motorized-vehicles-registered-in-alberta-as-of-march-31-years>
- Government of Canada. (2020). *Canada's Official Greenhouse Gas Inventory*. Retrieved from Government of Canada: <https://open.canada.ca/data/en/dataset/779c7bcf-4982-47eb-afb-a33618a05e5b>
- Harvard Business Review. (2021, March 30). *Commuting Hurts Productivity and Your Best Talent Suffers Most*. Retrieved from Harvard Business Review- Working Knowledge: <https://hbswk.hbs.edu/item/commuting-kills-productivity-and-your-best-talent-suffers-most>
- Hook, A. C. (2020, August 19). *A systematic review of the energy and climate impacts of teleworking*. Retrieved from Environmental Research Letters: <https://iopscience.iop.org/article/10.1088/1748-9326/ab8a84>
- Natural Resources Canada. (2019). *National Energy Use Database*. Retrieved from Transportation Sector- Canada: Transportation Sector- Canada
- O'Brien W, Y. A. (2020). *Does telecommuting save energy? A critical review of quantitative studies and their research methods*. Retrieved from Energy Build: <https://pubmed.ncbi.nlm.nih.gov/32834440/>
- Parker, K. M. (2020, 12 9). *How the Coronavirus Outbreak Has – and Hasn't – Changed the Way Americans Work*. Retrieved from Pew Research Center: <https://www.pewresearch.org/social-trends/2020/12/09/how-the-coronavirus-outbreak-has-and-hasnt-changed-the-way-americans-work/>
- PwC. (2020, June 25). *When everyone can work from home, what's the office for?* Retrieved from PwC's US Remote Work Survey: <https://www.pwc.com/us/en/library/covid-19/assets/pwc-return-to-work-survey.pdf>
- Statistics Canada. (2017, 2 8). *2016 Census of Population*. Retrieved from Statistics Canada Catalogue: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>
- Statistics Canada. (2020). *Statistics Canada*. Retrieved from Running the economy remotely: Potential for working from home during and after COVID-19.