Metro Vancouver

Integrated Air Quality and Greenhouse Gas MANAGEMENT PLAN

OCTOBER 2011

metrovancouver

TABLE OF CONTENTS

Figures and Tables

VISION

INTEGRATED AIR QUALITY AND GREENHOUSE GAS MANAGEMENT PLAN

Healthy, clean and clear air is a foundation of the high quality of life, the robust and creative economy, and the spectacular natural beauty we enjoy in Metro Vancouver. Maintaining high standards for air quality in our region, for both current and future generations, is a key part of Metro Vancouver's long-term vision. Clean air is essential to the health of all residents of the region, as well as to our local ecosystems which provide food, jobs, and recreational opportunities for all of us. Clear air provides us with unfettered views of the region's natural beauty and some of our most iconic places. Metro Vancouver is committed to monitoring and continuously improving the air quality of the region. As a region we are also committed to reducing our greenhouse gas emissions to fulfill our obligation of minimizing our impact on the global climate.

This Integrated Air Quality and Greenhouse Gas Management Plan recognizes the inextricable link between air quality, climate change and energy issues, and accordingly, integrates goals, strategies and actions related to both air contaminants and greenhouse gases.

The long-term vision for air quality and greenhouse gas management in Metro Vancouver is:

Healthy, clean and clear air for current and future generations.

PART ONE: PLAN OVERVIEW

Metro Vancouver Sustainability Framework

Since 2002 Metro Vancouver has formally put the concept of sustainability at the centre of its operating and planning philosophy and advanced its role as a leader in the attempt to make the region one which is explicitly committed to a sustainable future. This comprehensive endeavour became known as the Sustainable Region Initiative, or more familiarly as the 'SRI'. In 2008, Metro Vancouver's Board adopted a Sustainability Framework outlining its vision, mission, values, sustainability imperatives, and sustainability principles. Depicted in Figure 1, the Sustainability Framework provides the foundation for Metro Vancouver's suite of plans, including the Integrated Air Quality and Greenhouse Gas Management Plan (IAQGGMP).

Regional Vision

Metro Vancouver has an opportunity and a vision to achieve what humanity aspires to on a global basis – the highest quality of life embracing cultural vitality, economic prosperity, social justice and compassion, all nurtured in and by a beautiful and healthy natural environment.

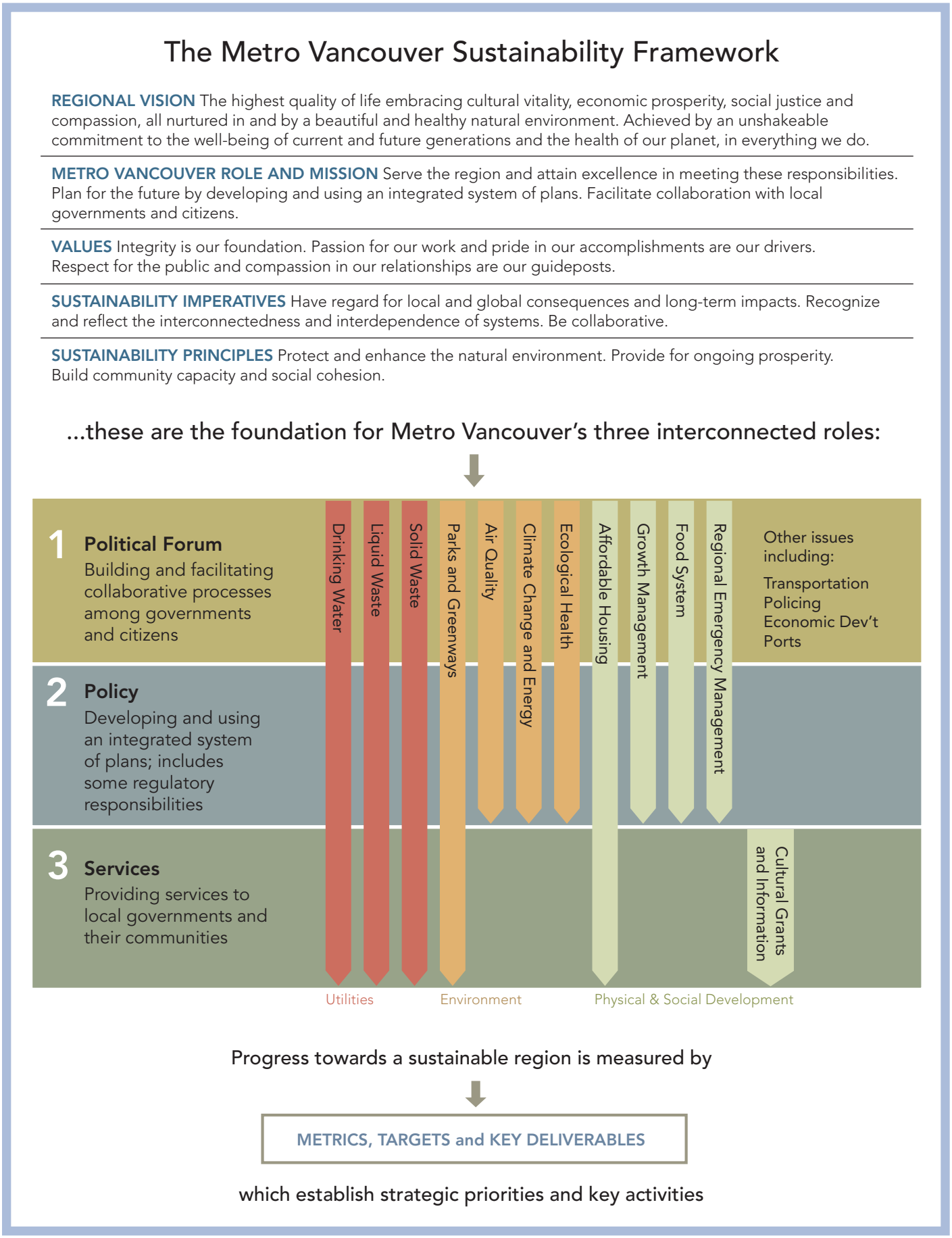
We will achieve this vision by embracing and applying the principles of sustainability, not least of which is an unshakeable commitment to the well-being of current and future generations and the health of our planet, in everything we do.

As we share our efforts in achieving this vision, we are confident that the inspiration and mutual learning we gain will become vital ingredients in our hopes for a sustainable common future.

Metro Vancouver is a political body and corporate entity operating under provincial legislation as a 'regional district' and 'greater boards' that delivers regional services, planning and political leadership on behalf of 24 local authorities. It comprises:

CITY OF ABBOTSFORD
VILLAGE OF ANMORE
VILLAGE OF BELCARRA
BOWEN ISLAND MUNICIPALITY
CITY OF BURNABY
CITY OF COQUITLAM
CORPORATION OF DELTA
CITY OF LANGLEY
ELECTORAL AREA A (UNINCORPORATED AREA)
TOWNSHIP OF LANGLEY
VILLAGE OF LIONS BAY
DISTRICT OF MAPLE RIDGE
CITY OF NEW WESTMINSTER
CITY OF NORTH VANCOUVER
DISTRICT OF NORTH VANCOUVER
CITY OF PITT MEADOWS
CITY OF PORT COQUITLAM
CITY OF PORT MOODY
CITY OF RICHMOND
CITY OF SURREY
TSAWWASSEN FIRST NATION
CITY OF VANCOUVER
DISTRICT OF WEST VANCOUVER
CITY OF WHITE ROCK

Figure 1 Metro Vancouver's Sustainability Framework



Context for the Integrated Air Quality and Greenhouse Gas Management Plan

History

In 1971, the *Pollution Control Act* and the *GVRD Letters Patent* established the Greater Vancouver Regional District (GVRD, now Metro Vancouver) as the single agency under which all provincial and municipal air pollution control activities in the Greater Vancouver urban area would be recognized. Section 31 of the Provincial *Environmental Management Act* gives the GVRD the authority to "provide the service of air pollution control and air quality management and, for that purpose, the board of the regional district may, by bylaw, prohibit, regulate and otherwise control and prevent the discharge of air contaminants".

In October 2005, the Metro Vancouver Board adopted its second Air Quality Management Plan which included goals to minimize the risk to public health, improve visual air quality and minimize the region's contribution to climate change.

Since the 2005 Air Quality Management Plan was adopted, several events have provided Metro Vancouver with additional tools for action. The Provincial government enacted several significant pieces of climate action legislation which mandated regional districts and municipalities to reduce greenhouse gas emissions. Under the *Local Government (Green Communities) Statutes Amendment Act* (Bill 27, 2008) regional districts are required to include targets, policies and actions to reduce greenhouse gas emissions in their Regional Growth Strategies. The Metro Vancouver Board adopted greenhouse gases targets as part of its Sustainability Framework and associated action plans.

In recognition of the strong connections between air quality and climate change, this Plan integrates actions to manage air quality with actions to manage greenhouse gases.

Trends, Challenges, Opportunities

Metro Vancouver currently experiences good regional air quality relative to most other urban areas in North America. However, as the region's population increases, it is expected that emissions of several key air contaminants will also rise in the region over the next decade. Our challenge will be to develop and implement air quality management actions that reduce emissions in the face of regional growth, and allow us to meet our health-based air quality objectives. A detailed discussion of trends and forecasts can be found in Appendix A, and potential impacts in Appendix B.

The region's fine **particulate matter emissions** are expected to rise as more buildings require heating, and marine vessel transport increases over the next decade. Fine particulate matter is associated with significant health problems, including hospital admissions and emergency room visits, aggravated asthma, acute respiratory symptoms, chronic bronchitis, decreased lung function and premature death. Children, the elderly and people with pre-existing lung and heart conditions are particularly at risk. Fine particulate matter can also impair visual air quality, making it difficult to see our beautiful vistas. Poor visual air quality can have a negative impact on the well-being of residents and reduce tourism revenues.

Programs aimed at reducing **particulate matter from diesel engines** are just beginning to take effect. Emissions of diesel particulate matter are responsible for 67% of the lifetime cancer risk from air pollution in Metro Vancouver. It is now understood that, in addition to providing significant health benefits, reducing black carbon (a component of diesel particulate matter) will help to mitigate climate change in the short-term.

Increased agricultural production will cause **ammonia and methane emissions** to rise over the next decade. Ammonia has a pungent smell and can react with nitrogen oxides and sulphur oxides in the air to form fine particulate matter, which impacts health and visual air quality. Methane is a potent greenhouse gas which contributes to global climate change.

Sulphur dioxide can also cause breathing problems in people with asthma, and may increase hospital admissions and premature deaths. Marine vessels are currently the largest source of sulphur dioxide emissions in the Lower Fraser Valley airshed. New International Maritime Organization regulations will be implemented in 2012 that will help to reduce local sulphur dioxide levels and associated health risks.

Despite large reductions in emissions of nitrogen oxides and volatile organic compounds, concentrations of **ground-level ozone** in the region have remained stable over the past decade. Ongoing investigation of the most effective strategies for reducing ozone levels will provide Metro Vancouver with options and opportunities for improvement.

Greenhouse gas emissions contribute to global climate change including global warming. Although recent changes to provincial legislation provide Metro Vancouver and its member municipalities with mandates to reduce greenhouse gas emissions, it will be particularly challenging to meet our greenhouse gas emission reduction targets as the region's population increases.

The IAQGGMP seeks to reduce levels of these contaminants to protect human health and the environment, improve visual air quality and minimize our contribution to climate change.

Partners: Roles and Responsibilities

Metro Vancouver is situated within the Lower Fraser Valley airshed – an international airshed shared with the Fraser Valley Regional District to the east and Whatcom County in the State of Washington to the south.

Air quality and greenhouse gas management in Metro Vancouver requires close coordination between all levels of government, businesses, institutions and residents. Metro Vancouver works with other air quality, health, climate change and transportation authorities at the regional, provincial, federal and international levels to collaboratively plan and implement initiatives to improve air quality and address climate change. Metro Vancouver also works closely with municipal staff to coordinate air quality and climate actions at both the municipal and regional level.

Several partners have established legislation, policies and other initiatives which will assist Metro Vancouver in its efforts to protect human and environmental health, improve visual air quality and combat climate change. And conversely, many of the actions in this Plan will assist the work of other authorities, underscoring the need for a coordinated and collaborative approach.

The partner agencies listed below will continue to have key roles and responsibilities in the implementation of the Plan. Additional information on other governments is provided in Appendix C.

Aligning with other Government Initiatives

GOVERNMENT OF CANADA

The federal government regulates new vehicle performance and fuels, emissions from marine vessels, rail locomotives, non-road vehicles and engines, some industrial sources and toxic substances.

- Through a collaborative effort, the federal government and several provinces, industry and non-governmental organizations are developing the **Air Quality Management System**, a proposed framework for reducing air pollution in Canada that addresses emissions from all sources in a consistent manner with the flexibility to deal with regional differences in air quality. Metro Vancouver intends to work with the Government of Canada and other stakeholders in the development of new Canadian air quality standards, location-based air quality management and base-level emission requirements for industrial sectors which complement the actions in this Plan.
- Environment Canada's efforts include, but are not limited to, regulations for: small gasoline powered engines (such as lawn and garden equipment); volatile organic compound concentration limits for automotive refinishing products, architectural coatings and other products; marine spark ignition engines such as personal watercraft and outboard engines; off-road recreational vehicles; and sulphur content limits for various grades of diesel fuel.
- The Government of Canada is committed to reducing Canada's total greenhouse gas emissions by 17 per cent below 2005 levels by 2020 - a target that is inscribed in the Copenhagen Accord and aligned with that of the United States. Within Canada, the federal government is taking action to reduce greenhouse gas emissions through a sector-by-sector approach. Regulatory initiatives have already been implemented or announced for the transport and electricity sector. Examples include new regulations for passenger automobile and light trucks, renewable fuel regulations, and initiatives under development for new heavy-duty trucks.

- In 2012 Transport Canada will begin enforcing the Canadian portion of the International Maritime Organization's United States-Canada **Emissions Control Area**. Large ships within 200 nautical miles of the shoreline will be subject to strict standards to reduce both nitrogen and sulphur oxide emissions, as well as emissions of fine particles from exhaust. This action will significantly reduce sulphur dioxide and particulate matter emissions in the region, with associated benefits to human health.

PROVINCE OF BRITISH COLUMBIA

The provincial government delegates air quality management authority in the region to Metro Vancouver, but retains regulatory authority for the remainder of the province, including adjacent regional districts. Provincial legislation requires regional districts and municipalities in B.C. to reduce community greenhouse gas emissions. The Government of British Columbia is implementing several programs which will assist Metro Vancouver to improve air quality and reduce greenhouse gas emissions in the region.

- Programs under the **B.C. Air Action Plan** will assist local air quality improvement efforts by providing funding for on-road vehicle emission reduction programs such as BC SCRAP-IT® and AirCare-On-Road, greener ports and marine vessels initiatives, anti-idling and wood stove replacement programs.
- The **B.C. Climate Action Plan** established enabling legislation for municipalities and regional districts, creating provincial programs that stimulate low carbon economic development, transit investments, building code upgrades, and providing incentives for individual household efficiency improvements and forest carbon sequestration.
- By facilitating investments in infrastructure that reduce greenhouse gas emissions, such as district energy systems and integrated resource recovery, the IAQGGMP will assist the **B.C. Energy Plan** to meet its goals for energy conservation and efficiency, and clean or renewable electricity generation.
- The **Provincial Transit Plan** will provide partial funding for expansion of major transit infrastructure including SkyTrain extensions and rapid bus service in the region. Programs to increase transit ridership, reduce automobile use, and provide a foundation of transportation infrastructure to support the development of healthier communities in the future, will help to reduce local greenhouse gas emissions per capita over the long term.

TRANSLINK

TransLink administers the regional AirCare vehicle inspection and maintenance program, plans, manages and finances public transit, and shares responsibility for the major road network and regional cycling with the municipalities in Metro Vancouver.

TransLink's **Transport 2040** plan establishes programs to meet the regional transportation challenges of the coming decades. Transport 2040's first goal seeks to aggressively reduce greenhouse gas emissions from transportation by investing in improvements in bicycle, pedestrian, and transit access, and connecting modes of travel. Programs under this plan will help to achieve regional greenhouse gas emission reduction targets.

LOCAL GOVERNMENTS

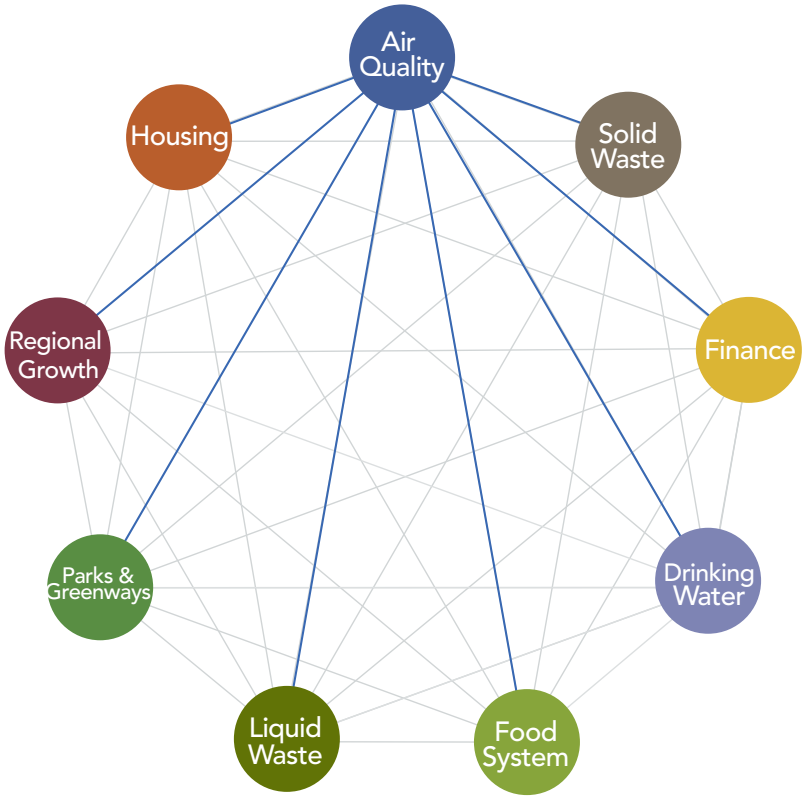
Under the *Local Government (Green Communities) Statutes Amendment Act* (Bill 27, 2008) all local governments in B.C. are required to include targets, policies and actions to reduce greenhouse gas emissions in their Official Community Plans (OCPs). The IAQGGMP will help municipalities to achieve their greenhouse gas emission reduction targets.

Many municipalities have also included objectives to support and encourage regional airshed management initiatives to improve air quality in their OCPs. Many of the IAQGGMP's air quality improvement strategies will improve the health and wellness of municipal residents.

With the assistance of the B.C. Ministry of Environment, municipalities and regional districts in the Sea-to-Sky/Howe Sound corridor have created the **Sea-to-Sky Air Quality Management Plan**. The Fraser Valley Regional District is also revising its 1998 **Air Quality Management Plan**.

Continued partnerships with adjacent districts will avoid duplication of effort for mutual benefit.

Figure 2 Metro Vancouver's Interconnected Management Plans



Coordinating with other Metro Vancouver Plans

The Integrated Air Quality and Greenhouse Gas Management Plan is one plan among a suite of interconnected management plans developed around Metro Vancouver's Sustainability Framework. Table 1 Linkages Between Metro Vancouver Plans summarizes key links where actions identified in other Metro Vancouver plans affect the Integrated Air Quality and Greenhouse Gas Management Plan, and conversely where actions in this Plan make a contribution to the goals of other Metro Vancouver plans.

Table 1 Metro Vancouver Management Plan Linkages

Linkages Between Metro Vancouver Plans

REGIONAL GROWTH STRATEGY

A compact urban area, including transit-oriented development, reduces regional greenhouse gas and air contaminant emissions from transportation.

Complete communities promote walking, cycling, transit and reduced trip distances, all of which reduce greenhouse gas and air contaminant emissions.

Protecting forests and green space sequesters carbon.

INPUT → INTEGRATED AIR QUALITY AND GREENHOUSE GAS MANAGEMENT PLAN (IAQGGMP) → OUTPUT

Minimizing air contaminant and greenhouse gas emissions will protect the region's environment.

INTEGRATED SOLID WASTE AND RESOURCE MANAGEMENT PLAN

Minimizing solid waste generation will minimize the production of greenhouse gases from waste disposal.

Maximizing reuse, recycling, material and energy recovery from the solid waste stream will minimize the production of greenhouse gases from landfills and other waste disposal.

Air contaminant and greenhouse gas emissions associated with energy recovery from waste are to be managed in a way that minimizes air emissions that impact public health and the environment.

INPUT → IAQGGMP → OUTPUT

Implementing an odour management program for solid waste recycling, recovery and disposal options will minimize odours from waste processing, increase public acceptability and increase siting options.

Promoting the development of district energy opportunities will encourage energy recovery from the solid waste stream.

DRINKING WATER MANAGEMENT PLAN

Ensuring that drinking water is produced, distributed and used efficiently will minimize energy consumption and associated greenhouse gas emissions.

INPUT → IAQGGMP → OUTPUT

Reducing deposition of air contaminants will minimize the contamination of water resources and foster the provision of clean, safe drinking water.

Linkages Between Metro Vancouver Plans

PARKS AND GREENWAYS PLAN

Protecting and enhancing regional landscapes and biodiversity sequesters carbon.

INPUT → IAQGGMP → OUTPUT

Reducing emissions of air contaminants and greenhouse gases will benefit natural systems and people enjoying recreational activities.

INTEGRATED LIQUID WASTE AND RESOURCE MANAGEMENT PLAN

Energy recovery from sewage heat and biogas will reduce the need for additional energy production and associated greenhouse gas emissions.

Reduction of greenhouse gas emissions from liquid waste management will contribute to the reduction of our total regional greenhouse gas emissions.

INPUT → IAQGGMP → OUTPUT

Implementing an odour management program will minimize odours from liquid waste.

Reducing emissions of air contaminants will improve water quality of storm runoff.

REGIONAL FOOD SYSTEM STRATEGY

Pilot projects for the recovery of energy on farms, including biogas, may reduce greenhouse gas emissions from agriculture.

Reduction of food scraps going to landfill reduces greenhouse gas emissions (in the form of methane).

By facilitating the adoption of environmentally sustainable practices, emissions of greenhouse gases, ammonia, fertilizers and pesticides may be minimized.

INPUT → IAQGGMP → OUTPUT

Improved regional air quality should lead to greater crop productivity.

Efforts to reduce targeted air emissions (e.g., air pollutants or odours) may effect the operations of food producers and others in the food sector.

Regional greenhouse gas emission reductions may encourage carbon sequestration in the agricultural sector.

CORPORATE CLIMATE ACTION PLAN

Reducing Metro Vancouver's corporate greenhouse gas emissions and energy consumption helps reduce regional greenhouse gas emissions.

Recovering energy from Metro Vancouver utilities displaces fossil fuel-derived energy and therefore reduces greenhouse gas emissions.

Using Metro Vancouver facilities and lands to sequester carbon supports regional greenhouse gas reduction goals and targets.

INPUT → IAQGGMP → OUTPUT

Planning and developing regional energy use and demand opportunities supports shift to renewable energy and energy recovery in our corporate operations.

Supporting the development of regional infrastructure for low carbon vehicles will enable a corporate switch to low carbon vehicles.

PART TWO: GOALS, STRATEGIES and ACTIONS

This Plan outlines the goals, strategies, and actions for implementation within the Metro Vancouver region over the next decade. Recognizing that air pollution knows no boundaries, the measures in this Plan will protect air quality in the Lower Fraser Valley and adjacent airsheds. Consequently, several initiatives will involve coordination and partnership with adjacent agencies. In addition to actions led by Metro Vancouver, this Plan identifies actions for other levels of government where appropriate.

The Integrated Air Quality and Greenhouse Gas Management Plan establishes three primary goals, which are addressed by 12 strategies and 81 actions for Metro Vancouver and its partners. The implementation of these actions requires collaboration and integration to ensure an informed and coordinated process.

Although the strategies and actions in this Plan aspire to meet all three goals, they have been organized by their primary goal. Where actions provide benefit in more than one goal area that will be explained in the description of the action. The actions that fall under each strategy will be prioritized based on their potential to reduce public exposure to contaminants that pose the highest risk to human health, improve visual air quality and achieve greenhouse gas emission reductions.

GUIDELINES FOR AIR QUALITY AND GREENHOUSE GAS MANAGEMENT

Building on Metro Vancouver's Sustainability Principles (Figure 1), the following guidelines will be used to develop and implement actions that effectively reduce air contaminants and greenhouse gas emissions. It is not imperative that each action meet all of the guidelines equally, however it is intended that implementation of this overall Plan will result in these guidelines being met.

POLLUTION PREVENTION:

Encourage the use of processes, practices, materials and energy in ways that avoid or minimize the creation of contaminants at the source, rather than remedial efforts after contaminants have been released to the environment.

CONTINUOUS IMPROVEMENT:

Reduce emissions towards the long-term goal of reducing overall ambient concentrations to levels that do not pose health and environmental concerns.

ACHIEVE CO-BENEFITS:

Reduce emissions of both air contaminants and greenhouse gases to improve health and visual air quality, while mitigating climate impacts. Actions will be developed carefully and in collaboration with stakeholders to avoid unintended consequences.

SHARED RESPONSIBILITY:

Partner with public and private organizations to address common priorities and engage the public in Plan implementation.

INNOVATIVE APPROACHES:

Using market-based, community-based and other innovative approaches to complement conventional air quality management.

Goal 1:
Protect public health and the environment

The freedom to breathe clean air is a basic human right. Metro Vancouver is committed to minimizing the risk to public health from air pollution and protecting the environment. Addressing air contaminants will generally benefit both human health and the environment.

Reducing emissions of particulate matter (including diesel particulate matter) and its precursors, as well as ozone precursors from the major sources in the Lower Fraser Valley airshed, will protect the health of Metro Vancouver residents and the environment. The following strategies and actions will achieve this goal.

Strategy 1.1 Reduce emissions of and public exposure to diesel particulate matter

In addition to increasing the risk of adverse heart and lung health outcomes, emissions of diesel particulate matter are responsible for 67% of the lifetime cancer risk from air pollution in Metro Vancouver. Diesel emissions often occur at ground level and close to where people live, work and play – resulting in higher exposures and increased health risk.

METRO VANCOUVER WILL:

1.1.1 Explore measures and financing mechanisms to promote retrofits of on-road diesel engines and accelerate the use of cleaner alternative fuels in partnership with interested public and private on-road diesel fleet managers and senior levels of government.
1.1.2 Implement Metro Vancouver's regulatory requirements for older, in-use non-road diesel engines, and promote further emission reductions by exploring additional funding sources.
1.1.3 Work with the AirCare Steering Committee and other partners to develop enhanced programs for inspection and maintenance of heavy-duty vehicles in the Lower Fraser Valley airshed.
1.1.4 Work with municipalities, health authorities, the Provincial government, and TransLink to develop air quality-focussed land use planning and urban design guidelines that will minimize resident exposure to diesel emissions and other traffic-related air pollution.

1.1.5 Participate in the B.C. Marine Vessel Air Quality Work Group to develop and implement emission reduction measures for ocean-going vessels, harbour vessels and port operations, including, but not limited to:

a. piloting and testing of emission control technology,
b. installation of improved engine technology,
c. installation of shore-power for cruise ships, container and other marine vessels, and
d. support for Port Metro Vancouver's clean air programs such as the Northwest Ports Clean Air Strategy and the Blue Circle Awards.

1.1.6 Assist the B.C. Locomotive and Rail Air Quality Working Group in identifying and implementing appropriate measures to reduce emissions from diesel locomotives.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

1.1.7 Provincial and Federal Governments to enhance programs and provide funding to increase effectiveness of on-road and non-road engine retrofits, increase the use of cleaner alternative fuels and promote uptake of new heavy-duty diesel vehicles and fuel saving technologies, as per Actions 1.1.1, 1.1.2 and 1.1.3.

1.1.8 Provincial government to introduce a vehicle retirement program for heavy-duty diesel vehicles, similar to the BC SCRAP-IT® Program, which provides incentives for truck drivers to replace higher-polluting vehicles with newer, cleaner units.

1.1.9 Federal Government to expedite the adoption of more stringent non-road engine and fuel emission standards to further reduce diesel particulate matter and greenhouse gas emissions.

1.1.10 Federal Government to enforce the International Maritime Organization's Annex VI protocol which contains air emission regulations, including more stringent Emission Control Area standards for marine vessels in Canadian waters.

1.1.11 Federal Government to adopt and enforce regulations that require the implementation of stringent operational practices for the rail sector, such as railyard idling limits and mandatory technology requirements.

1.1.12 Municipalities to consider potential air quality impacts of land use planning decisions by utilizing the land use planning and urban design guidelines to be collaboratively developed under Action 1.1.4.

Strategy 1.2 Reduce air contaminant emissions from industrial, commercial, institutional (ICI) and agricultural sources at both the regional and local level

Industrial, Commercial and Institutional sources emit 20% of the fine particulate matter and 16% of the sulphur oxides in Metro Vancouver. Metro Vancouver has direct authority over industrial, commercial and institutional sources within the region through the administration of bylaws which includes the issuance of permits, compliance promotion and enforcement.

Livestock, manure handling and storage, and fertilizer application contribute 76% of the total ammonia emissions in the Lower Fraser Valley airshed. Agriculture is also responsible for 11% of the airshed's inhalable particulate matter emissions. With limited jurisdiction over agricultural operations, Metro Vancouver and the Fraser Valley Regional District must work with the Provincial government to reduce emissions from this sector.

It is possible that air quality at the local community or neighbourhood scale can become degraded while regional air quality remains acceptable. Developing and implementing local air quality management programs will help to minimize the risk to public health from air pollution.

METRO VANCOUVER WILL:

1.2.1 Deliver a fair, effective and efficient regulatory program and follow the guideline of continuous improvement, to minimize emissions, adverse health impacts and environmental degradation.
1.2.2 Continue to develop and implement local air quality action plans to address neighbourhood air quality priority areas, in partnership with other governments, industry and other interested parties.

1.2.3 Investigate and implement additional targeted measures to address emissions of contaminants (e.g., volatile organic compounds, ammonia, nitrogen oxides and sulphur oxides) that contribute to ground-level ozone and secondary fine particulate matter concentrations, in partnership with other governments, industry, academia and other interested parties.

1.2.4 Develop and implement an odour management program including an odour management regulation that addresses key sources of odorous emissions, and effective complaint management and communications processes.

1.2.5 Develop and promote the adoption of best management practices for local businesses, such as the construction/demolition industry and restaurants, including the use of solvents and solvent-containing products.

1.2.8 B.C. Ministry of Agriculture and B.C Ministry of Environment to continue developing beneficial management practices to reduce emissions of particulate matter, ammonia, greenhouse gases, and odours from agricultural operations, in collaboration with the B.C. Agriculture Nutrient and Air Working Group.

1.2.9 B.C. Ministry of Agriculture to continue encouraging farmers/producers to adopt beneficial management practices that will reduce emissions of particulate matter, ammonia, greenhouse gases and odours from agricultural operations.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

1.2.6 Federal Government to expedite ICI emission reduction programs which support continuous improvement (e.g., reductions in the volatile organic compound content in consumer and commercial products).

1.2.7 Northwest Clean Air Agency and Washington State Department of Ecology to continue to involve Metro Vancouver in the review of new industrial proposals and permit amendments as per the 1994 Interagency Agreement and require relevant facilities to upgrade to the best available technology whenever feasible.

Strategy 1.3 Reduce air contaminant emissions from residential sources

Occasionally some Metro Vancouver neighbourhoods experience elevated levels of wood smoke from fireplaces or wood stoves. Wood smoke is composed of fine particulate matter and a mix of chemicals which can be hazardous to human health. These substances can increase the risk of heart and lung diseases such as asthma and emphysema, and increase susceptibility to illness.

METRO VANCOUVER WILL:

1.3.1 Work with partners to enhance residential wood smoke emission reduction programs and other education and outreach initiatives.
1.3.2 Work with municipalities, health authorities, fire departments and other partners to explore regulatory options that will reduce residential wood smoke emissions.
1.3.3 Explore incentives to encourage the removal of residential fuel oil devices where lower emission and more efficient options are available.
1.3.4 Investigate options and introduce mechanisms to reduce emissions from open burning.
1.3.5 Promote programs, such as the "Mow Down Pollution" program, that encourage residents to exchange their old gas-fired lawn, garden and other household equipment for lower emission models.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

1.3.6 B.C. Ministry of Environment to explore regulatory and non-regulatory options to address residential wood burning and fuel oil devices at point of sale.

Strategy 1.4 Reduce air contaminant emissions from cars, trucks, and buses

Cars, trucks and buses emit 35% of the nitrogen oxides and 17% of all man-made volatile organic compounds in the Lower Fraser Valley airshed. Reducing emissions from cars, trucks and buses will protect the health of drivers, passengers, pedestrians, cyclists and residents living close to transportation corridors.

The Actions under Strategy 3.3 will complement these health-related actions by reducing greenhouse gas emissions from vehicle travel.

METRO VANCOUVER WILL:

1.4.1 Work with the provincial government, AirCare and the Fraser Valley Regional District to design and implement more effective and user-friendly emission inspection and maintenance programs for the most polluting light and heavy-duty vehicles.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

1.4.2 TransLink to work with Metro Vancouver and municipalities to develop:

a. regional air quality targets and supporting implementation strategies for inclusion in regional long-range transportation plans, and
b. air quality guidelines to optimize facility locations and fleet technology.

1.4.3 Municipalities to work with Metro Vancouver to develop idling reduction programs, including consideration of adopting Metro Vancouver's model anti-idling bylaw.

Strategy 1.5 Increase public understanding of air quality issues and public engagement in clean air programs

Metro Vancouver will inform the public about current air quality conditions and trends. A range of audience-appropriate engagement techniques will be explored, including community-based social marketing, to encourage the adoption of behaviours that will contribute to improving the quality of the air.

METRO VANCOUVER WILL:

1.5.1 Work with partners to create a proactive adverse air quality episode mitigation program by developing voluntary and mandatory emissions reduction actions for municipalities, industry, businesses and residents, to be taken during air quality advisory periods.
1.5.2 Improve coordination with health authorities on air quality issues, including ensuring that adequate health protection information is available to the public during air quality advisories.
1.5.3 Work with the provincial government and other partners (such as health agencies, municipalities, and non-government organizations) to create locally-relevant air quality and climate change materials for use by teachers and student environmental groups.
1.5.4 Develop and implement a communications strategy to engage audiences which have been less accessible through Metro Vancouver's existing air quality outreach programs.
1.5.5 Pursue the development of an Air Quality and Climate Change Academy, in partnership with academic institutions and other partners, which will enhance air quality and climate change research, formal education, and public outreach within the region.

Goal 2:
Improve visual air quality

Clear, haze-free views improve the well-being of residents and benefit the tourism industry. With improved visual air quality, the residents of Metro Vancouver and visitors can better enjoy the region's magnificent scenery.

Visual air quality refers to our ability or inability to see through the atmosphere as a result of air quality conditions, excluding those associated with meteorological conditions like fog or rain. Reducing emissions of particulate matter and other contaminants, such as ammonia, that lead to secondary fine particulate matter formation, will improve visual air quality. Improving the clarity of views in the Lower Fraser Valley airshed will improve the well-being of residents and benefit the tourism industry. The following strategies and actions will achieve this goal.

Strategy 2.1 Reduce emissions of air contaminants and precursors that can degrade visual air quality

Even when pollutant levels meet our health-based standards, visual air quality can still be impaired. To protect visual air quality, it may be necessary under certain conditions to reduce particulate matter to levels that are better than Metro Vancouver's ambient air quality objectives, which will result in additional health co-benefits.

METRO VANCOUVER WILL:

2.1.1 Investigate and implement measures that will reduce ammonia emissions in the Lower Fraser Valley airshed in partnership with other governments.
2.1.2 Investigate and implement measures that will reduce fine particulate to levels that improve visual air quality.
2.1.3 Implement actions under Strategy 1.1 to reduce emissions of diesel particulate matter and Strategy 1.3 to reduce wood smoke emissions.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

2.1.4 B.C. Ministry of Agriculture to continue encouraging farmers/producers to adopt beneficial management practices that will reduce fine particulate matter and ammonia emissions from agricultural operations as per Action 1.2.9.

Strategy 2.2 Develop a visual air quality management program for the Lower Fraser Valley airshed in partnership with other government agencies

Collaboration with federal, provincial and adjacent agencies will be necessary to develop, pilot and implement an effective visual air quality program for the Lower Fraser Valley airshed.

METRO VANCOUVER WILL:

2.2.1 Enhance monitoring and reporting of visual air quality conditions.
2.2.2 Implement a visual air quality pilot project, which includes: a. developing a visual air quality index and a measurable visual air quality improvement target, b. engaging interested parties and the public in improving visual air quality, c. identifying potential visual air quality management approaches, and d. evaluating visual air quality management options.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

2.2.3 Environment Canada to continue supporting visual air quality monitoring and science in Metro Vancouver and adjacent districts.
2.2.4 Health Canada to continue supporting work that will enhance understanding of the link between improvements in visual air quality and health benefits.
2.2.5 B.C. Ministry of Environment and the Fraser Valley Regional District to continue supporting the development and implementation of the visual air quality improvement program in the Lower Fraser Valley airshed.

Goal 3:
Minimize the region's contribution to global climate change

Climate change is occurring worldwide. The Metro Vancouver region has a global responsibility to reduce its greenhouse gas emissions, thereby minimizing its contribution to global climate change.

Local actions are imperative to achieve regional greenhouse gas emission reduction targets and mitigate global climate change. In the process we can make the region more efficient and improve the quality of life for residents by reducing our exposure to air contaminants, reducing the negative effects of rising global energy prices, and supporting the development of a regional green economy. The actions under Goal 3 are aligned closely with Metro Vancouver's Corporate Climate Action Plan which outlines actions to reduce greenhouse gas emissions from Metro Vancouver's own corporate operations, including the region's drinking water, liquid waste, and solid waste systems. The following strategies and actions will achieve this goal.

Strategy 3.1 Reduce emissions of short-lived climate forcers

A great deal of policy and research effort has concentrated on reducing the most prevalent greenhouse gas, carbon dioxide, which can exist in the atmosphere for decades. Recent research has shown that ground-level ozone, black carbon (more commonly called soot), and methane have a larger impact on the global climate than previously understood. In contrast to carbon dioxide, these "short-lived" climate forcers last days to months in the atmosphere. By reducing these potent yet short-lived contaminants we can delay the worst impacts of climate change – effectively buying time in the next few decades while longer term actions to mitigate carbon dioxide emissions take effect. In addition, reductions in emissions of black carbon and ground-level ozone precursors will also lead to air quality and health benefits.

METRO VANCOUVER WILL:

3.1.1 Develop and implement strategies and actions listed under Goal 1 of this Plan to reduce diesel particulate matter and wood smoke which are key contributors of black carbon.

3.1.2 Develop and implement strategies and actions listed under Goal 1 to reduce the precursors to ground-level ozone including nitrogen oxides from cars, trucks, and buses and volatile organic compounds from industrial, commercial, institutional and agricultural sources.

3.1.3 Work with partners to develop and implement strategies and actions to reduce methane emissions from landfills through organics diversion and methane capture.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

3.1.4 B.C. Ministry of Agriculture to continue developing and implementing projects to reduce methane emissions from agricultural activities (e.g., methane recovery from livestock waste for use as biogas and other products).

Strategy 3.2 Support the region's municipalities, businesses and residents to reduce their carbon footprints

Industrial, commercial, and institutional (ICI) sectors are significant contributors to greenhouse gas emissions in the region. In order to reach regional greenhouse gas emissions reduction targets, greenhouse gas emissions need to be decreased across the economy. Reducing emissions from the ICI sectors often generate additional cost and efficiency benefits for their operations.

Emissions from agricultural operations include carbon dioxide emissions from farm machinery and methane emissions from livestock operations including manure and cattle digestive processes.

Heating for buildings makes up approximately 30% of regional greenhouse gas emissions. Buildings can reduce their greenhouse gas emissions by installing more efficient and low carbon heating systems. Direct and future emissions associated with construction and land development can be reduced by designing and locating new buildings and developments in a way that minimizes greenhouse gas emissions.

METRO VANCOUVER WILL:

3.2.1 Explore the establishment of a regional climate action fund dedicated to funding a range of measures that will reduce regional greenhouse gas emissions and energy consumption.

3.2.2 Work with municipalities to establish a regional carbon credit ownership protocol to clarify the process of assigning carbon credit ownership among local governments in the region.

3.2.3 Assess the region's low carbon energy (e.g., biomass, geothermal, etc.), waste heat recovery, and district energy opportunities and risks, and where appropriate work with municipalities to coordinate public and private investment in supporting infrastructure.

3.2.4 Provide greenhouse gas management training for the region's small and medium-sized enterprises and link training to other related initiatives such as LiveSmartBC and the TransLink Travel Smart program.

3.2.5 Develop model greenhouse gas emission reporting protocols for inclusion in sustainable procurement policies, and promote adoption by municipalities and businesses.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

3.2.6 Federal Government to support the development of an International Maritime Organization regulation for greenhouse gas emissions from commercial marine vessels.

3.2.7 Federal Government to support the International Civil Aviation Organization's certification of sustainable low carbon fuels for use in aircrafts.

3.2.8 Fortis BC and BC Hydro to continue to assess energy efficiency improvement opportunities for major energy users and implement effective incentive programs.

3.2.9 Provincial Government to earmark a portion of the carbon tax revenues and other funding sources for local government actions that will reduce community emissions.

3.2.10 Provincial Government to continue to increase the carbon tax provided that:

a. impacts to low income households are mitigated,
b. a portion of the funding is dedicated to a regional climate action fund for greenhouse gas emission reduction projects in the region, and
c. local governments continue to receive CARIP funds.

3.2.11 Provincial Government to investigate regulatory and incentive options for greenhouse gas emission reductions from heaters and boilers.

3.2.12 Provincial Government to continue setting more stringent energy and greenhouse gas performance standards for new and existing buildings, developing standards for on-site renewable energy systems through the B.C. Building Code, and promoting best practices in building energy performance.

3.2.13 B.C. Ministry of Agriculture to continue investigating renewable energy technologies and low carbon farming techniques, in collaboration with Metro Vancouver, Fraser Valley Regional District, municipalities and other partners.

Strategy 3.3 Reduce the carbon footprint of the region's transportation system

On-road vehicles are responsible for one-third of the region's greenhouse gas emissions. Improving the efficiency of vehicles and reducing the number and length of vehicle trips can reduce the region's impact on the global climate. Vehicle efficiency is largely driven by policies of senior levels of government, but the region can enable new low carbon technologies such as electric vehicles by providing supportive infrastructure. Similarly, Metro Vancouver's role for planning regional growth will have a direct impact on the length and number of vehicle trips.

METRO VANCOUVER WILL:

3.3.1 Work with municipalities and TransLink to implement elements of the Regional Growth Strategy that support land use patterns that reduce vehicle trips and increase walking, cycling, and use of public transit and support the efficient movement of goods.
3.3.2 Work with municipalities and TransLink to develop model bylaws that facilitate low carbon transportation choices, such as pedestrian-oriented design, road space allocation, cycling infrastructure, car sharing, low carbon vehicle infrastructure, etc.
3.3.3 Provide detailed greenhouse gas emission analysis of the regional transportation system in support of regional and municipal transportation planning, and jointly develop strategic actions to reduce transportation-related greenhouse gas emissions.
3.3.4 Promote TransLink 's TravelSmart trip reduction program through Metro Vancouver's public outreach programs.
3.3.5 Work with municipalities, TransLink, the Provincial Government, and the utility providers to coordinate planning and investment in low carbon vehicle infrastructure (e.g., plug-in electric vehicles, natural gas vehicle facilities).
3.3.6 Work with TransLink, municipalities, and the Provincial Government to improve data collection and sharing which will inform transportation-related emission reduction strategies.

ACTIONS REQUESTED OF OTHER GOVERNMENTS AND AGENCIES:

3.3.7 Provincial and Federal Governments to enact enabling legislation that generates additional revenues for transit infrastructure.
3.3.8 Federal and Provincial Governments to enhance financial incentives to promote cleaner, fuel-efficient heavy and light duty vehicle purchases and the adoption of new low-carbon and efficient vehicle technologies.
3.3.9 Provincial Government to expand support of Sustainable Fleet Management Programs (such as E3 and GreenFleets BC, IdleFree BC) as a central source for reducing emissions from private and public vehicle fleets.

3.3.10 Provincial Government to extend the *Greenhouse Gas (Vehicle Emissions Standard) Act* to 2017 through 2025 and incrementally increase the stringency of these standards.

3.3.11 The Provincial Government to investigate combining air contaminants and greenhouse gases into a coordinated vehicle emission standard and increase its stringency.

3.3.12 The Provincial Government to review the B.C. low-carbon fuel standard to ensure provisions are meeting desired greenhouse gas reduction goals and are not creating unintended economic and environmental consequences.

3.3.13 The Insurance Corporation of British Columbia, in consultation with TransLink and other stakeholders, to investigate an equitable distance-based insurance option that helps encourage drivers to drive fewer kilometres.

3.3.14 The Provincial Government, TransLink, and municipalities to enhance transportation demand management measures, including user road pricing, fuel efficient vehicle incentives and outreach programs.

3.3.15 TransLink and municipalities to work with the private sector to improve the efficiency of goods movement through better logistics coordination between ports, carriers, shippers, and their customers.

Strategy 3.4 Explore opportunities for carbon sequestration

Opportunities to increase the carbon sequestration capacity of the region can create carbon credits which can be used towards Metro Vancouver's goal of corporate carbon neutrality, or sold in a carbon market to generate revenues for the region. Sequestration projects can also have associated benefits by restoring green spaces and creating new areas with enhanced ecological services.

METRO VANCOUVER WILL:

3.4.1 Explore carbon sequestration opportunities on Metro Vancouver's corporate lands, such as: a. reforestation, b. ecosystem restoration, and c. biochar.
3.4.2 Develop a regionally specific carbon storage and sequestration guide to aid in site specific land use and landscape decision making in Metro Vancouver.

Strategy 3.5 Increase public understanding of climate change issues and encourage personal action

Public understanding and support for climate change actions is critical to their effectiveness over the long term. Even though Metro Vancouver and other governments are leading many initiatives, action by individuals, businesses, and community organizations will be necessary to meet aggressive greenhouse gas emission reduction targets.

METRO VANCOUVER WILL:

3.5.1 Produce a consolidated climate change action guide which outlines public actions which will significantly reduce greenhouse gas emissions.
3.5.2 Raise public awareness and uptake of low carbon building and transportation options through Metro Vancouver's outreach programs.
3.5.3 Pursue the development of an Air Quality and Climate Change Academy, in partnership with academic institutions and other partners, which will enhance air quality and climate change research, formal education, and public outreach within the region.

PERFORMANCE MEASURES

The following performance measures will be used to monitor progress toward the Plan's goals over the next decade.

Goal 1: Protect public health and the environment

1. Percentage change in annual emissions of air contaminants (region-wide and by sector)
2. Number of exceedances of regional and national objectives and standards
   a. Metro Vancouver's Ambient Air Quality Objectives
   b. Canada-wide Standards for $PM_{2.5}$ and Ozone
3. Percentage change in annually-averaged air contaminant concentrations at long-term monitoring network stations
4. Percentage of hours with the Air Quality Health Index in the HIGH and LOW health risk categories
5. Number of days that the region is under an air quality advisory

Goal 2: Improve visual air quality

1. Number of impaired visual air quality events
2. Number of days with visual air quality index in the worst and best categories

Goal 3: Minimize the region's contribution to global climate change

1. Percentage change in regional greenhouse gas emissions compared to 2007 baseline
2. Percentage change in greenhouse gas emissions per source sector
3. Percentage change in greenhouse gas emissions per capita and per vehicle

Targets

Metro Vancouver has adopted the following regional targets as part of its Sustainability Framework and associated action plans.

DIESEL PARTICULATE MATTER:

- Reduce diesel particulates from vehicles, equipment and rail in the region by 50 percent by 2015 (compared to 2005).

GREENHOUSE GASES:

- Reduce regional greenhouse gases 15 percent by 2015 and 33 percent by 2020 from 2007 levels.

Measuring and Monitoring

Metro Vancouver collects data related to air quality, greenhouse gases and energy use which can be used to identify priority areas for action in the IAQGGMP, and to allow measurement of the performance of the Plan. Air quality monitoring data, emissions inventories and forecasts, and Metro Vancouver's public air quality complaint database provide the on-going information necessary to track progress.

The quality of our air is often described in terms of the amount of contaminants released by emission sources, and the concentrations measured at ambient (outdoor) monitoring stations. It is important to make a distinction between the emissions themselves and the resultant ambient air quality. While the emissions released from industrial stacks, motor vehicle tailpipes, residential chimneys and the myriad of sources in the region do contribute to ambient air quality, some air contaminants discharged into the atmosphere undergo transformations or reactions, leading to secondary pollutants. Two examples are the reaction of nitrogen oxides and volatile organic compounds in the presence of sunlight to form ground-level ozone, and the reaction of nitrogen oxides, sulphur oxides and ammonia to form secondary fine particulate matter.

To track the region's emissions, Metro Vancouver compiles detailed emission inventories of common air contaminants (including smog-forming pollutants) and greenhouse gases every five years. Emission inventories describe the types and amounts of air contaminants released into the air by different sources. This information provides a baseline against which progress can be measured, and a projection of future emissions which helps to identify significant emerging regional sources.

To track ambient air quality levels, Metro Vancouver operates the Lower Fraser Valley Air Quality Monitoring Network in partnership with Environment Canada, Fraser Valley Regional District and the B.C. Ministry of Environment. The network includes over 25 air quality monitoring stations located from Horseshoe Bay to Hope. Air quality and weather data is collected on a continuous basis and used to calculate the public air quality health index (AQHI). The network also allows staff to: collect information about air contaminants that contribute to human health risk; track air quality trends; and evaluate the effectiveness of actions in the IAQGGMP.

Metro Vancouver also conducts specialized air quality monitoring studies to investigate problem areas, measure the impact of specific emission sources and support regulatory decisions. These specialized studies are conducted using portable monitoring equipment to supplement the permanent monitoring network, and provide information about air quality at the neighbourhood level which may be used to develop local air quality action plans. Metro Vancouver has been upgrading its capabilities for undertaking specialized air quality studies.

Metro Vancouver also collaborates with other agencies and academic institutions to conduct air quality research, which allows us to better understand current and future trends, and develop effective programs to support the goals of the IAQGGMP.

Ambient Air Quality Objectives

Metro Vancouver establishes Ambient Air Quality Objectives (AAQOs) based on current knowledge about air quality and health science, with consideration of other relevant objectives world-wide and local achievability. Recognizing that health evidence suggests that there is no safe level for some contaminants, the AAQOs are a step towards the lowest observable effects levels. Metro Vancouver's AAQOs are revised from time to time, consistent with the continuous improvement guideline. Metro Vancouver reviews its AAQOs when new information becomes available and when the federal or provincial government modifies their objectives.

While it is intended that air quality throughout Metro Vancouver region will always be better than Metro Vancouver's AAQOs, natural events such as forest fires may result in unavoidable exceedances. Metro Vancouver's AAQOs are part of an integrated management program comprising, but not limited to, the following components:

- Long-term surveillance monitoring,
- Reporting on the quality of the air,
- One of several decision factors in permit evaluation and regulation development, and
- Input to determining the need for and developing air quality management programs for area and mobile sources.

Table 2 Metro Vancouver's Ambient Air Quality Objectives

Air Contaminant	Averaging Time	Ambient Air Quality Objectives	
		µg/m^3	parts per billion
Carbon monoxide	1-hour	30,000	26,500
	8-hour	10,000	8,800
Nitrogen dioxide	1-hour	200	107
	Annual	40	22
Sulphur dioxide	1-hour	450	174
	24-hour	125	48
	Annual	30	12
Ozone	1-hour	160	82
	8-hour	126	65
Inhalable particulate matter (PM_{10})	24-hour	50	-
	Annual	20	-
Fine particulate matter ($PM_{2.5}$)	24-hour	25	-
	Annual	8 (6)*	-

** Metro Vancouver adopted ambient air quality objectives for $PM_{2.5}$ as part of the 2005 Air Quality Management Plan, based on the most stringent standards at the time and in advance of any Provincial objective. In 2009, the Provincial government adopted a 24-hour objective for $PM_{2.5}$, as well as an annual $PM_{2.5}$ objective of 8µg/m^3 and a planning goal of 6 µg/m^3. The 2011 IAQGGMP aligns Metro Vancouver's objectives with those of the Province.*

The potential impacts associated with each of these contaminants are described in more detail in Appendix B.

Emission Standards for Regulated Sources

Metro Vancouver has the delegated authority and responsibility to provide the service of air pollution control in the region. Regulatory services are delivered through development and administration of bylaws, emission regulations and permits for industrial, commercial and institutional emission sources, as well as compliance promotion and enforcement. The regulatory program aims to minimize emissions, thereby avoiding adverse health impacts and environmental degradation.

Regional emission regulations and permits typically include emission limits, which are emission standards applied at the "point of emission". Permits generally are used to regulate larger industrial sources, and emission limits in permits are legal requirements that restrict the quantity and quality of air contaminants emitted to the environment from a specific emission point (e.g., an industrial stack). In order to meet required emission limits and reduce their emissions, permit holders can be required to operate and maintain emission control works (such as technology like a baghouse or electrostatic precipitator that reduces emissions of particulate matter). Permit holders may also be required to perform regular testing to demonstrate compliance with emission limits.

Metro Vancouver also administers emission regulations which stipulate emission limits and other requirements for groups of smaller sources, such as service stations and industrial boilers. Emission limits are also imposed by other levels of government, including vehicle tailpipes (e.g., AirCare), and paints and solvents (federal limits).

Recalling the distinction between emissions and ambient air quality, regulatory emission limits are used to manage emissions at the point of discharge from a particular source, while ambient air quality objectives are used to manage the end result of those emissions in the regional airshed.

Often, an emission limit will be prescribed for a given emission source at a facility to ensure that there are no adverse impacts beyond the facility's boundaries. In particular, stringent emission limits on hazardous substances can be stipulated in a permit or regulation to ensure there are no adverse health or environmental impacts from a facility on the neighbouring community.

Adaptive Management

Implementation of the strategies and actions in the Integrated Air Quality and Greenhouse Gas Management Plan will be reflected in annual work programs and budgets, and the annual Action Plan under the Sustainability Framework. Metro Vancouver will develop and periodically update an implementation framework in collaboration with its partners. A progress report will be prepared every two years and the Plan will be reviewed every five years.

A key feature of the IAQGGMP is adaptive management – monitoring progress, identifying challenges and finding solutions to overcome those challenges. Through monitoring, assessment and collaboration with partners, Metro Vancouver will continue to adapt its programs in response to technological advances, changing regulatory regimes, air quality episodes, and other issues.

APPENDIX A

AIR QUALITY AND GREENHOUSE GASES – PAST, PRESENT AND FUTURE

Metro Vancouver currently experiences good regional air quality relative to most other urban areas in North America. The quality of our air is often described in terms of the amount of contaminants released by emission sources, and the concentrations measured at ambient (outdoor) monitoring stations.

PAST TRENDS

Past trends, based on these two measures of performance, are shown in Table A-1. Efforts to reduce emissions of most air contaminants in the Lower Fraser Valley airshed have been relatively successful over the past 20 years. Similarly, improvements in carbon monoxide, nitrogen dioxide, sulphur dioxide, volatile organic compounds and particulate matter levels have also been observed at regional air quality monitoring stations.

Table A-1 Past Trends in Emissions and Air Quality in the Lower Fraser Valley Airshed 1990—2010

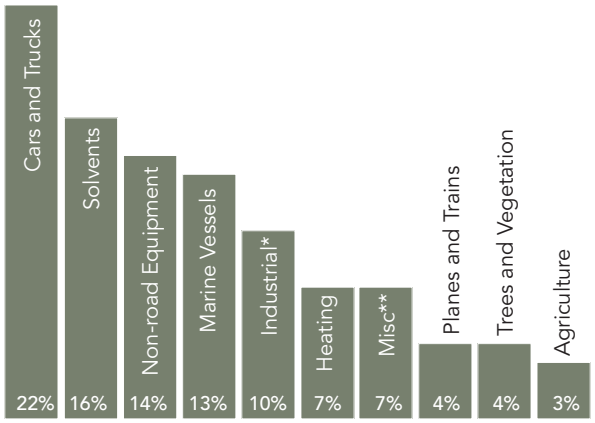
Pollutant	Regional Emission Trend	Regional Air Quality Monitoring Trend
Inhalable particulate matter (PM_{10})	↘	↘
Fine particulate matter ($PM_{2.5}$)	↘	↘
Sulphur oxides (SO_x)	↘	↘
Ammonia (NH_3)	↗	No discernible trend
Diesel particulate matter	↘	Insufficient monitoring record
Ground-Level Ozone (O_3)	Not emitted	↘ Short term peaks → Annual averages
Oxides of nitrogen (NO_x)	↘	↘
Volatile Organic Compounds (VOCs)	↘	↘
Carbon monoxide (CO)	↘	↘
Greenhouse gases (GHGs)	↗	↗*

* Based on global carbon dioxide concentration measurements at National Oceanic and Atmospheric Administration's Mauna Loa observatory.

CURRENT EMISSIONS

The following diagrams summarize the main sources that contributed to smog formation and greenhouse gas emissions in the Metro Vancouver region in the year 2010.

2010 Smog-Forming Pollutant Emissions in the Metro Vancouver Region by Source



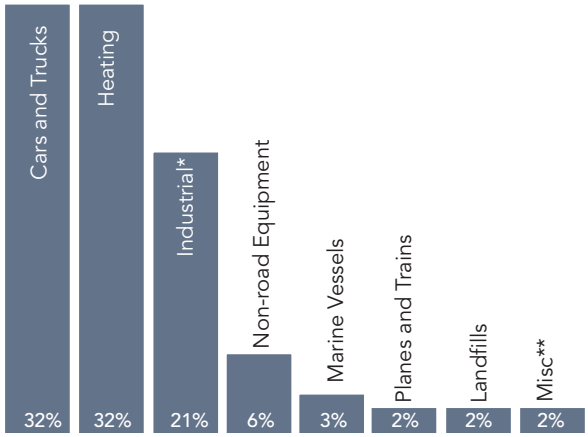
*Permitted Industrial sources

**Miscellaneous smog-forming pollutants are from burning, waste, and other sources.

The total smog-forming emissions for 2010 were 100,005 tonnes.

Smog-forming pollutants emissions are the sum of nitrogen oxides, sulphur oxides, volatile organic compounds, fine particulate matter and ammonia emissions.

2010 Greenhouse Gas Emissions in the Metro Vancouver Region by Source



*Permitted Industrial sources

**Miscellaneous greenhouse gas emissions are from burning, refueling, agriculture and other sources.

The total greenhouse gas emissions for 2010 were 16.3 megatonnes.

Greenhouse gas emissions are the weighted sum of carbon dioxide, methane, and nitrous oxide, expressed as carbon dioxide-equivalents.

FUTURE TRENDS

Despite recent air quality improvements, emissions of particulate matter, carbon monoxide, ammonia and greenhouse gases are predicted to rise as a result of projected increases in population, agricultural activity and transportation, as illustrated in Table A-2.

Table A-2 Forecasted Lower Fraser Valley Airshed Emission Trends 2010– 2020

Pollutant	Forecasted Trend	Forecasted Change from 2010–2020	Major Sources in the Lower Fraser Valley Airshed
Inhalable particulate matter (PM_{10})	↗	+7%	Miscellaneous area sources, building heating, agriculture, burning, non-road engines, wood products industries, marine vessels
Fine particulate matter ($PM_{2.5}$)	↗	+4%	Space heating, burning, miscellaneous area sources, non-road engines
Sulphur oxides (SO_x)	↗ (↘)*	+17% (-51%)*	Marine vessels, petroleum products industries, primary metal industries
Ammonia (NH_3)	↗	+9%	Agriculture, miscellaneous area sources, light-duty vehicles
Diesel particulate matter	↘	-15%**	Non-road engines, marine vessels, heavy-duty vehicles
Oxides of nitrogen (NO_x)	↘	-15%	Light-duty vehicles, non-road engines, marine vessels, heavy-duty vehicles, space heating, railways, non-metallic mineral processing
Volatile Organic Compounds (VOCs)	Levelling off	-3%	Vegetation, solvent evaporation, light-duty vehicles, non-road engines
Carbon monoxide (CO)	↗	+4%	Light-duty vehicles, non-road engines
Greenhouse gases (GHGs)	↗	+5%	Light-duty vehicles, building heating, petroleum products, non-metallic mineral processing

** This trend includes the implementation of an International Maritime Organization Emission Control Area on the coasts of Canada and United States.*

*** Percentage of Canadian Lower Fraser Valley total. Diesel particulate matter emission trends are not available for Whatcom County.*

Current health research indicates that even low levels of **fine particulate matter** exposure are harmful to human health. Particulate matter also impairs visual air quality. Reducing regional emissions of particulate matter and its precursors (nitrogen oxides, sulphur oxides and ammonia) will continue to protect the health of residents and improve visual air quality in the region.

Programs aimed at reducing **diesel particulate matter** are just beginning to take effect. Given the significant risk to human health and its role as a short-term climate forcer, Metro Vancouver will continue to implement and enhance programs to reduce emissions of diesel particulate matter.

Metro Vancouver will continue to partner with other governments and organizations to reduce emissions of **sulphur oxides** and **ammonia**. The largest source of sulphur dioxide emissions in Metro Vancouver is marine vessels, but the pending implementation of the International Maritime Organization's Emission Control Area on the North American coasts will reduce sulphur oxides emissions significantly. Ammonia emissions are predicted to rise as a result of increased agricultural activity.

The severity of **ground-level ozone** episodes has diminished since the 1980s and early 1990s. However, this trend has been mainly unchanged during the last ten to fifteen years, despite large reductions in emissions of nitrogen oxides and volatile organic compounds, which lead to ground-level ozone formation. Ongoing investigation of the most effective strategies for reducing ozone levels will provide Metro Vancouver with options and opportunities for improvement.

Despite recent efforts from governments, organizations, businesses and individuals in B.C. to combat climate change, emissions of **greenhouse gases** in Metro Vancouver continue to increase. Continued commitment and an expansion of efforts to engage the public will be key to achieving future reductions.

APPENDIX B

POTENTIAL IMPACTS ASSOCIATED WITH AIR CONTAMINANTS

Health, visual air quality and climate change issues arise when contaminants are emitted into the air at concentrations that may be harmful to human health and the natural and built environments. These contaminants can also undergo chemical reactions in the air to produce other contaminants, called secondary contaminants, which can additionally affect our health and environment. Table B-1 provides a summary of the possible effects associated with air contaminants and greenhouse gases.

Table B-1 Potential Impacts Associated with Air Contaminants in the Lower Fraser Valley Airshed

Pollutant	Description	Health impacts	Ecosystem impacts	Climate impacts	Other socio-economic impacts
Inhalable particulate matter (PM_{10})	PM_{10} refers to microscopic solid and liquid particles, 10 micrometres or smaller, that are suspended in the atmosphere.	Aggravates respiratory and cardiovascular disease, reduces lung function, increases respiratory symptoms and can lead to premature death.	Contributes to acidification and nutrient enrichment of soil and surface water.	Affects radiative balance and climate.	Contributes to poor visual air quality, which affects the well-being of residents. Poor visual air quality impacts tourism. Damages or discolours structures and property.
Fine particulate matter ($PM_{2.5}$)	$PM_{2.5}$ refers to microscopic solid and liquid particles, 2.5 micrometres or smaller, that are suspended in the atmosphere; can be emitted directly from sources or formed secondarily in the atmosphere.	Aggravates respiratory and cardiovascular disease, reduces lung function, increases respiratory symptoms and can lead to premature death.	Contributes to acidification and nutrient enrichment of soil and surface water.	Affects radiative balance and climate.	Contributes to poor visual air quality, which affects the well-being of residents. Poor visual air quality impacts tourism. Damages or discolours structures and property.
Sulphur dioxide (SO_2) *	Colourless gas with pungent odour that smells like a struck match.	Aggravates asthma and increases respiratory symptoms.	Contributes to acidification of soil and surface water and mercury methylation in wetland areas.		Damages or discolours structures and property.
Ammonia (NH_3)*	Ammonia is a colourless gas with a pungent smell.	Irritates eyes, nose and throat, and may induce coughing.	Contributes to nutrient enrichment of soil and surface water.		Odours affect the well-being of residents.

Pollutant	Description	Health impacts	Ecosystem impacts	Climate impacts	Other socio-economic impacts
Black carbon (BC)*	Black carbon (or soot) comes from the incomplete combustion of fossil fuels, biofuel, and biomass. Black carbon absorbs radiation from the sun, increasing the rate of global climate change.	Health impacts of black carbon are closely linked with diesel particulate matter, which is responsible for 67% of the lifetime cancer risk due to air pollution in Metro Vancouver.	Higher water temperatures in oceans and rivers make them less hospitable to salmon and other fish. Drier and hotter climates make it more difficult for species accustomed to coastal rainforests.	Black carbon has been identified as a short-lived climate forcer and cited as the second biggest contributor to global climate change after carbon dioxide, although its effects are not as long-lived.	Climate refugees may begin arriving in the region because of climate induced flooding, desertification, loss of drinking water, and other impacts. Damage from increased frequency and intensity of storms.
Carbon monoxide (CO)	An odourless gas which, when inhaled, reduces our body's ability to use oxygen.	Decreases athletic performance, aggravates cardiac symptoms, increases hospital admissions for cardiac diseases, and can lead to premature death.			
Ground-level ozone (O_3)	Very reactive oxygen species. Formed in the atmosphere from reactions involving NOx and VOCs in the presence of sunlight.	Aggravates respiratory and cardiovascular disease, decreases lung function and increases respiratory symptoms, increases susceptibility to respiratory infection and can lead to premature death.	Damages vegetation and impacts tree growth.	Ground-level ozone is identified as a short-lived climate forcer.	Reduces crop yields.
Nitrogen oxides (NO_x) ♠*	Group of highly reactive gases that include nitric oxide (NO) and nitrogen dioxide (NO_2); NO_2 is an odorous, brown and highly corrosive gas.	Aggravates respiratory disease and increases susceptibility to respiratory infections.	Contributes to acidification and nutrient enrichment of soil and surface water.		
Volatile organic compounds (VOC) ♠*	A group of carbon-containing compounds that tend to evaporate quickly at ordinary temperatures.	Some VOCs are carcinogenic, such as formaldehyde and benzene.			Some VOCs are odourous, which affects the well-being of residents.

Pollutant	Description	Health impacts	Ecosystem impacts	Climate impacts	Other socio-economic impacts
Methane (CH_4)	A combustible gas, sometimes called natural or biogas. Sources are decomposition of waste in landfills, manure from livestock, and digestive processes in cattle.	No direct health impacts, but climate change is expected to cause more high heat days during the summer months which can stress those with pre-existing heart and lung conditions.	Higher water temperatures in oceans and rivers make them less hospitable to salmon and other fish. Drier and hotter climates make it more difficult for species accustomed to coastal rainforests.	Methane is a relatively potent greenhouse gas. Compared with carbon dioxide, it has a higher global warming potential, but has been identified as a short-lived climate forcer, persisting in the atmosphere for around 10 years.	Climate refugees may begin arriving in the region because of climate induced flooding, desertification, loss of drinking water, and other impacts. Damage from increased frequency and intensity of storms.
Carbon dioxide (CO_2)	A colorless, odourless, and tasteless gas that is the by-product of combustion of fossil fuels. Also released through processes of deforestation and other land-use change.	No direct health impacts, but climate change is expected to cause more high heat days during the summer months which can stress those with pre-existing heart and lung conditions.	Higher water temperatures in oceans and rivers make them less hospitable to salmon and other fish. Drier and hotter climates make it more difficult for species accustomed to coastal rainforests.	CO_2 is the most abundant greenhouse gas and causes global climate change. CO_2 is long-lived in the atmosphere often remaining for more than 100 years.	Climate refugees may begin arriving in the region because of climate induced flooding, desertification, loss of drinking water, and other impacts. Damage from increased frequency and intensity of storms.

* *Contributes to $PM_{2.5}$ formation with associated impacts*

♠ *Contributes to ground-level ozone formation with associated impacts*

Based on:

U.S. Environmental Protection Agency (2008) National Air Quality Status and Trends Through 2007. Report EPA-454/R-08-006, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Research Triangle Park, North Carolina, November 2008.

APPENDIX C

ROLES AND RESPONSIBILITIES OF OTHER GOVERNMENTS

Recognizing that Metro Vancouver does not have regulatory authority over all air emission sources in the region, partnerships with other levels of government will be necessary in the following areas.

FEDERAL GOVERNMENT:

- **Environment Canada** regulates emissions from on-road vehicles through standards for new vehicle performance and fuel composition, in-use fuel standards, the quality of fuel produced, imported and sold in Canada, and emissions from marine vessels, non-road vehicles and engines, and some industrial sources across Canada. The Government of Canada and the Government of the United States of America are signatories to the *US-Canada Air Quality Agreement*, a commitment to controlling transboundary air pollution between the two countries.
- **Environment Canada** and **Health Canada** share responsibility under the *Canadian Environmental Protection Act* (CEPA) to assess and manage threats posed by toxic substances.
- **Transport Canada** has the mandate to enforce the International Maritime Organization's regulations for marine vessels under the authority of the *Canada Shipping Act*. Transport Canada is also the authority responsible for Canadian railways.
- **Port Metro Vancouver** manages all port operations and mitigation of environmental impacts related to development and expansion proposals. Port Metro Vancouver is a non-shareholder, financially self-sufficient corporation which was established by the Government of Canada in January 2008 pursuant to the *Canada Marine Act*. Port Metro Vancouver is accountable to the federal Minister of Transport.

PROVINCIAL GOVERNMENT:

- **The government of British Columbia** delegates air quality management authority to Metro Vancouver through the Provincial Environmental Management Act, and the **B.C. Ministry of Environment** has regulatory authority for air quality management in the remainder of the Province.
- In 2007, the Government of British Columbia enacted the *Greenhouse Gas Reductions Target Act* which commits the Province to reducing greenhouse gas emissions by 33 percent below 2007 levels by 2020 and 80 percent by 2050. Other provincial legislation, such as the *Carbon Tax Act* and other *Greenhouse Gas Reduction Acts* (Cap and Trade, Vehicle Emissions Standards, Renewable and Low Carbon Fuel Requirements); will assist the Province and local governments to meet their greenhouse gas emission reduction targets.

REGIONAL AND LOCAL GOVERNMENTS:

- The South Coast British Columbia Transportation Authority (or **TransLink**) administers the regional AirCare vehicle inspection and maintenance program; plans, manages and finances public transit; and shares responsibility for the major road network and regional cycling with the municipalities in Metro Vancouver.
- **Municipalities** are required under the *Local Government (Green Communities) Statutes Amendment Act* (Bill 27) to include targets, policies and actions to reduce greenhouse gas emissions in their Official Community Plans. Several municipalities within Metro Vancouver have also adopted and enforce municipal bylaws, such as fire and anti-idling bylaws, which improve air quality.

FIRST NATIONS:

- **First Nations** have constitutional rights which must be taken into account in the planning process. In April 2009 Tsawwassen became a treaty First Nation member of the Metro Vancouver Board when a treaty signed and ratified by the Government of Canada, the Province of British Columbia and Tsawwassen First Nation came into effect.

ADJACENT REGIONAL DISTRICTS AND AIRSHED PARTNERS:

- **Fraser Valley Regional District (FVRD)** has been given authority for air quality planning and monitoring through a provincial Order-in-Council. The FVRD is currently working to acquire regulatory powers similar to those of Metro Vancouver.
- **Squamish-Lillooet Regional District** has an interest in air quality management as stated in its Regional Growth Strategy, but air quality management authority within this district lies with the B.C. Ministry of Environment.
- **Northwest Clean Air Agency** is the local air quality authority with responsibility for Whatcom County, and has similar powers to Metro Vancouver.