ADVANCING AIR QUALITY AND CLIMATE CO-BENEFITS IN THE PRINCE GEORGE AIRSHED

FINAL REPORT

APRIL 4TH, 2023

PRINCE GEORGE air IMPROVEMENT ROUNDTABLE

THE UNIVERSITY OF BRITISH COLUMBIA
School of Community and Regional Planning (SCARP)

Prepared For

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Acknowledgements

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Our group also sincerely thanks our partner the Prince George Air Improvement Roundtable (PGAIR) with a special mention to Patience Rakochy. We are grateful to have worked alongside such a passionate, aspiring community leader. We want to thank all PGAIR members who helped unconditionally with the project and provided feedback and sit down for interviews to inform this project.

Acronym List

AQ - Air Quality
AQMP- Air Quality Management Plan
BC - Black Carbon
BMP - Best Management Practices
CC - Climate Change
City of PG - City of Prince George
CSA - Canadian Standards Association
DRES - Downtown Renewable Energy System
EV - Electric Vehicle
GHGs - Greenhouse Gasses
HVAC - Heating, Ventilation and Air Conditioning
KPI - Key Performance Indicator
PGA - Prince George Airshed
PGAIR - Prince George Air Improvement Roundtable
PM - Particulate Matter
RDFFG - Regional District of Fraser-Fort George
TDM - Transportation Demand Management

Positionality Statement

Our team

As three UBC Vancouver students who are settlers on this land, we would like to acknowledge that our work was done on the traditional, ancestral, and unceded territory of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh (Squamish) and səlilwətaɬ (Tsleil- Waututh) people. Furthermore, our project's study area is situated on lands belonging to the Lheidli T'enneh First Nation. We are grateful to have visited these lands and have had the opportunity to work closely with partner organizations who live, work, and play there.

Each member of our team was raised and currently resides in an urban setting. We understand that the City of Prince George and the surrounding region are located in Northern B.C. and share a different context from urban centers. Communities throughout the Prince George Airshed (PGA) will have different needs and experiences than those in urban settings, which may include various perceptions of the urgency to address CC and sources contributing to poor AQ. In the PGA, most residents' livelihoods rely on employment in the forestry sector, a highly pollution-producing industrial activity. Additionally, the region's exceptionally long cold winters require high energy consumption through heating. Overall, as outsiders to this community, project findings must consider the region's social, economic, and environmental needs.

As student planners, this project offers an opportunity to expand our knowledge and learn from partner organizations and community members. Our team has had the privilege of receiving education at both the graduate and undergraduate levels in the fields of Environmental Sciences, Environmental Engineering, and Biology. Therefore, our positionality may elicit certain biases and assumptions that differ from those who live, work, and play in the PGA.

Our Partner

This project acknowledges the individual and collective needs of organizations with vested interest in this project, particularly PGAIR, the City of PG, and the Regional District of Fraser Forth George. We have identified the following considerations:

- PGAIR is located within the City of PG, which is situated on the traditional territory of the Lheidli T'enneh First Nation. City Council established a reconciliation framework in 2016, which guides the City's relationship with the Lheidli T'enneh and the RDFFG as they continue to pursue opportunities for greater collaboration and relationship building (City of Prince George, 2017a).
- As a non-profit, multi-stakeholder organization, PGAIR is responsible for appealing to local governments, funding entities, and the community itself. Therefore, support and collaboration from various parties of interest are crucial to further air quality improvements in the PG Airshed.
- The City of PG and the RDFFG are both governmental bodies with elected leaders with an obligation to make decisions that are palatable to the community. Furthermore, PGAIR must navigate that government priorities can shift between election cycles.

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EXECUTIVE SUMMARY

Project Context

Greater attention is being paid to addressing AQ and climate change (CC) simultaneously because of **environmental, human health, and socioeconomic** benefits.

PGAIR is a non-profit, multi-stakeholder organization dedicated to improving the PGA's AQ. PGAIR sees a valuable opportunity to identify actions that offer **co-benefits** between AQ and CC goals in the PGA. This project will provide PGAIR with **strategic direction** for how to support their member organizations, the City of PG and RDFFG, to **advance AQ & CC goals.**

Findings

Our team identified **10 Big Moves and 45 proposed actions** that offer AQ and CC co-benefits. These Big Moves and proposed actions target three sectors that are the highest contributors to air pollutants and GHGs in the PGA: Transportation, Industry, and Buildings.

We identified **funding opportunities** for each Big Move, and suggested **timelines** and **lead organization(s)** for each proposed action. Each proposed action is supported by **example actions** categorized by **6 action types** to reflect the diverse approaches that the partner organizations can apply in the PGA.

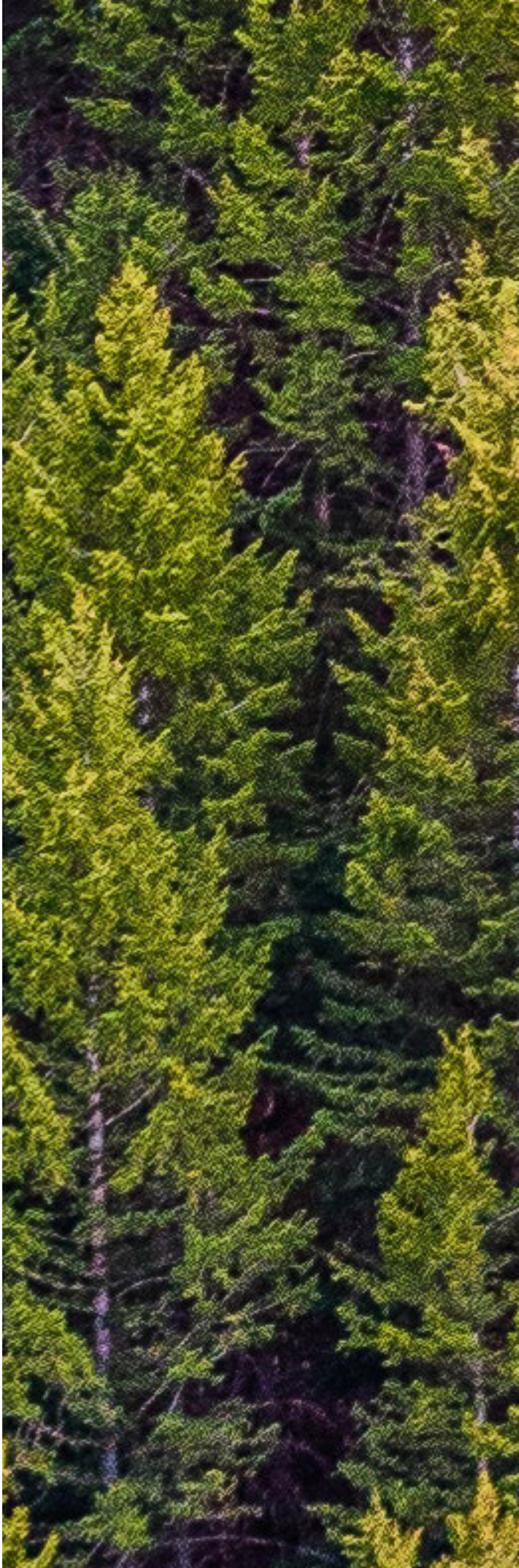
Project Next Steps

This project provides a *contemporary perspective* to address both AQ and CC in the PGA. However, there are some project limitations, including capacity constraints and a narrow scope that restricted the range of actions proposed in our findings. There are opportunities to expand on this project, such as **integrating equity** and exploring **sectors** beyond transportation, industry, and buildings that contribute to GHGs and air pollutants in the PGA.

Our findings can be explored as **options** to inform AQ/CC action and policy such as an AQMP, and/or an updated City of PG Official Community Plan. Overall, this project presents an exciting opportunity to support PGAIR and their member organizations with actions that strive to improve human and environmental health in the PGA for generations to come.

INTRODUCTION

- Air Quality and Climate change co-benefits
- Project Overview
    - Context of PG Airshed
    - Jurisdiction in AQ Management



Air Quality and Climate Change Co-benefits

AQ and CC have traditionally been managed as separate challenges in environmental policy, with CC receiving most of the attention and resources from governments. Both AQ and CC threaten human health, ecosystems and economic stability across the globe, and recent research has demonstrated their synergistic relationship at both the technical and policy levels (Bishop, 2021). In the face of CC, there are socio-economic benefits for local governments to address both AQ and CC simultaneously.

Synergistic relationship at the technical level

AQ and CC are closely linked phenomena stemming from the fact that air pollutants and GHGs often derive from the same sources, predominantly fossil fuel combustion. Methane and black carbon (BC) contribute to both air pollution and CC, and therefore reducing their emissions is the most immediate and powerful connection to gain AQ/CC co-benefits (G. Roth, personal communication, January 13, 2023) (See figure 1). Methane has ten times more warming potential than CO2 and is a precursor to ground-level ozone, a pollutant that causes approximately half a million deaths per year globally from respiratory problems (Shindell et al., 2021). Methane is produced by various natural and human-made sources, including natural gas and oil extraction, livestock production, and landfills. Furthermore, black carbon (BC), or soot, is produced by the incomplete combustion of fossil fuels and biomass. Due to its black colour, it absorbs sunlight and heats the atmosphere, contributing to global warming and accelerating snow and ice cap melting (CCAC, 2018). BC is a significant component of a harmful air pollutant, fine particulate matter (PM2.5). Particulate matter impacts the entire human body and is responsible for exacerbating chronic respiratory and cardiovascular diseases (Thurston et al., 2017), with evidence linking black carbon with cardiovascular health effects and premature mortality (WHO, 2013). Therefore, reducing methane and BC emissions can help slow down the rate of warming by around 0.3°C by 2040 (Shindell et al., 2021) and ~ 0.5 °C by 2050 (Shindell et al., 2012), while having immediate benefits for air quality.

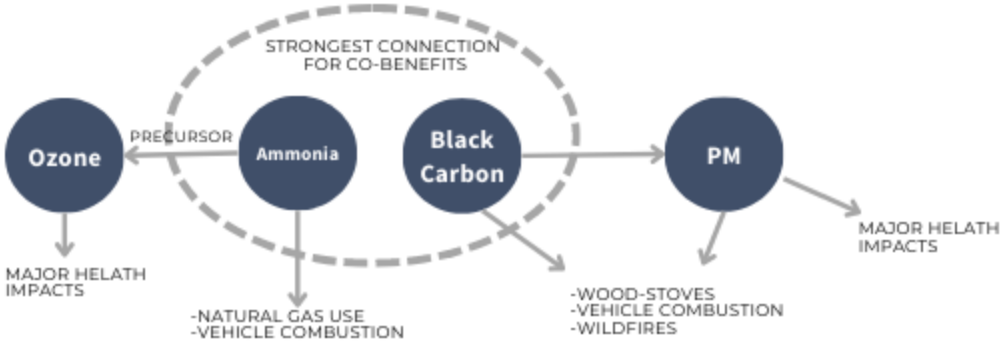


Fig. 1. Ammonia and Black Carbon concept diagram

Positive Feedback Loop

Another concern is the positive feedback loop in CC and air-polluting events. CC makes AQ more difficult to manage, especially because climate events occur at different spatial and temporal scales, whereas AQ is experienced more locally and in the short term. Wildfire events release PM and other GHG into the atmosphere. Black carbon present in PM as well as GHGs exacerbate the greenhouse effect resulting in warmer temperatures. Higher temperatures increase the occurrence of wildfire events, and the cycle repeats (Figure 2). This issue becomes even more complex when additional factors intervene. For example, the mountain pine beetle invasion destroyed nine million hectares of forest in Prince George and increased the vulnerability of forests to wildfires (Hinzmann, 2020).

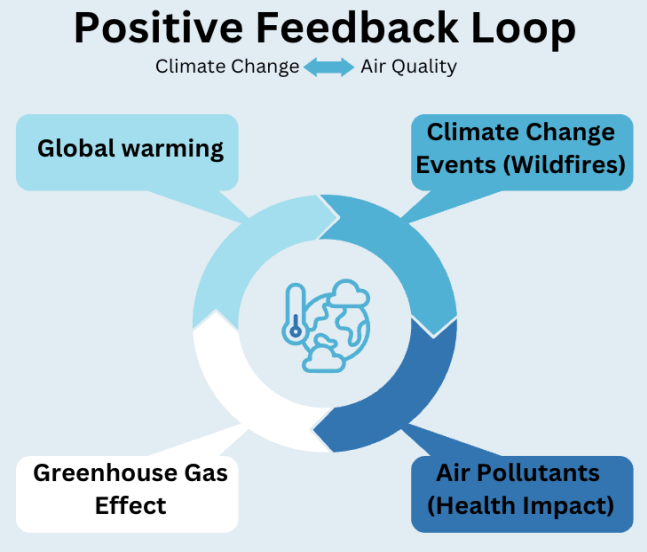


Figure 2. Reinforcing feedback loop model for climate change/ air quality in the PGA.

Inverse relationship between AQ/CC

From the same lens, it is also important to be mindful of conflicting goals in air quality management and climate action. The most relevant examples are:

- Converting transportation fleets and heavy and medium trucks to diesel fuel to lower GHGs, but diesel combustion emissions increase harmful air pollutants like particulate matter and nitrous oxides (Haines, 2017).
- Using biomass burning as an energy source can lower GHG emissions but impact air quality negatively emitting particulate matter and carbon monoxide (CO). Similarly, using natural gas for heating eliminates the emission of PM but increases GHG release and, in the long term, the amount of methane in the atmosphere that could be chemically converted into ozone (Michael Brauer interview).

Synergistic relationship at the policy level

Addressing air quality and climate change together can lead to significant co-benefits in environmental policy, and economic cost savings (Bishop, 2021). While air quality impacts people daily, climate action focuses on decarbonization to be achieved over a long-term timeline (30 to 40 years). This means that air quality benefits can function as a motivational driver to accelerate the transition to a low-carbon future and meet global warming reduction targets.

Economic benefits show that the co-benefits of improved air quality alone "often justify the cost of climate change mitigation programs, even before the climate-related and other benefits of these policies are considered" (Bishop, 2021, p.1). This realization is a valuable opportunity to push for im-

proved environmental policy and action against a rapidly changing climate, with air quality co-benefits providing immediate benefits that politicians need to make the case for climate action (Bishop, 2021). Significant emphasis has been placed on climate change policy, but immediate benefits will be perceived in air quality, resulting in tangible, immediate health and economic benefits to gain buy-in from the government to provide more funding and engage in transformational change (M. Brauer, personal communication, March 1, 2023).

There is a socio-economic value in taking action compared to the avoided monetary loss through subsequent premature deaths or disruptive climate change events. In the face of CC, there are socio-economic benefits for local governments to simultaneously address both AQ and CC. Several studies have shown the potential to achieve both environmental and health improvements. The cost of premature deaths by air pollution was 6.1% of the global GDP in 2019, equivalent to US $8.1 trillion (Appoh, 2021). It is predicted that 0.7 to 4.7 million annual premature deaths can be avoided from outdoor air pollution, mainly by reducing black carbon and particulate matter emissions. West et al. (2013) model the co-benefits of avoided mortality due to air pollution to be US$50–380 per tonne of carbon dioxide, which exceeds the marginal abatement costs of removing GHGs from the atmosphere (West et al., 2013). Similarly, the benefits of reducing methane emissions are valued at $700 to $5000 per metric ton, mostly from increasing annual crop yields by 30 to 135 million metric tons due to ozone reductions by 2030 and beyond (Shindell et al., 2012). Low-emission vehicle models, including increased active transportation mode usage throughout cities, have also shown major benefits to health through air pollution reduction while lowering heat island effects on a city scale and reducing contributions to climate change on a global level (Haines, 2017). For policy committing to actions that reduce emissions contributing to air quality and climate change can improve health and reduce GHGs more effectively, at less cost and with greater overall benefits. Adopting this approach in environmental policy will result in the most practical and powerful actions that benefit the community and the surrounding environment.

"The air quality 'co-benefits' are generally so valuable that they exceed the cost of climate action, often many times over" - Rebecca Saari, University of Waterloo (Bishop, 2021, p.1).

The Role of Local Governments in Managing AQ/CC

Local governments play an essential role in implementing and monitoring actions that influence both CC and AQ. However, limited funding and budget constraints are challenges for every local government across Canada. By highlighting the mutual benefits of taking action that improves AQ while mitigating CC, more provincial and federal level finance programs can be applied and used to benefit local governments seeking change in their communities.

In the context of the PGA, shifting the Fraser Fort George Region's local government's agendas to focus on addressing AQ and CC will allow for a more effective resource allocation and human and environmental health benefits.

Context of PG Airshed

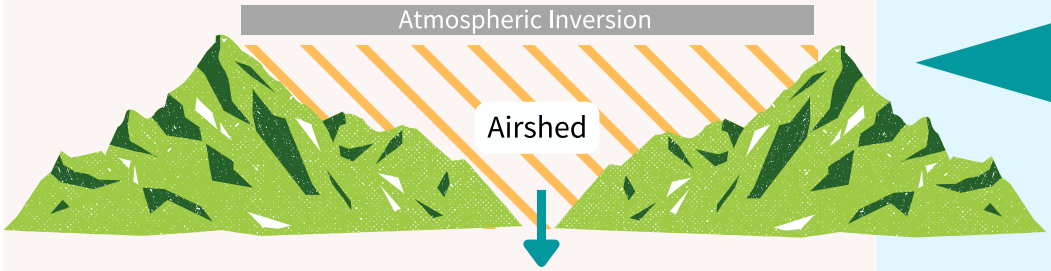
Topography

Air quality in PG is impacted by the topography in the region, where the majority of population is settled in the valley formed by the confluence of two rivers, the Nechako River and the Fraser River, in an area known as the 'Bowl'. Topography acts as a physical barrier that, combined with meteorological phenomena such as thermal inversions occurring mostly in winter, trap air pollutants worsening air quality sometimes for multiple days. (Figure 3)

Air pollutants

Particulate Matter (PM 2.5 and PM 10) emissions are the main concern in the Prince George Airshed and have been a challenge since the 1980s (PGAIR, 2018). The most recent micro-emissions inventory (MEI) found that the main sectors contributing to PM in decreasing order are permitted industry, residential heating, dust and on-road mobile (Nilson et al., 2020). Industrial emissions come from forest product manufacturing at pulp and paper mills and sawmills, which has been the leading industry since 1960s (Varcoe & Browne, 2015) and represents one of the largest employment and income generators in the City of PG and the region (City of PG, 2017; Coady & Picketts, 2012). PM from residential burning is mostly attributed to wood-burning during winter periods. PM emissions decreased by 50% between 2011 and 2016, which was mostly attributable to upgrades in infrastructure and equipment. Although, there are areas in the City that exceed PGAIR's, provincial and federal PM targets, which may be attributed to background PM that exists in PG, even if there were no anthropogenic emissions (Jackson et al., 2017; Nilson et al., 2020).

Ozone is currently not a primary issue in the PG airshed because of microclimate conditions and composition of pollution emissions. Tropospheric ozone, as mentioned earlier, requires specific precursors such as methane, volatile organic compounds (VOCs) and nitrogen oxides in combination with strong UV sunlight, which in Prince George are limited (G. Roth, personal communication, January 13, 2023). However, it is important to consider how future changes in emissions as well as climate change could impact the formation of tropospheric ozone so that there are measures put in place.



What is an Airshed?

A region sharing common airflow patterns constrained by weather and topography

- Regions exposed to similar levels of air pollution concentrations
- Air pollutants could be trapped, causing poor air quality levels for long periods of time until weather conditions change

An **Atmospheric Inversion** occurs when air temperature increases with height within a layer of the atmosphere. Colder air in proximity to the ground is kept below this layer, impeding the flow of air to the atmosphere.

PG Airshed

PG Airshed is strongly influenced by its location at the confluence of Nechako River and the Fraser River, whose valleys form a large topographic depression.

Overlaps with:

- City of Prince George
- Electoral Area A – Salmon River Lakes
- Electoral Area C – Chilako River-Nechako
- Electoral Area D - Tabor Lake – Stone Creek
- Electoral Area D – Pineview
- Electoral Area F – Willow River – Upper Fraser Valley

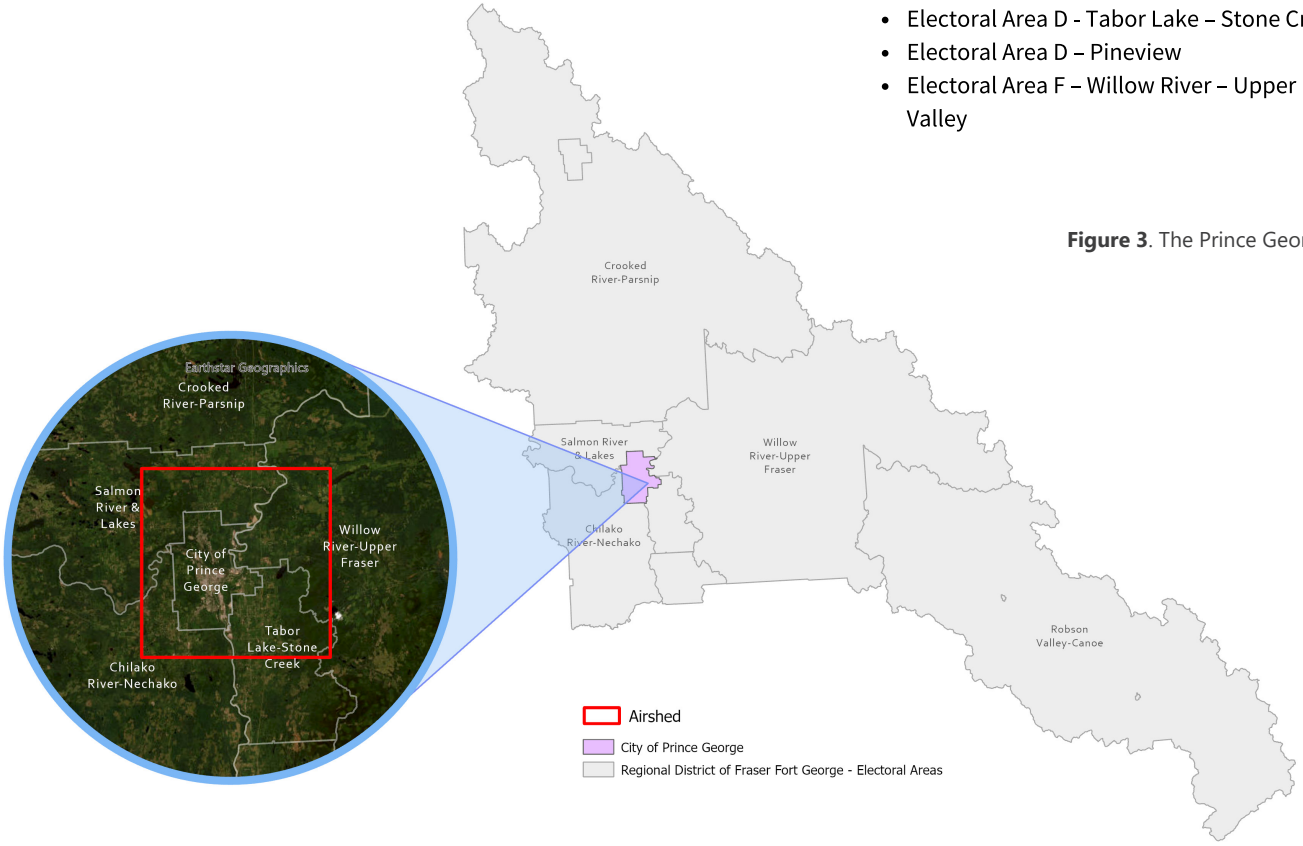


Figure 3. The Prince George Airshed

Jurisdiction

Determing an organization's ability to create change based on jurisdictional authority is an important first step when assessing possible action plans towards improving AQ conditions. Spanning across multiple government bodies, borders and legislation, regulating for AQ can become challenging to manage for between vested parties. Knowing where responsibilities lie within local, provincial and federal government's will allow an organization like PGAIR to know who best to lobby and gain support for towards better managing for both AQ and CC. We've outlined below the limits of authority between the three levels of Canadian governance including examples of actions, plans and legislation.

Local and Regional

- Enact bylaws to control emissions such as backyard burning, wood stoves and vehicle idling.
- Regulate land-use zoning, density and development permits.
- Transportation planning e.g. public transit, transit networks and active transporation network.
- Official Community Plans and Regional Growth Strategies.

Action:
- Transportation infrastructure
- Waste management
- Public transit services
- EV strategy
- Energy retrofit programs
- Green areas land designations

Plans & Legislation:
- RDFFG Corporate Climate Action Plan
- Active Transportation Plan
- Prince George Official Community Plan
- Local Government Act
- Clean Air Bylaw

Provincial

- Responsible for regulating pollution from heavy industry and business activities.
- Develop air quality standards and guidelines, regulate point and area sources of pollution, and can require the preparation of Airshed Management Plans.

Action:
- Codes (building, energy)
- Data Inventory
- Green infrastructure
- Provincial roads & transit funding
- Municipal regulation & authority
- Carbon tax
- Vehicle Emission Mandates

Plans & Legislation:
- CleanBC
- Environmental Management Act
- Waste Discharge Regulation

Federal

- Many emission sources that lie beyond provincial authority are subject to federal regulation, standards and guidelines.
- The federal government also provides research support and guidance to provincial and municipal agencies in the development of strategies and plans

Action:
- Vehicle fuel efficiency standards
- Green infrastructure funding
- Energy ratings & tools
- Carbon pricing
- Carbon capture & sequestration

Plans & Legislation:
- Canadian Environmental Protection Act
- Pan-Canadian Framework on
- Clean Growth and Climate Change
- A Healthy Environment and a Healthy Economy

Project Challenge

Addressing AQ and CC simultaneously can provide environmental and socioeconomic benefits. PGAIR sees an opportunity to identify actions that offer co-benefits between AQ and CC goals in the PGA. In partnership with the SCARP Studio team, this project will provide PGAIR with **strategic direction** for how they can support the City of PG and RDFFG in advancing their CC goals that have a positive impact for AQ. This work will also inform the upcoming development of an **Air Quality Management Plan** (AQMP) for the PGA.

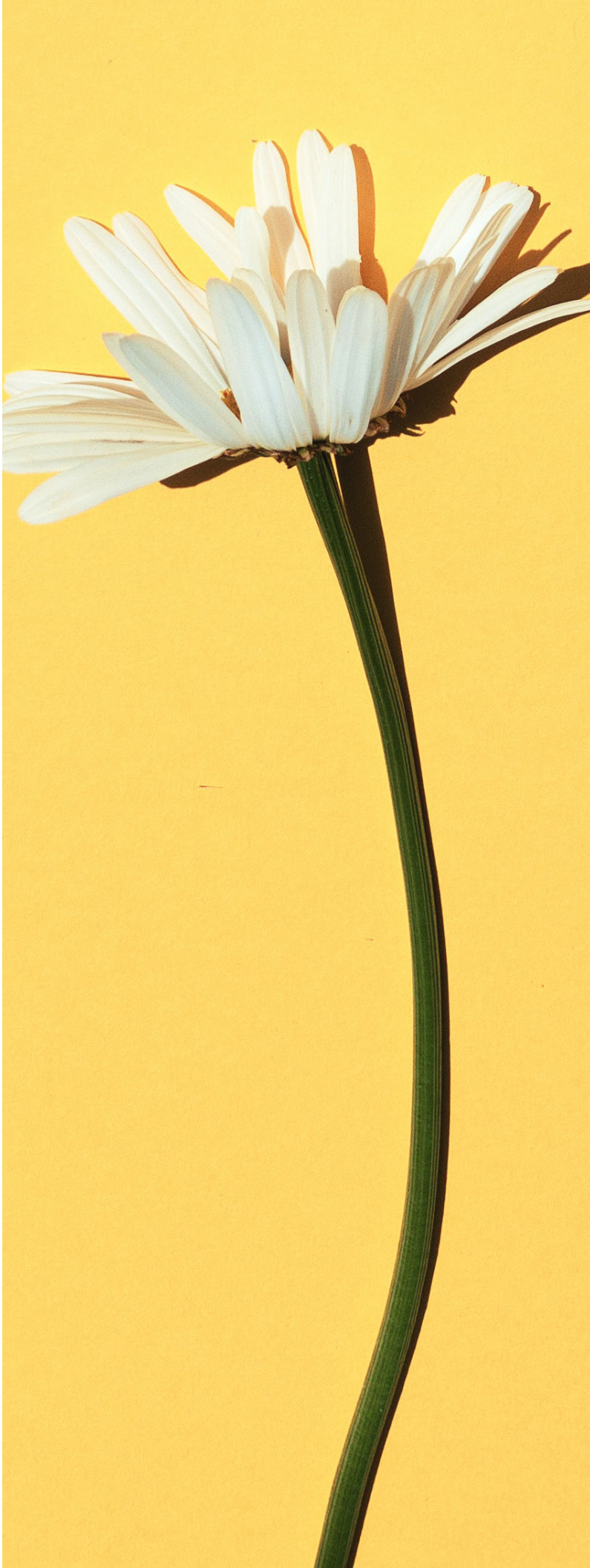
Project Objectives:

1. Compile a comprehensive database of existing actions related to AQ by reviewing each organizations existing CC planning documents.

2. Assess gaps and opportunities to advance AQM by interviewing parties of interest and identifying new actions from comparable plans from outside organizations.

3. Provide PGAIR and member organizations with strategic direction by identifying proposed actions that offer AQ/CC co-benefits as options to advance AQM in the PGA.

METHODS



Our team adopted PGAIR's suggested six step framework Silversten and Bartonva, (2012)'s for the development of a new AQMP. More specifically, our project focuses on supporting PGAIR on Steps 1, 4, and 5 of this framework. For more information on the six-step process, please refer to Appendix A.

We structured our project into three phases. Figure 4, provides key timelines and deliverables for each phase.

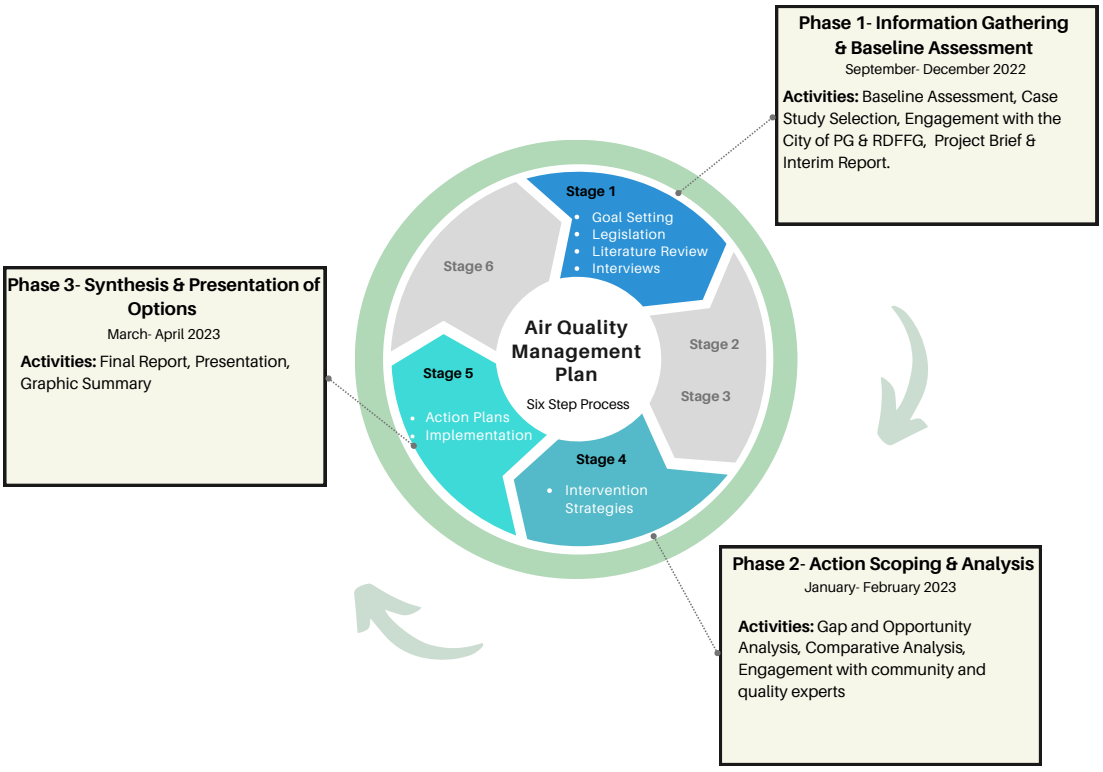


Figure 4. The three-phase project approach, which adopts the framework of Silversten and Bartonva (2012) 's six step process for the development of an AQMP.

6.11 Phase 1 "Information Gathering & Baseline Assessment" (September-December 2022)

The objective of Phase 1 was to gain an understanding of the current context of AQM in the PGA. In Phase 1, we compiled a comprehensive baseline of existing CC actions related to AQ from 13 planning documents from PGAIR, the City of PG and the RDFFG.

Deliverables from Phase 1 included the project proposal, brief, engagement strategy, a baseline assessment, and a list of comparable plans from outside organizations (formerly referred to as the case study selection in the interim report). Please refer to the interim report for the detailed methodology.

6.12 Phase 2 "Action Scoping and Analysis" (January-February 2023)

The objective of Phase 2 was to further scope down the existing actions identified in Phase 1 to reveal the sectors that offer the most benefits for both CC and AQ. Phase 2 also intended to assess gaps and opportunities for improving AQM in the PGA by reviewing comparable plans to determine what other 'like' governments or organizations within Western Canada are doing to manage air quality.

Comparative Analysis to Identify Climate Change and Air Quality Co-Benefits

To provide strategic direction for PGAIR, we wanted to narrow the scope of our actions to prioritize those that offer co-benefits for CC and AQ. Therefore, we performed a comparative analysis to identify which sectors in the City of PG contribute most to GHG emissions and air pollutants.

City of PG GHGs

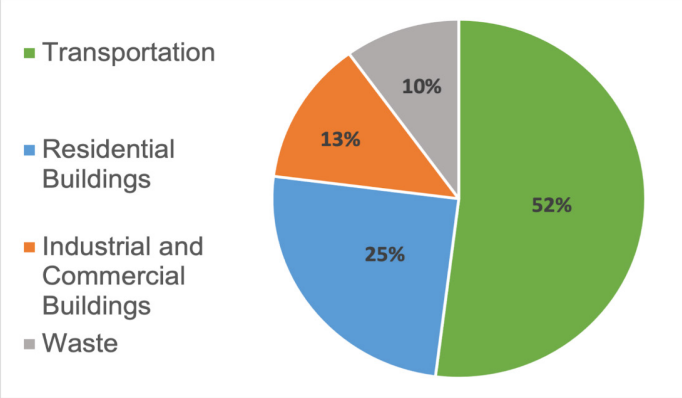


Figure 5. Prince George's Community Greenhouse Gas Emissions, adapted from the 2020 City of Prince George Climate Mitigation Plan.

To determine the highest contributing GHG sectors of GHGs in the City of PG, we examined the emissions inventories in the 2020 City of Prince George Climate Mitigation Plan. Given this project's scope, we only focused on the community emission sources, which the City has influence over (e.g. excludes industry).

As shown in figure 5, the top three highest sectors contributing to community GHGs are transportation, buildings, and industry.

City of PG Air Pollutants

To determine the highest contributing sectors of air pollutants in the City of PG, we examined the Prince George Microemissions Inventory (MEI), which contains a list of all sources of PM10, PM2.5, NOx, and SO2 in the Prince George Airshed (Nilson et al., 2020). See table 5 in the Appendix D.

We only examined the total emission rates (t/y) of PM 2.5 sources because PM 2.5 is a primary pollutant of concern in the PGA(G. Roth, personal communication, January 13, 2023). Next, we categorized the various emissions sources into sectors to determine their relative contributions to PM 2.5 emissions, as shown in table Y in the appendix.

Table 1. PM 2.5 Total Emission Rates (t/y) by sector and emission sources

Sector	Emission Sources	Total Emission Rates (t/y)
Industry	Industry	956.5
Transportation	• Road Dust • Commercial Dust • Fugitive Dust • On-Road Mobile • Rail Yards/Lines	248
Buildings	• Residential Heat • Commercial Heat • Restaurants	220.2

The comparative analysis identified **transportation, industry, and buildings** as the most significant contributing sectors to GHGs and air pollutants like PM 2.5.Therefore, the project assumes these three sectors would offer the greatest co-benefits for AQ and CC within the PGA.

We did not rank the three sectors in order of importance because of jurisdictional considerations and differences in measurements and metrics within these two documents. For example, the Climate Change Mitigation Plan did not include GHGs emissions from the permitted industry because the City does not have jurisdictional power over industrial activities. Instead, we decided to consider each sector further and explore actions that work for all three sectors.

Gap and Opportunity Assessment

To further expand our knowledge of AQM we identified ten air quality related plans from outside organizations across British Columbia and Alberta with similar economic activities, geographies and community profiles. See Appendix B for the list of reviewed documents.

We reviewed these comparable plans to identify "new" example actions relevant to AQM from the three sectors of interest. We considered 'new' actions to be activities absent in the baseline assessment and novel to the PGA.

The gap and opportunity assessment identified 101 new actions in total, [industry (28), transportation (46), buildings (27)].

6.23 Phase 3 Synthesis and Presentation of Options" (February- March 2023)

The objective of Phase 3 was to provide PGAIR and member organizations with strategic direction by identifying proposed actions that offer AQ/CC co-benefits as options to advance AQM in the PGA.

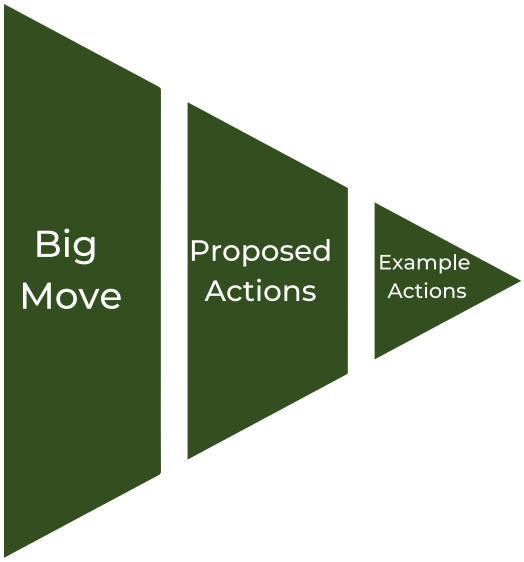


Figure 6. Demonstrates the hierarchy breakdown from Big Moves to Example Actions

Synthesis and Identification of Proposed Actions and Big Moves

We provided strategic direction for our partner by synthesizing an abundance of information into a usable format of Example Actions, Proposed Actions, Big Moves as shown in Figure 6.

Example Actions

Phase 1 and Phase 2 used Excel to compile a comprehensive database of existing actions from the baseline assessment and new actions from the gap and opportunity analysis. These example actions are practical ways of approaching the proposed actions. This exercise also allowed us to filter out weak example actions from the baseline assessment that were not specific or actionable.

Proposed Actions

We coded example actions into similar themes (e.g. active transportation, electric vehicle, renewable energy, etc.) and used these to group and synthesize similar example actions into proposed actions. We assigned a code to each proposed action for organization and data handling. We present proposed actions as options for PGAIR, the City and RDDFG to consider when tackling the Big Moves.

Big Moves

We reviewed proposed actions to identify similar activities and categorized them into "Big Moves." These Big Moves represent areas of interest for the partner organizations to improve air quality in the PGA.

FINDINGS

Baseline Assessment

The baseline assessment in Phase 1 reviewed 17 regional and municipal documents to identify goals and actions focused on improving air quality. The baseline assessment identified 498 actions categorized into six sectors of interest: Transportation, Waste Management, Land-Use, Buildings, Industry, and Other. Findings from the baseline assessment offered PGAIR and partner organizations an abundance of actions to explore further in Phase 2. Please refer to the interim report for more detailed findings.

Engagement with Community and Air Quality Experts

Throughout October 2022- March 2023, we conducted several interviews with community and technical experts. Although we did not perform qualitative analysis, we acknowledge the following contributions:

- **Wil Wedel and Deanna Wasnik:** City of PG staff provided context regarding the City's limiting factors in achieving climate goals and improvements to air quality. Understanding how PGAIR can better support this was extremely insightful.
- **Rachael Ryder and Kenna Jonkman:** Regional District of Fraser Fort George staff shared information about the capacity limits the region is facing and areas of air quality they believe show the highest potential for successful impact.
- **PGAIR Operations Committee and the Fraser Basin Council (Patience Rakochy, Barbara Oke and Randi Zurowski)**- Provided extensive feedback on our interim report, which clarified foundational details and future direction to continue to Phase 2 of our project.
- **Gail Roth** (B.C. Government- Air Quality Meteorologist) provided technical expertise on air quality contaminants within the PGA, which informed the comparative analysis.
- **Paula Tait** (Health & Resource Development Technical Advisor, Northern Health) provided context on public health concerns associated with air quality, further establishing this work's significance.
- **Dr. Marie Hay** (PGAIR Board Member) shared knowledge on the historical context of Prince George and political and social considerations for the uptake of air quality action.
- **Andrea Burn** (Former City of Prince George Employee) shared knowledge of her experience at the City of PG and organizational goals and priorities.
- **Michael Brauer (**Professor, ScD, University of British Columbia) shared knowledge of air quality management, including practical challenges and opportunities for improvement.

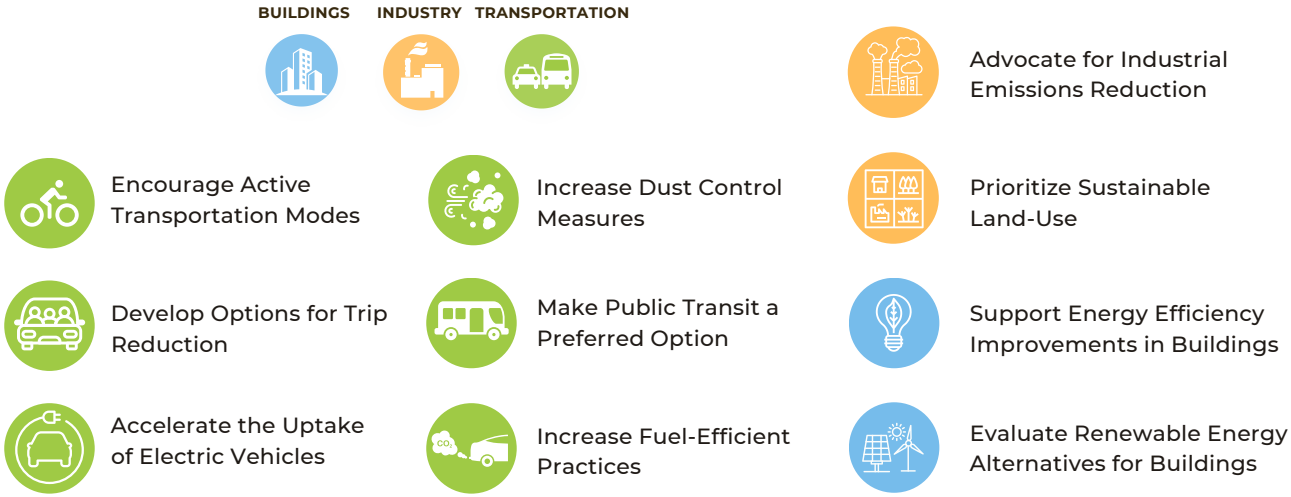
Takeaways of Engagement

Interviews provided key insights on the PGA and AQM in general. We learned about historical and modern context from community experts who shed light on the PGA's culture. Interviewees shared perspectives on the City of PG being rooted through a resource-based economy that has additional considerations as a community in northern, interior British Columbia. Furthermore, interviews with City of PG and RDFFG staff revealed organizational attitudes, perceptions, and capacity constraints. Therefore, our findings strive to align with the socio-economic, political, and culture of the community.

Interviews with technical experts emphasized the human health and environmental benefits of taking action to improve AQ and CC simultaneously, which is the foundation of our project. Technical experts informed and scoped our project processes and deliverables, ultimately shaping our findings to provide strategic direction to PGAIR, the City of PG, and the RDFFG.

10 Big Moves

We identified **Big Moves** across the three sectors, whereby Transportation has 6, and Buildings and Industry have 2 Big Moves each. Each big move includes funding opportunities identified by our team. See Appendix C for a full description of funding programs.



45 Proposed Actions

Each proposed action includes information on the timeline, reference document(s), lead organization(s), and in some cases new actions/strategies (See table 2). The following section will list all proposed actions.

Table 2. Breakdown of details included for each Proposed Action

Item	Description
Timeline	We provided an estimate of the timeline for implementation according to our understanding of the feasibility and organizational capacities. The timelines proposed are: • Short-term (1-2 years) • Medium-term (3-5 years) • Long-term (5+ years).
Lead Organization(s)	We suggest lead organization(s) that, given structure and jurisdiction, would be better suited to address each action. We acknowledge that these are simply suggestions based on our knowledge and understanding of organizational capacity and jurisdictional abilities.
New Example Actions	If applicable, we added examples of new and exciting example actions from the comparable plans to bring attention to what other organizations are doing that may be of interest to our partners.
Reference Document(s)	For each proposed action, we provide a suprescript citation of reference documents that support the action. Table 3 in appendix B assigns a unique number to each reference document.

TRANSPORTATION

Transportation networks serve and shape entire communities and economies throughout our regions. Roads, rail lines, shipping routes and bike paths are integral to connecting people to their destinations (Metro Vancouver, 2021). However, the subsequent burning of fossil fuels needed to energize these modes of travel can worsen air quality while contributing to climate change. As the region continues to grow and expand outwards, we require a transportation system that looks to better link people with essential services & resources while also reducing carbon footprints.

In comparison to provincial and national averages, PG has a high degree of vehicle reliance due to low-density, sprawled development, severe winter weather, harsh topography and limited connectivity of both active transportation and public transit networks (City of PG, 2020). Moreover, as outlined in the 2010 Active Transportation Plan, nearly 90% of trips within the City are in personal vehicles, while other modes account for the remainder 10% (City of PG, 2020), suggesting the need for improved planning practices that provide safe and reliable low-emission transportation alternatives.

Develop Options for Trip Reduction

Funding Opportunity

Source: Rural and Northern Communities Infrastructure Program.

Estimated amount :$2 million

Deadline: 2028

Park and ride, park and carpool, and car share programs are valuable options to reduce personal vehicle trips. Other strategies include removing free parking benefits and replacing them with spaces available for carshare modes. Offering diverse transportation modes that are beyond conventional options like public transit can reach a broader audience and promote trip-reducing options for all! This big move has 6 proposed actions.

[TR1] Encourage carpooling or offer work-related transportation [1,9,15]. Encourage carpooling among city staff and the community. Investigate opportunities for collaboration with major employers and large trip generator businesses (e.g. shopping malls) to implement trip reduction programs. Programs could require employers to measure staff and customer driving habits and take action. To reduce emissions related to commuting, promote carpooling and have remote and flexible work options.

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Short-term

[TR2] Support infrastructure upgrades and expansions for safe and affordable park-and-ride options [14]. Designate park-and-ride/carpool lots in proximity to transit hubs and facilitate information exchange between drivers and riders to plan rides and routes.

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Short-term

[TR3] Develop a regional strategy to streamline the use of bike and car sharing services[1]. Develop a regional strategy in coordination with member jurisdictions to support the increased use of bike and carsharing services. Include options to support carshare co-ops and ride-hailing services.

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Short-term

[TR4] Develop and implement a policy that puts a price for driving in the region [15]. Work in partnership with member jurisdictions and other regional partners to develop and implement a policy that puts a price on driving. The program could include mobility pricing, transportation

pricing, usage-based insurance, fuel taxes, etc.

- Lead Organization(s): BC government, City of PG, RDFFG
- Timeline: Medium-term.

[TR5] Develop a regional parking strategy to discourage driving [15,18]. In coordination with member jurisdictions, strategize land use planning policy to promote active transportation and other low emission transportation options over parking. Review options to replace building parking minimums with maximum set requirements, establish parking minimums for bicycles, implement more stringent parking pricing and reduce free parking spaces. Strategy can be in liaison with actions to increase the uptake of electric vehicles and use of carshare vehicles by providing preferential parking rates and exclusive parking spaces.

- Lead Organization(s): City of PG.
- Timeline: Medium-term. Requires de update of OCP and bylaw.

[TR6] Develop a Downtown Transportation Demand Management (TDM) Strategy for single-occupancy vehicles [1]. Develop a TDM strategy that focuses on understanding how and why people make transportation decisions in the region. The TDM applies behaviour change research, tools and incentives to encourage the use of sustainable transportation. The strategy should include public educational campaigns that promote sustainable transportation options. The City could also assess the possibility to include a TDM requirement for subdivision in new developments, with proper assistance and support offered to developers.

- Lead Organization(s): City of PG and PGAIR
- Timeline: Short Term

Increase Fuel-Efficient Practices

Although change is occuring, reliance on burning fossil fuels is common within our current transportation systems. In circumstances where fossil fuels are still necessary, there are actions and strategies individuals, organizations, and governments can take to improve fuel-efficiency, such as anti-idling and advocating for stricter emission regulations.

Funding Opportunity

Source: Emotive Community Outreach Incentive Program

Estimated amount: $10,000

Deadline: Immediately

[FE1] Develop a green fleet strategy to provide direction for future fleet replacement and renewal projects [1,2, 8, 9,16]. Collaborate in partnership with the BC government and support the development of a long-term, province-wide emissions strategy for medium and heavy duty

fleet for a phased implementation of the transition to zero emissions vehicles. Adopt environmental considerations when purchasing or renewing corporate fleet vehicles, such as fuel sources, fuel efficiency, rightsizing, emissions testing, etc. The green fleet strategy can include a standard operations procedure that examines purchasing criteria for fleet vehicles.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Medium-term

New: *Red Deer Particulate Matter Response is converting the bus fleet to Compressed Natural Gas.*

[FE2] Advocate for more stringent regional emissions requirements for existing passenger vehicles and support with vehicle emissions programs [1,4, 8, 13, 15, 18, 20]. Advocate to the BC government for additional regulatory requirements for more stringent fuel economy and emissions standards. Local governments can offer a free vehicle emission inspection and testing programs, and explore low or zero emission zones in critical areas of the "Bowl." or a vehicle emissions levy with rebates for replacing older vehicles

- Lead Organization: City of PG.
- Timeline: Short-term

[FE3] Analyze fleet fuel consumption data to identify efficiency opportunities [1, 9, 20]. Develop a fuel consumption monitoring program for corporate fleet. The monitoring program should be cohesive and standardized, reviewed at a specific frequency (e.g. semi-annually) and provide direction for fuel efficiency opportunities.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Short-term

[FE4] Encourage and support initiatives on developing electrification infrastructure for truck stops to reduce the idling of commercial trucks [14]. Assess the option to develop electrified truck parking for drivers to connect to the electric grid during mandated rest. Connection to the electric grid would prevent the idling of vehicles while maintaining access to air conditioning, heat and electricity.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Long-term

[FE5] Advocate for regulation of existing medium and heavy trucks to reduce emissions [14, 15]. Advocate to the BC government to develop and implement more stringent regulatory emissions standards for existing medium and heavy duty vehicles. Regulatory approaches could include an inspection and maintenance program, registration require-

ments, a regional smoking vehicle hotline, and low or zero emissions zones in sensitive areas, such as the Bowl. These requirements should be done in collaboration with member jurisdictions.

- Lead Organization: PGAIR
- Timeline: Medium Term

[FE6] Reduce congestion via roundabouts and efficient timing of traffic signals [4]. Periodically review the timing and phasing of traffic signals to enhance mobility and avoid congestion and delays. Local governments can consider implementing roundabouts at intersections requiring design upgrades because of the advantages of roundabouts in user safety, delay and emissions reduction and lower operational costs.

- Lead Organization: City of PG
- Timeline: Long-term

[FE7] Advocate to accelerate emissions reductions from rail locomotives [14, 15]. Advocate to Transport Canada, the BC government and the Railway Association of Canada to continue developing and implementing strategies to accelerate emission reductions from diesel locomotives and rail yard support machinery. Strategies should prioritize emission monitoring programs and cleaner locomotives operating near areas that are most impacted by rail emissions, such as the "Bowl".

New: *Fraser Basin Valley is advocating to Transport Canada and Railway Association of Canada for emission monitoring and enforcement of new railway emission regulations to reduce emissions from the railway industry.*

- Lead Organization: City of PG
- Timeline: Long-term

[FE8] Develop and implement corporate and community anti-idling strategies. Work in partnership with member jurisdictions to implement corporate and community anti-idling programs, including car-idling restrictions in existing Clean Air Bylaw or a new Anti-idling bylaw. For corporations, implement training for staff drivers to be fuel efficient and install anti-idling devices and GPS in fleet vehicles. For the community, create driver education materials, advertising tools, prompts and signage at key locations like schools and libraries. Use education materials to identify best practices and address the 'myths' of idling.

New*: Red Deer is delivering smart drive programs to all new and recertifying fleet drivers, emphasizing in driving to be fuel efficient. They are also implementing an Idle-free School education program to realize the benefits of being an idle-free school. The program includes a teacher's manual, school assembly presentation, communications support and signane.*

- Lead Organization(s): PGAIR, City of PG and RDFFG
- Timeline: Short-term

Make Public Transit a Preferred Option

Encouraging people to use public transit as a safe and affordable way of travel can help reduce trips taken by personal vehicles, alleviating congestion and reducing GHG emissions. This big move includes actions related to scheduling efficiencies, enhanced connectivity to growth priority areas and user-centric improved designs to increase ridership experiences and convenience!

Funding Opportunity

Source: Rural Transit Solutions Fund

Estimated amount: $3-5 million

Deadline: 2026

[PT1] Implement scheduling and routing efficiencies for transit systems [1, 2, 4]. Implement scheduling and routing efficiencies to increase the frequency and reliability of transit services. To be an attractive alternative, transit should be a safe and convenient option for all residents, including seniors, youth, and people of various physical abilities. Review ridership patterns and use key performance indicators (KPIs) to monitor and control transit service over time. Use benchmarks to measure progress over time.

- Lead Organization: City of PG
- Timeline: Short term

[PT2] Increase the connectivity of transit services [4]. Transit services should connect major destinations, including major residential, activity centres, and commercial areas. To increase the connectivity of the region, public transit systems should connect to other transportation modes, including the active transportation network, rail, and the airport.

- Lead Organization: City of PG, RDFFG
- Timeline: Intermediate

[PT3] Increase the accessibility of transit services with enhanced on-street passenger facilities and more flexible ridership policies [16]. Improve on-street passenger facilities, including bus benches, shelters, lighting, waste receptacles, and route/schedule information. Improve the rider experience with stop announcements, passenger counting, enhanced security, and access to real-time transit information.

- Lead Organization: City of PG, RDFFG
- Timeline: Intermediate

***New**: Red Deer has a plan to provide Wi-Fi services, mini libraries, and allowing small pets in carriers in public transit.*

[PT4] Implement targeted educational initiatives to attract new ridership [4, 16]. Continue providing targeted educational and promotional initiatives to attract new ridership. Create a public campaign strategy that rewards the use of other modes of transportation similar to the bike-to-work week for staff. For example, create community-wide competitions in collaboration with employer generators to implement a point system for companies with the greatest number of bike or active transportation trips and provide recognition with awards and certifications for the most active companies.

- Lead Organization: City of PG, PGAIR
- Timeline: Short term/Ongoing

[PT5] Create a partnership with local governments to discuss future transit service expansion [4, 15, 16]. Launch a regional transit service in collaboration with the different local governments and create a space for holding conversations on the future expansion of regional transit. The partnership could create momentum to advocate to the government of BC and Canada for more stable funding for the Regional Public Transit System to cover operations and capital investments. Add transit coverage criteria in the development approval process to comply with the minimum target transit coverage stipulated in the OCP.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Medium-term

Increase Dust Control Measures

Funding Opportunity

Source: Ministry of Transportation and Infrastructure Grant

Estimated amount: $500,000-1.2 million

Deadline: N/A

Dust as fine particles in the air we breathe, can be extremely harmful to human health. Targeted actions like public education and municipal street sweeping can suppress the dust created by activities like construction sites and recreational vehicles. Increased dust control measures will be essential as the length of dry seasons increases with climate change.

[D1] Establish dust-reducing guidelines for commercial and public spaces [6,12]. Establish more stringent guidelines that control the application of traction material and streetsweeping procedures for commercial and public spaces, including parking lots. Traction material should be applied to enhance public safety, while minimizing dust. Evaluate street sweeping procedures, and explore doubling the amount of street sweeps during the spring.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Short Term

[D2] Create a public education campaign for dust management [5, 6, 16] **.** Educate the public on the health and environmental benefits through dust management campaigns. Being aware of how individual behaviour and municipal dust control impacts public health through air quality is crucial to the initiative's success. Minor adjustments such as the limited use of recreational vehicles on gravel pathways during long spells of dry weather can result in major positive impacts.

New: *Red Deer is implementing a Dust Control Incentive Program that offers a cost-share to residents for the purchase and application of dust abatement in front of their residences*

- Lead Organization: PGAIR
- Timeline: Short-term

Accelerate the Uptake of Electric Vehicles

EVs have been one of the most attractive green technologies available to the mainstream public in recent years. From motorcycles to buses, electric, battery-fueled vehicles cover an extremely wide range of options and available uses. Governments and organizations can support this surging trend by expanding EV charging stations throughout its buildings and public facilities in addition to helping lower the costs through funding incentives! Within this big move we identified two actions:

Funding Opportunity

Source: CleanBC Go Electric Charger Rebate

Estimated amount: $120,000

Deadline: N/A

[EV1] Support the development of an EV strategy[1, 2, 14, 15, 18]**.**

Reduce GHG emissions through the development and implementation of an electric vehicle strategy that supports the expansion of current and supportive facilities, such as charging stations. The installation of 10 EV chargers at city-owned buildings combined with updated bylaw parking EV charging station requirements will further promote the widespread use of EV vehicles. The EV strategy can include findings from the 2021 UBC Sustainability Scholars Program project, "Building Trust in Electric Vehicles." Furthermore, regional campaigns with events and resources can showcase and promote EVs to the community.

New: *Metro Vancouver is developing a strategy for vehicle charging infrastructure with member jurisdictions to ensure equitable access and guidance surrounding user fees, design and siting*

- Lead Organization(s): City of PG, RDFFG
- Timeline: Long-term

***New**: Metro Vancouver is lobbying the Government of British Columbia to require zero-emission sales targets for new medium and heavy-duty trucks. The sales target for zero-emission medium-duty vehicles should reach 100% by 2050, and for heavy-duty vehicles shortly thereafter, in 2060.*

[EV2] Advocate to expand EV funding and accelerate sales targets under the Zero Emission Act[14, 15]. Advocate to the BC Government to explore options to expedite sales for new medium and heavy duty zero emission vehicles through the Zero Emission Vehicles Act. Increased affordability can help improve access to electric vehicles. Therefore, advocate to the provincial and federal government as well as other regional partners to enhance funding opportunities (e.g., incentives, loans, tax credits) for EV charging stations and the individual purchase of low and zero emission vehicles, including medium and heavy trucks.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Medium Term

Encourage Active Transportation Modes

Active transportation includes modes like walking, biking, e-mobility devices etc. Increasing active transportation throughout communities is a valuable opportunity to address sustainability issues and improve individual health through physical activity. Supporting active transportation upgrades to the existing networks and new regional infrastructure will reduce emissions by encouraging residents to get out of their cars and onto their bikes!

Funding Opportunity

Source: B.C. Active Transportation Infrastructure Grants Program.

Estimated amount: $500,000

Deadline: September 1st, 2023

[AT1] Expand Active Transportation Networks to increase connectivity in the region [4, 7, 15]. Perform a gap analysis of existing active transportation infrastructure to identify opportunities to expand the network and provide residents increased access to safe and inviting active transportation options within the region. Consideration should be given to Growth Priority Areas, including under-served and rural areas. The network should be planned, implemented, and maintained to be suitable for various mobility types, including walking, cycling, and electric mobility devices.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Medium-term

[AT2] Review and update the Active Transportation Plan [4,7]. Review the Active Transportation Plan and determine updates on priorities and roles that span across jurisdictional boundaries. Updates should be reflected into the upcoming Official Community Plan with coordinated action within the region on the development and maintenance of the active transportation network.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Short-Term

[AT3] Reallocate road capacity on arterial roads to the active transportation network [4]. Road capacity on arterial and collector roads should be evaluated to determine whether road space can be reallocated to the active transportation network. Both on and off-street parking requirements should also be reviewed. Where permitted, traffic lanes and parking can be reduced to allocate additional space for active transportation, which may shift demand towards sustainable modes of transportation.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Medium-term

[AT4] Continue encouraging city staff and the public to walk or cycle to work [4, 7, 16]. Implement educational and social marketing initiatives that promote the use of active transportation and offer information regarding safety rules for both active transportation and car drivers. Advocate the installation of end-of trip storage facilities and flexible working start time options to employers for workers and visitors. Continue organizing events like bike to work week or include car free days.

New: *Red Deer is engaging with the community by meeting at schools to celebrate the Commuter Challenge, which promotes the use of alternative modes of transportation.*

- Lead Organization(s): City of PG, RDFFG
- Timeline: Short-term

[AT5] Advocate for active transportation funding and increase affordability of bikes and other mobility types [4, 7, 15]. Advocate for more stable infrastructure funding by the Provincial or Federal government towards regional active transportation networks. Increase affordability for people to access active transportation options, such as bike swaps, rentals, sharing services secondhand sales, reward systems, or discounts from local businesses. Consideration and funding can be allocated to those who may have reduced access to transportation options, including low-income residents and households.

New: *Metro Vancouver has a plan to advocate to the BC Government and the Government of Canada to offer and expand stable funding sources for local and regional active transportation networks.*

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Short-term

[AT6] Conduct research to improve the dataset for active transportation demand [1,4, 7]. Increase knowledge and understanding of active transportation demand through methods such as conducting traffic counts, community walkability scoring, and surveying residents on travel-modal split.

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Short-term.

BUILDINGS

Acting as spaces for shelter, comfort, productivity and recreation, buildings are where we spend most of our time. Yet, this essential infrastructure through homes, business, schools and hospitals throughout the region emits large amounts of greenhouse gases and health-harming air contaminants (Metro Vancouver, 2021). Lasting centuries at times, the way we currently design, build and retrofit buildings will impact emissions for decades to follow.

Accounting for a high percentage of both greenhouse gas emissions and energy expenditures, buildings have a large potential for improvement in the City of PG (City of PG, 2020). It's recognized that the most effective way to reduce energy costs and GHGs throughout buildings is to increase building efficiency. Remodeling buildings to be more energy efficient can provide significant economic and social benefits through lowered energy bills as one example. While public support in PG for taking climate action related to buildings was low, models have shown the ability for this sector to have the greatest impact on community GHG emissions and energy costs (City of PG, 2020a).

Support Energy Efficiency Improvements in Buildings

We spend much of our time at home or the office within residential, institutional, and commercial buildings. Providing functions from recreation to leisure, the energy demand to heat buildings is becoming an increasing concern, especially in areas with cold climates. Communities can play a large role in supporting energy efficiency upgrades through retrofits to private and public buildings and developing more dynamic and resilient energy systems. Within energy efficiency improvements, we identified five actions:

Funding Opportunity

Source: B.C. Hydro Business Energy Saving Incentives

Estimated amount: $500,000

Deadline: N/A

[EE1] Expand regulation and financing tools to support retrofits/ upgrades to existing buildings [3, 4, 9,15, 18]**.** Existing residential, commercial, and institutional buildings can undergo retrofits and/or upgrades to meet energy efficiency performance targets. Regulation and financing tools can support and accelerate home and business owners and institutions to undergo retrofits and upgrades. Regulation can be established at the local, provincial, and federal level. For example, local governments can establish regulations like zero-emission targets for their own existing buildings. Furthermore, interested parties can advocate to higher levels of government to expand regulation/financing tools, such as the B.C. Retrofit Code.

- Lead Organization(s): City of P.G., RDFFG, PGAIR
- Timeline: Medium-term

[EE2] Encourage new buildings to meet energy efficiency performance targets [1, 2, 4, 10, 15, 19]**.** Meet energy efficiency performance standards through a combination of incentive and regulatory measures. Implement monetary incentives, such as "green mortgages" or demonstration projects that showcase green building techniques. Consider creating a building decarbonization coalition to work with governments, energy utilities, construction industry, academic institutions to address major barriers to decarbonization. Regulate through updating land use or building permits processes to locate building exhausts in suitable locations or promote builders to adhere to the B.C. Energy Step Code.

New: *Metro Vancouver has a plan to advocate to the B.C. Government to require energy labels for homes and buildings. The label must be disclosed publicly when a property is constructed or listed for sale, rental or lease (Metro Vancouver Clean Air Plan, 2021).*

- Lead Organization(s): City of P.G., RDFFG
- Timeline: Medium-term

[EE3] EExpand public knowledge of energy efficient building strategies [1, 3, 4,15,16,18]**.** Support home and business owners with resources to improve energy efficiency, such as online decision tools, access to en-

ergy advisors, and home energy conservation toolkits to increase public awareness of low-carbon solutions. Incentives can complement incentives from other forms of government or other organizations, such as an award in collaboration with the Chamber of Commerce that recognize businesses that are leaders in implementing energy-efficient upgrades and strategies.

- Lead Organization(s): City of PG., RDFFG, PGAIR
- Timeline: Short-term

New: *The city of New Westminster is implementing a local and regional energy benchmarking program to track a building's energy performance over time compared to similar buildings.*

[EE4] Conduct and monitor energy audits to identify opportunities for efficiency improvements [1, 2, 4, 9, 19]. Perform inspections and energy audits of existing corporate and public buildings, including offices, recreation centers, and large spaces. Store energy consumption data in an information tracking system that can identify opportunities for emissions reduction and energy recovery, planning and programming, and informing targets and policies.

- Lead Organization(s): City of P.G., RDFFG
- Timeline: Short-term

[EE5] Engage with regional partners to promote knowledge sharing and resources for energy efficient buildings [1, 2, 3, 4, 10, 15]. Collaborate with the City of PG, the RDFFG, the Lheidli T'enneh First Nation, the B.C. Government, the construction industry, and other regional partners to promote public knowledge exchange and training on energy-efficient building techniques and the economic benefits of retrofits and upgrades. Partnerships and regional working groups can increase knowledge and capacity to inform energy efficiency, such as policies and constructing energy-efficient buildings.

- Lead Organization(s): City of P.G., RDFFG, PGAIR
- Timeline: Short-term

Evaluate Renewable Energy Alternatives

Renewable energy sources supplied through solar, wind, geothermal and hydro systems are a rising power provider to our buildings and communities. While renewable energy technology and processes continue to evolve and improve, so should policies and regulations towards transitioning away from conventional sources contributing to greenhouse gas emissions. Initiatives such as removing old wood stoves and increasing the uptake of renewable energy sources require education and support between the government and the public to understand the many benefits!

Funding Opportunity

Source: First Nations Clean Energy Business Fund (FNCEBF) – Equity Funding

Estimated Amount: $100,000 to $1,000,000

Deadline: April 30, 2023

[RE1] Increase incentives and education to reduce emissions from woodstoves [4, 5, 6, 9, 10]**.** Continue to expand resources and awareness for the woodstove exchange program to replace older woodstoves with those that meet CSA/EPA standards for emissions. Educational resources, like Burn It Smart clinics and online support tools, should inform the public of clean woodburning practices.

- Lead Organization(s): City of P.G., PGAIR
- Timeline: Short-term

[RE2] Expand regulations for indoor wood burning [6, 10, 17,]**.** Use regulation to reduce emissions by restricting seasonal burning and burning during air quality advisories. Prohibit the installation and use of woodstoves that do not meet emissions requirements and adopt burning material standards such as manufactured logs or wood pellets. New regulation ideas can include decommissioning woodstoves when moving out or selling a property (M. Brauer, personal communication, March 1, 2023).

New: *Under the Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw 1303, 2020, every person who burns from a residential indoor woodburning appliance must provide a declaration to the district director indicating compliance with best burning practices. Furthermore, eligible appliances must be registered in urban areas. These declarations and registrations must be renewed every three years in urban areas (17).*

- Lead Organization(s): City of P.G., RDFFG
- Timeline: Intermediate

[RE3] Develop and expand the DRES Strategy [1, 2, 3, 4, 19]**.** Continue to explore opportunities to expand the DRES by increasing infrastructure and connections. Increase public acceptance by improving awareness of the environmental and economic benefits of the DRES.

- Lead Organization(s): City of P.G., RDFFG
- Timeline: Medium-term

***New**:The City of New Westminster is implementing an Urban Solar Garden program that allows residents, businesses, non-profits and institutional organizations served by the city's electrical utility to purchase solar panels on municipal property. Energy generated by the panel is used as credits towards lowering their electricity bills. (Environmental Strategy and Action Plan of City of New Westminster, 2018)*

[**RE4]- Explore options to uptake renewable energy sources like wind and solar** [1, 4, 9, 15, 19]**.** Evaluate the benefits and costs of uptaking renewable energy sources like solar and wind. Implement an Urban Solar Garden program to assist the uptake of solar panels in houses. Discourage woodburning as the primary heating method and offer educational resources for community members (residential and commercial) to increase public awareness of energy and heating alternatives methods.

- Lead Organization(s): City of P.G., RDFFG, PGAIR
- Timeline: Medium-term

INDUSTRY

Diverse industrial activities and associated businesses mold our economy through providing jobs to residents and products for both consumers and essential supply chains (Metro Vancouver, 2021). Industry includes a wide range of industrial, commercial and business operations, which can have a lasting impact on a region's air quality and contributions to climate change (Metro Vancouver, 2021). Special attention should be placed towards long-term transitions to a low carbon regional economy and a shift to sustainable facility upgrades.

Manufacturing and forestry are among the largest economic drivers in PG, with nearly half the labor force being employed in these industries (City of PG, 2020). The City is home to seven lumber mills, three pulp mills, one paper mill, and multiple secondary manufacturing facilities which contribute to issues surrounding air quality pollutants and odor within city limits (City of PG, 2020). Finding ways to transition from industry intensive activities to the continued expansion of the city's renewable energy system and development can be extremely beneficial to the health of the region's environment and residents.

Advocate for Industrial Emissions Reduction

Funding Opportunity

Source: CleanBC Industry Project Feasibility Study Fund

Estimated Amount: $40,000 to $13 million

Deadline: Opens April 2023

While industry helps drive our economies, industrial emissions contribute to CC and AQ concerns. All levels of government can work together to encourage and enforce emission reductions through regulation, incentives and awareness of the benefits behind suggested actions. Improved availability of cleaner industrial technology and procedures is an ongoing development as industries worldwide look to reduce their emissions. Recognizing this continuous shift and being open-minded to modern changes is important for the progress of industry and its evolving state.

New: *Metro Vancouver investigated and implemented additional targeted measures in partnership with other governments, academia and interested parties, to address emissions that contribute to ground-level ozone and secondary fine particulate matter concentrations. (Integrated Air Quality and Greenhouse Gas Management Plan 2011)*

[ER1] Support the use of best available pollution control technologies and energy efficiency procedures for industry and businesses [1, 2, 3, 5, 6, 14, 16, 18, 20]**.** Promote the use of clean technologies for all new and existing industry. This can be facilitated through research, education, development of best management practices (BMPs) and industrial refurbishment programs. Investigate opportunities to partner with associated businesses to promote green energy and pollution control technologies. Understand and communicate the monetary value of emission reduction standards and other benefits of increasing industrial energy efficiency.

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Long-term

New: *Red Deer proposes to better understand contributions from small businesses and manufacturing that do not require an Environmental Protection and Enhancement Act (EPEA) approval to the fine particulate matter issue. This knowledge will inform us of the impact on air quality and help us identify partners and promote collaboration (Red Deer Particulate Matter Response).*

[ER2] Collaborate in sharing information surrounding industrial air quality upgrade initiatives [3, 6, 8, 11, 15, 16, 18]**.** Support industry by providing air quality importance awareness through sharing information relative to emissions. By prioritizing collective action and increased partnerships between vested organizations, more opportunities to minimize air quality impacts from industrial facilities and reduce industrial greenhouse gas emissions will be identified. This will also help accelerate emission control innovation competition and sustainable growth throughout industrial facilities.

- Lead Organization(s): PGAIR
- Timeline: Medium-term

[ER3] Support the development and implementation of industrial management frameworks and assessments that reduce emissions [11, 13, 15]. Assist regional organizations and government bodies in developing a process to better integrate health and environmental impact assessments into reviews for major industrial projects. This will help guide emission regulations for industrial facilities as well as recommendations and needs for infrastructure design, such as improved electrical grids. Special attention is to mitigating air quality impacts from odorous contaminants by developing a regional odour management framework.

New: *Working alongside health authorities and the BC Government, Metro Vancouver is developing a process to integrate health impact assessment into the reviews for major industrial projects (Metro Vancouver Clean Air Plan).*

- Lead Organization(s): PGAIR: City of PG, PGAIR
- Timeline: Medium-term

[ER4] Advocate for more stringent industrial emission standards [15]. Advocate to the Government of Canada and BC Government to implement stricter emissions standards for industry. Incentives could be in the form of innovative finance mechanisms, including rebates, carbon taxes, and tax credits. These incentives provided to encourage lower carbon footprints would be based on emissions reductions that meet or exceed industrial emission benchmarks.

New: *Metro Vancouver is advocating to the Government of Canada and the BC Government to develop more stringent emission standards to improve air quality coming from industrial facilities (Metro Vancouver Clean Air Plan 2021).*

- Lead Organization: PGAIR
- Timmeline: Short-term

Prioritize Sustainable Land Use

Mining, manufacturing and agriculture-related industries supply essential goods and services for all. Strategic economic development and the siting of industrial facilities is an effective way communities can reduce the harmful impacts of industrial emissions on nearby residents and environments. Within sustainable industrial land use management and energy practices, we identified two actions:

Funding Opportunity

Source: Rural Economic Diversification and Infrastructure Program

Estimated Amount: $100,000 to 1,000,000

Deadline: Unannounced (likely January 2024)

[IM1] - Prioritize infill development and strategic industrial land use designation [6, 10, 19]. Existing serviced industrial lands, including those underutilized, should be first considered before further expansion into designated areas with available un-serviced land. Consider implementing

transition buffer zones of mixed commercial-residential use for industrial lands near residential areas. Lastly, advocate for the ongoing commitment to increase greenfield/brownfield sites addressed in the Heavy Industry Land Use Plans.

- Lead Organization(s): City of PG, RDFFG
- Timeline: Long-term

[IM2] Support a stringent development approval process for new industry [6, 15]. Incorporate air quality considerations into any land use decision related to industrial developments. Offer development benefits such as lower building permit fees for developers committing to low carbon transition. Moreover, encourage new or expanding industries with fine particulate matter emissions to follow offsetting standards established in the Provincial Guidance Document for Industrial Development in the Prince George Airshed.

New: *The City of New Westminster adopted an action to ensure designs for new development incorporate measures to reduce the impacts of noise (Environmental Strategy and Action Plan - City of New Westminster, 2018)*

- Lead Organization(s): City of PG, RDFFG, PGAIR
- Timeline: Medium-term

Six action types

For the scope of this project, we have to tailor our actions to local and regional government jurisdictional authority. We identified 300 example actions categorized by 6 action types (to access all 300 example actions see appendix E):

- **Funding:** Loans, grants, and financing programs can help support organizations to take action
- **Incentives:** Encouraging support from businesses and residents by offering perks like awards, resources, tax credits and abatements
- **Capacity Building:** Developing and improving knowledge and skills through training, workshops, education, and awareness.
- **Advocacy:** Lobbying to governmental bodies, the public and businesses to gain their support towards action implementation.
- **Regulation:** Developing and enforcing local, provincial, and federal legal requirements. .
- **Demonstration Project:** Assist in implementing a small-scale project to test an action's viability and showcase potential exciting opportunities to the community.

These action types reflect the diverse approaches that the partner organizations can apply when advancing AQ/CC action in the PGA.

Figure 7 displays the distribution of action types in the 300 example actions. The majority (54%) of example actions are categorized as capacity building, followed by advocacy (23%) and regulation (12%).

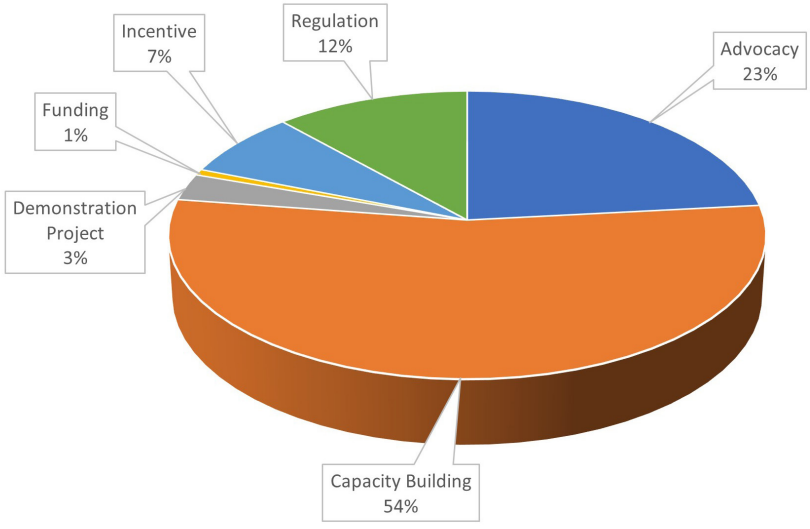
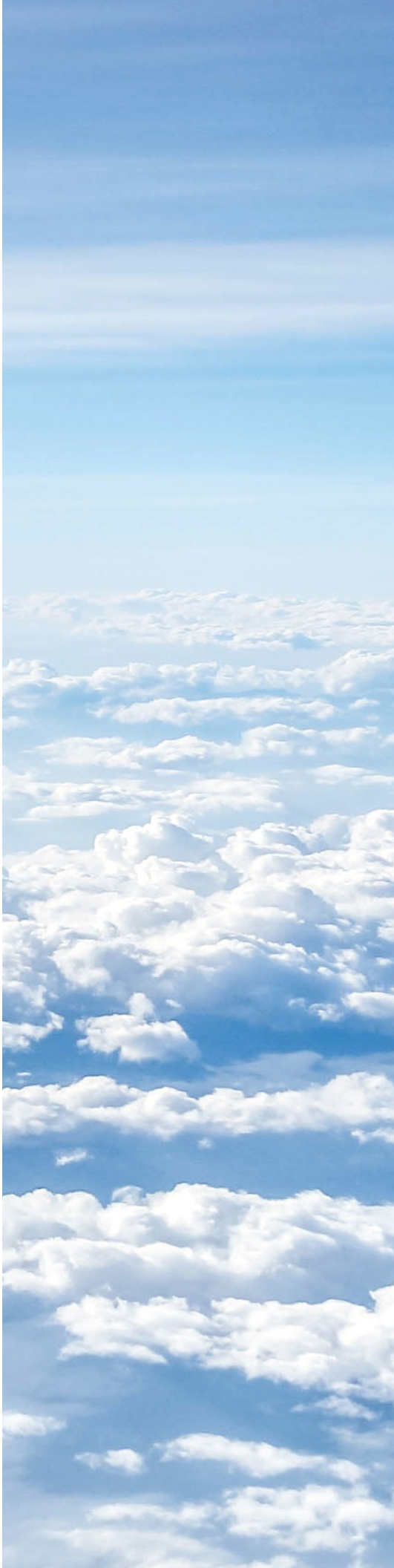


Figure 7. Distribution of action-types in overall 300 example actions

PROJECT NEXT STEPS & CONCLUSION



Project Limitations

Engagement with Lheidli T'enneh First Nation

We want to acknowledge the people of the Lheidli T'enneh First Nation as keepers of the land with archaeological evidence supporting First Nation occupation of the area between 8,700 and 9,000 YBP (Years Before Present) (Lheidli T'enneh First Nation, n.d.). Our team intended to include content resulting from engagement with the Lheidli T'enneh as a rights holder to this land. We would like to thank Emmanuel Ogwell, the Economic Development Officer for the Lheidli T'enneh Nation who made efforts to connect our team to the Nation. Unfortunately, due to capacity limitations, we were unable to include engagement with the Nation in our project. We recommend that PGAIR, the City of PG, and the RDFFG continue to engage with the Lheidli T'enneh as an opportunity for reconciliation and incorporating traditional ecological knowledge in this work.

"New"Actions

We recognize that actions selected from comparable plans were found in documents from outside of PGA and therefore, some may not be directly applicable to the PGA context. However, comparable plans were selected based on similar geographic conditions as the PG Airshed, and new actions can provide inspiration for new context-specific actions in the PGA.

Given the limited range of documents reviewed during our baseline assessment, some of the actions that we deemed as "new actions" to the project context could have already been addressed in the PG airshed.

Technical and Organizational Expertise

AQM is an extremely broad and complex topic based on technical and policy synergies. Our team identified proposed actions as options that we believe would offer co-benefits for both AQ and CC. However, additional technical and organizational expertise is required to determine which options are best suited to the PGA and the member organizations based on environmental conditions, organizational capacity, budgets, and priorities.

Narrow Scope on AQM

Due to capacity constraints, our team approached this project from a narrow scope, but there are opportunities for future research to broaden

our findings.

Exploring AQ/CC Co-Benefits in Other Contexts

The project's interim report explored actions related to AQ from six sectors. However, to provide strategic direction, we further narrowed our scope to explore AQ/CC co-benefits from three sectors: Transportation, Industry, and Buildings. Our team recommends exploring other sectors that contribute to AQ/CC for future research, such as land use and waste management.

Additionally, the comparable plans we selected were from Alberta and British Columbia to remain within a reasonable scope for this project. However, future research could explore innovations in the field worldwide with a similar context as the PGA.

City of PG Emphasis

Given the City of PG has a greater number of plans and documents related to AQ than the RDFFG, this project's findings may have been more representative to the context of the City of PG. For example, we based our comparative analysis on the City of PG's MEI and 2020 Climate Change Mitigation Plan, which may not accurately represent the air quality and GHGs conditions of the entire region. Future research across the region like emissions inventories and further collaboration with other organizations, could improve AQM.

Additional Considerations

Incorporating Equity in AQM

Equity *means achieving "parity in policy, process and outcomes for historically and/or currently underrepresented and/or marginalized people and groups while accounting for diversity" (University of British Columbia, n.d.). Equity considers who has power, access to opportunities and resources, impacts and outcomes, and who is involved in the decision making process*

CC and poor AQ impact some individuals, households, and neighbourhoods more than others (Metro Vancouver, 2021). Improving AQ and mitigating the effects of CC offer benefits to all. However, there may be unintended consequences whereby benefits and costs may not be equally distributed across the community. As the partner organizations advance work in AQ/CC, there are opportunities to integrate equity frameworks in this process, such as reflecting on the following questions:

- Who is benefiting from this action/initiative/policy? Who may experience negative impacts (e.g. increased cost of living)?
- Who is involved in our decision-making processes? How can we ensure that all voices are being heard?
- Who has the most power in this situation? In this context, can

power be re-distributed amongst the community?

Here are some ways that Metro Vancouver is incorporating equity into air quality management:

- Under Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw 1303, 2022, you cannot use non-registered appliances within urban areas except if your household qualifies as low income or during an emergency.
- Metro Vancouver's Community Wood Smoke Reduction Program offers a rebate for Metro Vancouver residents to trade in their old uncertified wood burning appliances for a new low emission appliance. The program offers higher rebate amounts for First Nation community members living on First Nations lands (e.g., reserve, treaty lands).
- The Metro Vancouver Clean Air Plan (2021) includes developing an "Air Quality Inequities Tool", a publicly accessible tool to highlight and track existing inequities and disproportionate air quality impacts experienced across the region (e.g. exposure to large emission sources or major roads).

For more information on how Metro Vancouver is integrating equity into actions and developing tools to address gaps, please refer to the Metro Vancouver Clean Air Plan (2021).

Phased Approach

For proposed actions that may receive more social and/or political resistance, we suggest using a phased approach (M. Brauer, personal communication, March 1, 2023). A phased approach allows for iterative change over time, which may increase social and/or political approval and uptake. For example, the Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw 1303, 2020, offers a phased approach with more stringent requirements enacted over a five-year period.

Public education and awareness should be ongoing as AQ/CC actions are being implemented. Transparency regarding resource allocation and planning will help increase public trust.

Informing Future Policy

Upcoming Official Community Plan for City of PG

The City of PG's Official Community Plan (OCP) was last updated in 2011 as a statement of objectives and policies to guide decisions on planning and land-use management (City of PG, 2023). Our team believes the findings in this report would be valuable to consider while

updating the OCP. Although the OCP does not commit the City of PG to proceed with any project specified in the plan, bylaws enacted or works undertaken by Council after the adoption of the OCP must be consistent with the Plan. Therefore, incorporating AQ/CC objectives in the OCP may guide future action to improve AQ in the PGA. Furthermore, this work can be incorporated into planning documents throughout the RDFFG.

A future AQMP for the PGA

PGAIR has expressed interest in an updated AQMP for the PGA. This project has informed Steps 1, 4, and 5 of Silversten and Bartonva (2012)'s six step framework for the development of a new AQMP. Future research could include collaborating with regional partners to expand on this project and continue with the remaining steps of this framework. Developing an updated AQMP would be essential to guide priorities and future action across the PGA.

Envisioning the future of the PGA Economy

The Government of British Columbia's Regional Economic Operations staff support communities across the province with planning and implementing economic development and diversification goals (Government of British Columbia, n.d.a). Furthermore, the Community Transition Services staff provide community services tailored to rural communities experiencing significant economic impacts, such as the closure of a major employer (Government of British Columbia, n.d.b)

The proposed actions in this report are based on existing plans and align with a resource-based economy in PG. However, changes are occurring, including the recent decision to close Canfor's pulp line at Prince George Pulp and paper mill. Canfor is one of the largest employers in the City of PG, and this closure could result in up to 300 jobs lost and estimates of up to $50 million in impact (Clark, 2023; Matassa-Fung, 2023). This closure will have socioeconomic ripple effects throughout the community, including lost wages, impacts on local businesses, family relocations, and lost property tax revenue (Stolz, 2023).

For long-range planning in the face of climate change, we encourage the PGA community to explore diverse economic opportunities that support the social, cultural and environmental needs of the community. Diversifying economic opportunities could offer socioeconomic benefits while improving AQ/CC in the PGA.

Conclusion

AQ is a broad and complex topic with technical and policy overlaps, which presents challenges like managing jurisdictional responsibilities across all three levels of government. More recently, greater attention is being paid to addressing AQ and CC simultaneously, which can have human and environmental health benefits, in addition to offering socio-economic advantages.

This project identifies 10 Big Moves and 45 proposed actions that target the three highest contributing sectors to air pollutants and GHGs in the PGA: Transportation, Industry, and Buildings. This project provides PGAIR with strategic direction for how to support the City of PG and RDFFG in advancing climate action goals that have a positive impact on AQ. Although technical and organizational expertise is needed to determine the most suitable future directions, this project provides PGAIR and member organizations with options to advance AQ/CC action in the PGA.

There are opportunities to expand on this project, including integrating equity and exploring AQ/CC action from different sectors. Furthermore, these findings can be used to inform policy, such as an AQMP for the PGA. We would like to thank UBC and PGAIR for the opportunity to support exciting efforts to improve human and environmental health in the PGA for generations to come.

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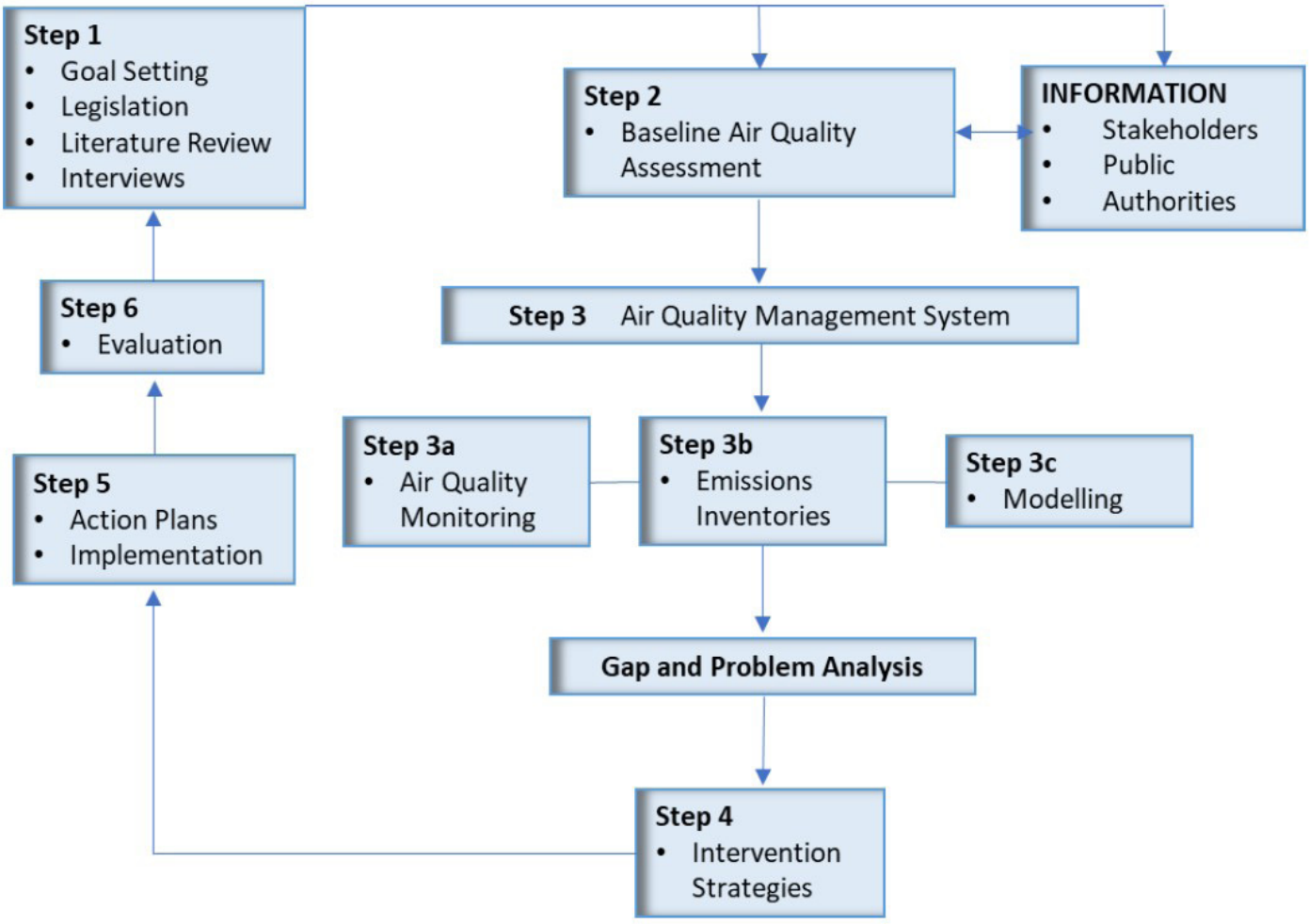
Appendix A

Six Step Process for an Air Quality Management Plan by Siversten and Bartonva, 2012.



Appendix B

Table 3. Annotated bibliography and numbering system for reference documents

Number	Reference Document
	City of PG
1	2020 Climate Change Mitigation Plan
2	Climate Forward Implementation Strategy / Phase 1 2021-2025
3	Climate Change Adaptation Strategies for the Community of Prince George
4	City of Prince George Official Community Plan, 2011
5	Clean Air Website Page
6	Clean Air Bylaw No.8266, 2010
7	Prince George Active Transportation Plan
8	Prince George Air Quality Management Plan - Phase 3 Plan Final Report
	Regional District of Fraser Forth George
9	RDFFG Corporate Climate Change Action Plan - May 2009
10	Official Community Plans for Regional Districts: Electoral Area A – Salmon River Lakes Electoral Area C – Chilako River-Nechako Electoral Area D - Tabor Lake – Stone Creek Electoral Area D – Pineview Electoral Area F – Willow River – Upper Fraser Valley
	Comparable Documents
11	Lakes District - A Summary of Local Air Quality 2021
12	Bulkley Valley Airshed Management Plan 2012
13	Parkland Airshed Management Zone (PAMZ) Ozone Management Plan 2008
14	Fraser Valley Air Quality Management Plan 2021
15	Metro Vancouver Clean Air Plan (2021)
16	Red Deer Fine Particulate Matter Response (2019)
17	Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw 1303, 2020
18	Calgary Region Airshed Zone Air Quality Management Plan 2019
19	Environmental Strategy and Action Plan - City of New Westminster, 2018
20	Integrated Air Quality and Greenhouse Gas Management Plan, 2011

Appendix C

Table 4. Funding summary table

Big Move	Source	Description	Amount (CAD $)	Deadline
Facilitate Options For Trip Reduction	Rural and Northern Communities Infrastructure Program	Through the Investing in Canada Plan launched in 2016, the Government of Canada is committing over $180 billion over 12 years towards infrastructure that benefits Canadians, such as transportation. Through the Rural and Northern Communities Infrastructure Program, communities like Pemberton have received nearly $2 million to construct a Regional Multi-Modal Transportation hub that will have park and ride, rideshare and transit connectivity.	$2 million	2028
Increase Fuel-Efficient Practices	Emotive Community Outreach Incentive Program	Financial assistance is offered to B.C. communities, organizations, and local governments to deliver local/regional Emotive electric vehicle (EV) awareness campaigns.	$10,000	Immediately
Make Public Transit a Preferred Options	Rural Transit Solutions Fund	Launched in 2021, the federal fund provides $250 million over 5 years to support the development of locally-driven transit solutions that will help people living in rural communities get to work, school, appointments, and to visit loved ones. Through the capital project stream, communities can receive up to $5 million to support new or expanded transit system solutions.	$2-5 million	2026
Increase Dust Control Measures	Ministry of Transportation and Infrastructure Grant	In 2010, Peace River received funding from the Provincial government to help support dust suppression initiatives throughout the community.	$500,000 - 1.2 million	N/A
Accelerate the Uptake of Electric Vehicles (EV)	CleanBC Go Electric Charger Rebate	Funded by the Government of B.C.'s Ministry of Energy "Mines and Low Carbon Innovation," this EV-Ready Infrastructure rebate can cover up to 50% of costs to install electrical infrastructure for charging stations up to $120,000.	$120,000	N/A

Encourage Active Transportation Modes	B.C. Active Transportation Infrastructure Grants Program	Indigenous and local governments can apply for this cost-shared project fund for Active transportation-related infrastructure upgrades in British Columbia. This maximum amount offered is for communities sized 25,000+ and can cover up to 50% of the total project cost.	$500,000	Sept 1st, 2023
Advocate for Industrial Emissions Reduction	CleanBC Industry Project Feasibility Study Fund	This funding stream supports 75% of costs needed to perform preliminary studies that aim to provide clarity and confidence for potential larger-scale projects to be implemented, which can receive subsequent funding from Clean BC ranging from $40,000 to 13 million	$40,000 to $13 million	Opens April 2023
Support Sustainable Industrial Land Use Management	Rural Economic Diversification and Infrastructure Program	The Government of B.C. has committed $33 million in investments to support projects promoting economic diversification, resilience, clean growth opportunities, and infrastructure development. This fund can assist the City of PG and the region to diversify the economy such as modernizing industrial facilities.	$100,000 - 1$ million	Unannounced (likely January 2024)
Support Energy Efficiency Improvements	BC Hydro Business Energy Saving Incentives	This program helps B.C. businesses reduce their operating costs by implementing energy-efficiency projects by offering incentives that can help cover up to 75% of the project's cost up to $500,000. Equipment upgrades to lighting, HVAC, Refrigerator and Mechanical technologies will be covered to about 25% of the upfront costs (on average) through energy-saving incentives.	$500,000	N/A
Evaluate Renewable Energy Alternatives	First Nations Clean Energy Business Fund (FNCEBF) – Equity Funding	Provides funding to Indigenous communities to support capital costs related to implementing community energy efficiency within their community, such as the construction of renewable energy projects. The Sustainable Communities program can also be explored by local governments seeking funding towards a wide range of projects and programs to support action on reducing greenhouse gas emissions.	$100,000 - 1 million	April 30th, 2023

Appendix D

Table 5. Total and average annual emission rates in PG - Micro Emissions Inventory.
Total and average annual emission rates by modelled emission source category. Totals (tonnes per year) are averaged for the three model years; there was little to no interannual variation. Average emission rates (grams per second) do not take into consideration temporal variability in emissions. Dashed lines separate groups of common emission categories – from top to bottom: Industry, dust sources, on-road mobile, heating sources, rail yards/lines, and miscellaneous sources.

Emission Source	Total Emission Rates (t/y)				Average Emission Rates (g/s)			
	PM_{10}	$PM_{2.5}$	SO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_2	NO_x
Industry	1259.2	956.5	6940.1	1268.4	39.93	30.33	220.07	40.22
Road Dust	378.8	60.6	0.0	0.0	12.01	1.92	0.00	0.00
Commercial Dust	758.0	148.7	0.5	268.5	24.04	4.71	0.01	8.51
Fugitive Dust	33.6	4.0	0.0	0.0	1.06	0.13	0.00	0.00
On-Road Mobile	31.6	22.1	24.7	1654.6	1.00	0.70	0.78	52.47
Residential Heat	193.7	190.8	4.2	123.6	6.14	6.05	0.13	3.92
Commercial Heat	5.5	5.5	0.4	70.8	0.17	0.17	0.01	2.24
Rail Yards/Lines	13.2	12.6	14.2	708.3	0.42	0.40	0.45	22.46
Restaurants	25.6	23.9	0.0	0.0	0.81	0.76	0.00	0.00
Miscellaneous	31.3	30.6	17.5	152.7	0.99	0.97	0.55	4.84
Total	**2698.6**	**1423.0**	**881.3**	**4230.8**	**85.6**	**45.1**	**27.9**	**134.16**

Appendix E

Use the following link to access the Excel spreadsheet with all Big Moves, Proposed Actions and Example of actions. To be able to view the table, you should sing in with an UBC account.

https://ubcca-my.sharepoint.com/:x:/g/personal/vamoroch_student_ubc_ca/ET66gPlKy_1Cv01N-raM_ZBkBYyDcndRXtSNcXHPvz-qWkA?e=jIgng2

AIR QUALITY AND CLIMATE CHANGE CO-BENEFITS IN THE PRINCE GEORGE AIRSHED

IN COLLABORATION WITH THE ***PRINCE GEORGE AIR IMPROVEMENT ROUNDTABLE (PGAIR)***

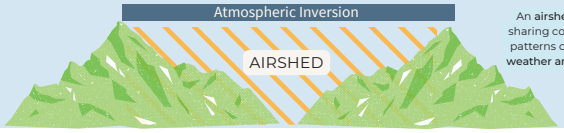
Project Overview

Identify actions that represent **co-benefits** between **air quality** and **climate change** goals in the Prince George Airshed. These co-benefits will:

- Provide PGAIR with **strategic direction** for how to support the City of Prince George and Regional District of Fraser-Fort George (RDFFG) in **advancing their climate action goals**
- Inform the upcoming development of an **Air Quality Management Plan (AQMP)** for the PG Airshed

The Prince George Airshed

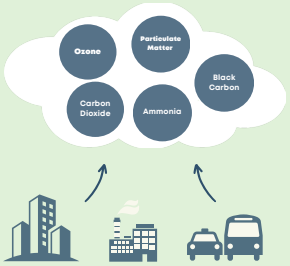
EMISSION SOURCES	Air Pollutants	Greenhouse Gases (GHGs)
1	Permitted Industry	On-road Transportation
2	Residential Heating	Residential Heating
3	On-road Transportation & Dust	Commercial & Industrial Heating



An **airshed** is a region sharing common airflow patterns constrained by **weather and topography**

Technical and Policy Synergies

Addressing AQ and CC simultaneously can provide **environmental** and **socioeconomic benefits.**



The majority of air pollutants and GHGs come from the **same sources**, including:

- burning fossil fuels
- residential wood stoves
- wildfires

However, AQ and CC have traditionally been managed as separate challenges in policy.

Air Quality Jurisdictional Powers

Municipal & Regional

Regulate zoning, density and development permits. Pass bylaws to control emissions from burning and plan transportation systems.
e.g Public transit services

Provincial

Regulate pollution from permitted industries and set air quality standards & guidelines. Provide funding for programs.
e.g Vehicle emission mandates

Federal

Set regulations, standards, and guidelines for emission sources. Provide funding, and support towards plan implementation.
e.g Carbon pricing

10 Big Moves

across 3 sectors to provide AQ and CC co-benefits

BUILDINGS | INDUSTRY | TRANSPORTATION

- Advocate for Industrial Emissions Reduction
- Encourage Active Transportation Modes
- Increase Dust Control Measures
- Prioritize Sustainable Land-Use
- Develop Options for Trip Reduction
- Make Public Transit a Preferred Option
- Support Energy Efficiency Improvements in Buildings
- Accelerate the Uptake of Electric Vehicles
- Increase Fuel-Efficient Practices
- Evaluate Renewable Energy Alternatives for Buildings

45 Proposed Actions Categorized by 6 Action Types

Each **big move** has **proposed actions** categorized by **6 action types.** These action types reflect the diverse approaches that our partner organizations can apply in the PG Airshed.

- Regulation
- Advocacy
- Capacity Building
- Incentives
- Funding
- Demonstration Project

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