

*Sharing the Air*

**State of the Sea-to-Sky/Howe Sound Airshed**

# 2010 Annual Report



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Prepared for:



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## Executive Summary

An Air Quality Management Plan (AQMP) was developed for the Sea-to-Sky/Howe Sound airshed between 2002 and 2005 as a proactive measure to ensure clean air is maintained throughout the airshed, in particular due to the projected high levels of growth and development for the region. The AQMP identifies actions that help maintain healthy air through an integrated planning approach that addresses area, point and mobile sources in the airshed.

This report highlights the state of air quality in the airshed and the progress with respect to oversight and implementation of the AQMP in 2010.

## Air Quality

The quality of the air throughout the airshed was generally good in 2010, demonstrated by data collected and analysed for six air quality indicators. A summary of these indicators is provided below. There was one air quality advisory issued due to forest fire smoke, and several hours where the air quality was considered poor in Whistler and Squamish due to particulate matter levels. However, levels of particulate matter were generally lower in 2010 compared to 2009 due to the lower incidence of forest fires. No advisories were issued in relation to smog in 2010, compared to one that was issued in 2009. The odour index in Langdale exceeded the target threshold more times in 2010 than any previous year reported.

In February, the 2010 Winter Olympics were held in Vancouver and Whistler, with significant transportation impacts for the Sea-to-Sky corridor. Additional monitoring was undertaken during the period. The results indicated that the air quality was as good, or possibly better, than those typically observed during that time of year.

## AQMP Implementation Oversight

2010 was an eventful year for the organizations involved in implementing the Sea-to-Sky AQMP. First, a part-time staff position was created to facilitate the AQMP implementation process and undertake certain actions. Second, a non-profit organization called the Sea-to-Sky Clean Air Society (SSCAS) was formed to replace the Air Quality Coordinating Committee as the key organization overseeing implementation of the AQMP. Third, a brand and logo were created for SSCAS as part of the development of a communication strategy. These activities are important steps in the transition of the oversight of air quality issues to a locally-driven organization in the airshed.

## Implementation Highlights

In addition to changes in organizational structure, SSCAS conducted a review of the AQMP actions and created a work plan to guide staff and Board efforts through the end of 2011. Activities undertaken during 2010 support the following actions from the AQMP:

- Action #1 and #3: Integrate transit systems and promote opportunities to access public transportation and other transportation alternatives
- Action #4: Reduce vehicle idling through education and bylaws
- Action #8: Develop airshed-wide smoke control strategy
- Action #14: Share successes and information via the Sea-to-Sky air quality website

- Action #15: Implement an airshed-wide public outreach and education campaign
- Action #16: Coordinate air quality initiatives with other organizations

Several other actions in the AQMP are supported by initiatives in progress at the community level, where communities are working independently and providing updates at SSCAS meetings.

### **Indicators for the Sea-to-Sky AQMP**

Ten indicators were identified in the AQMP to gauge whether air quality is improving or deteriorating in the airshed. Two of these indicators provide context and the remaining eight indicators gauge air quality conditions by analysing data from ambient air quality monitoring stations in the airshed and other sources. Data is not currently reported for two of the air quality indicators (AQ-2: Economic Impacts and AQ-4: Visibility) because the data and methodology for reporting these indicators are not currently available. Data for 2010 for AQ-3: Greenhouse Gases is expected to be released by the Province in 2012, but is not available at the time of this report.

In addition, four performance measures were identified to track the progress on implementing the AQMP. The indicators and performance measures are summarized here and explained in greater detail in the report.

#### **Context Indicators**

##### **Resident Population: CTX-1**

**Purpose:** A significant proportion of air quality and greenhouse gas emissions in the Sea-to-Sky/Howe Sound airshed can be attributed to transportation and space heating. Both of these are directly dependent on the size of the resident population.

**Results:** The population in the airshed grew by 2.4% in 2010. Since 2005, the population has grown approximately 12%.

##### **Visitor Population: CTX-2**

**Purpose:** Tourism is a vital part of the economy in the airshed, and the level of tourism has a strong impact on energy demand and air quality in the airshed – both with respect to transportation and space heating for accommodations.

**Results:** Visitor centre records indicate an increase in visitor population during 2010 compared to 2009 by 7%. Overall, the number of visits in the airshed has increased approximately 33% since 2005, based on visitor centre records.

#### **Air Quality Indicators**

##### **Health Reference Levels (HRL): AQ-1**

**Purpose:** The HRL is a measure of particulate matter (PM), which is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. PM contributes to poor air quality which can negatively affect human health.

**Results:** Based on a rolling 24-hour average from continuous monitoring, there were: (a) 20 days on which the HRL for PM<sub>10</sub> was exceeded in 2010, 34 days less than in 2009, and; (b) 8 days on which the HRL for PM<sub>2.5</sub> was exceeded in 2010, 11 days less than in 2009.

**Odour: AQ-5**

**Purpose:** Clean, fresh-smelling air is a vital component of the fresh air experience boasted by the Sea-to-Sky/Howe Sound airshed for both its residents and guests.

**Results:** Howe Sound Pulp and Paper reported receiving twelve odour complaints in 2010, which is an increase from the five complaints received in 2009. There were 30 exceedances of the Odour Index in 2010, which is an increase from 16 exceedances in 2009.

**Canada-wide Standards (CWS): AQ-6**

**Purpose:** Air pollution has been shown to have detrimental effects on human health – particularly to at-risk persons such as those with respiratory and cardiovascular ailments, children and the elderly. The CWS standard has set thresholds for particulate matter and ground-level ozone because they are the pollutants of most concern.

**Results:** Fine particulate matter (PM<sub>2.5</sub>) – No exceedances. The 2-year average for 2010 at the Whistler station was 14.7 µg/ m<sup>3</sup>, a decrease from the 3-year average calculated for 2009.

Ground-level ozone (O<sub>3</sub>) – No exceedances. The 3-year averages for 2010 were 50.3 ppb at the Squamish station and 54.3 ppb at the Whistler station, very similar to 2008 and 2009 levels.

**Air Quality Index (AQI): AQ-7**

**Purpose:** The main purpose of the AQI is to inform the public, on a daily basis, about the present state of air quality.

**Results:** In 2010, the AQI exceeded 50 and was rated POOR for 0 hours at the monitoring station in Langdale, 51 hours at the monitoring station in Squamish (due to high PM<sub>10</sub>), and for 68 hours in Whistler (due to high PM<sub>2.5</sub>). One air quality advisory was issued in the airshed in 2010, due to smoke from wildfires (particulate matter).

**Continuous Improvement: AQ-8**

**Purpose:** Most measures used to describe air quality describe whether pollutant levels are high over short periods of time. However, it is also important to track long term trends of air quality in the region since long term exposure may also affect health.

**Results:** There are four data points available for each contaminant, making it difficult to identify a clear trend. An increase of PM<sub>2.5</sub> has been observed at the Whistler station (a 40% increase relative to 2006). Wildfires may be a significant contributor to the changing levels of PM<sub>2.5</sub> in this area. Decreases have been measured in other contaminants relative to the 2005 / 2006 base years (e.g. ozone in Squamish decreased 11% relative to 2005; and PM<sub>10</sub> in Squamish decreased 6% relative to 2005). Some contaminants have shown little change (e.g. Ozone in Whistler and PM<sub>10</sub> in Langdale).

**Performance Measures****Action Plan Implementation Progress: PFM-1 and PFM-2**

**Purpose:** Tracking the completed actions provides an indication of progress in implementing the AQMP. This measure will help the SSCAS determine whether the approach to implementation and structure of the organization is effective in carrying out the identified actions.

**Results:** Implementation of the AQMP started in 2008 and several actions were initiated during the first three years. No actions have been completed at this stage, and several are ongoing in nature.

Activities undertaken in 2010 are supportive of seven AQMP actions at the airshed scale. SSCAS also undertook a review of the AQMP actions to re-prioritize the key actions to be pursued for 2011.

**SSCAS Funder Involvement: PFM-3**

**Purpose:** This measure provides an indication of the level of involvement that the funding members have in the process. This indicator may be revised in future years due to the changing structure of the organization.

**Results:** On average, 75% of funding members were represented at meetings in 2010, and seven out of eight funding members participated in at least two of the three meetings. Several other (non-funding) members participated in at least one of the three meetings held throughout the year.

**Website Usage: PFM-4**

**Purpose:** This measure provides an indication of the level of use of the website.

**Results:** Visits to the website were not being tracked until October 1, 2010. The total annual visits will be reported starting in 2011. Between October 1 and December 31 2010, there were 274 visits.

**Next Steps**

- 2011 will see continued implementation of the AQMP concentrating on communication and engagement, with stakeholders, organizations and communities in the airshed. Key areas of focus will be wood smoke reduction through the Woodstove Exchange Program, and initiatives to improve transit connectivity and access to alternative forms of transportation.
- SSCAS Board of Directors is expected to meet three times in 2011.
- SSCAS will seek out other avenues of funding beyond the current funding partners.
- An annual report will continue to be produced to track changes in the identified context indicators, air quality indicators, and implementation performance measures.
- The first five-year report is scheduled for 2013 and will provide SSCAS with an opportunity to revise or add new actions in order to achieve the vision and goals of the AQMP by 2025.

**Conclusion**

The air quality is generally good in the Sea-to-Sky/Howe Sound airshed at present; however, it is important to continue implementation of the AQMP because:

- Continued increases in population and visitors that lead to increases in transportation and space heating would result in deteriorating air quality without action to keep the air clean;
- There are no safe levels of certain pollutants, and research suggests human health impacts are occurring in sensitive individuals at levels currently being measured in the airshed;
- Typical summer air quality conditions measured in the airshed approach, and at times reach, levels that warrant the issuance of an air quality advisory, and;
- The region is known for outdoor recreational opportunities, which are important to the local economy. When air quality is considered poor, air quality advisories are issued that recommend refraining from such activities. Poor air quality conditions may therefore have an impact on the local economy.

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## 1 Introduction

### 1.1. Background

The Sea-to-Sky/Howe Sound airshed encompasses the region from Bowen Island to just north of Pemberton. It includes the following communities along the eastern and western shores of Howe Sound: parts of West Vancouver, Bowen Island, Gibsons, Langdale, Lions Bay, Squamish, Whistler and Pemberton. The Squamish-Lillooet Regional District (SLRD), the Sunshine Coast Regional District (SCRD) and Metro Vancouver all have residents in the airshed. See Figure 1 for a map that outlines the airshed boundaries. The airshed boundaries are defined by a combination of topography, meteorology and climate considerations that contain a shared air mass. The pollutants emitted by activities throughout the airshed get mixed together into the air being breathed by everyone that lives in or visits the region.

The B.C. Ministry of Environment (MoE) monitors ambient air quality, provides data and technical expertise, and carries out regulatory activity throughout the province. In the late 1990s and early 2000s, MoE identified that certain pollutants in the Sea-to-Sky/Howe Sound airshed (e.g. particulate matter and ground-level ozone) were approaching levels of concern to human health<sup>1</sup> and the impacts were expected to grow as population and tourism increase. A significant portion of these emissions were from mobile sources (e.g. transportation) and area sources (e.g. space heating and wood burning)<sup>2</sup> which are beyond the traditional regulatory role of MoE.

The Sea-to-Sky Air Quality Management Plan (AQMP) was developed between 2002 and 2005 using a community-based approach to form a comprehensive plan to protect air quality addressing the area and mobile sources, as well as point sources in the airshed. Through the AQMP, with the involvement of all stakeholders in the airshed, emissions could be addressed through actions that could be carried out by municipalities, non-governmental organizations, industry, members of the public and other relevant agencies and organizations.

Since 2006, the AQMP has entered into a phase of implementation, reporting and ongoing monitoring. The first State of the Airshed Annual Report was released for 2008, and continues to be released on an annual basis. Every five years of implementation, the AQMP will undergo a review to assess the direction and priority of implementation activities.

### 1.2. How was the AQMP developed?

The Sea-to-Sky AQMP was created in a series of four phases.

**Phase 1** involved the evaluation of the opportunities to build an AQMP by supporting existing community-based initiatives. Specifically, this phase identified stakeholders, evaluated potential benefits of existing programs, and led to the development of a community-based process for creating the AQMP. The report titled "Sharing the Air: A Community-based Approach to Airshed Management in the Sea-to-Sky Corridor"<sup>3</sup> details the results of this phase.

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<sup>1</sup> Ambient Air Quality Monitoring Report for Whistler, B.C.; B.C. Ministry of Water, Land and Air Protection (now MoE) November 2002.

<sup>2</sup> 1995 Sea-to-Sky Airshed Emissions Inventory of Common Air Contaminants, B.C. Ministry of Water, Land and Air Protection (now MoE).

<sup>3</sup> Report prepared by The Sheltair Group for the B.C. Ministry of Water, Land and Air Protection (now MoE), March 2004.



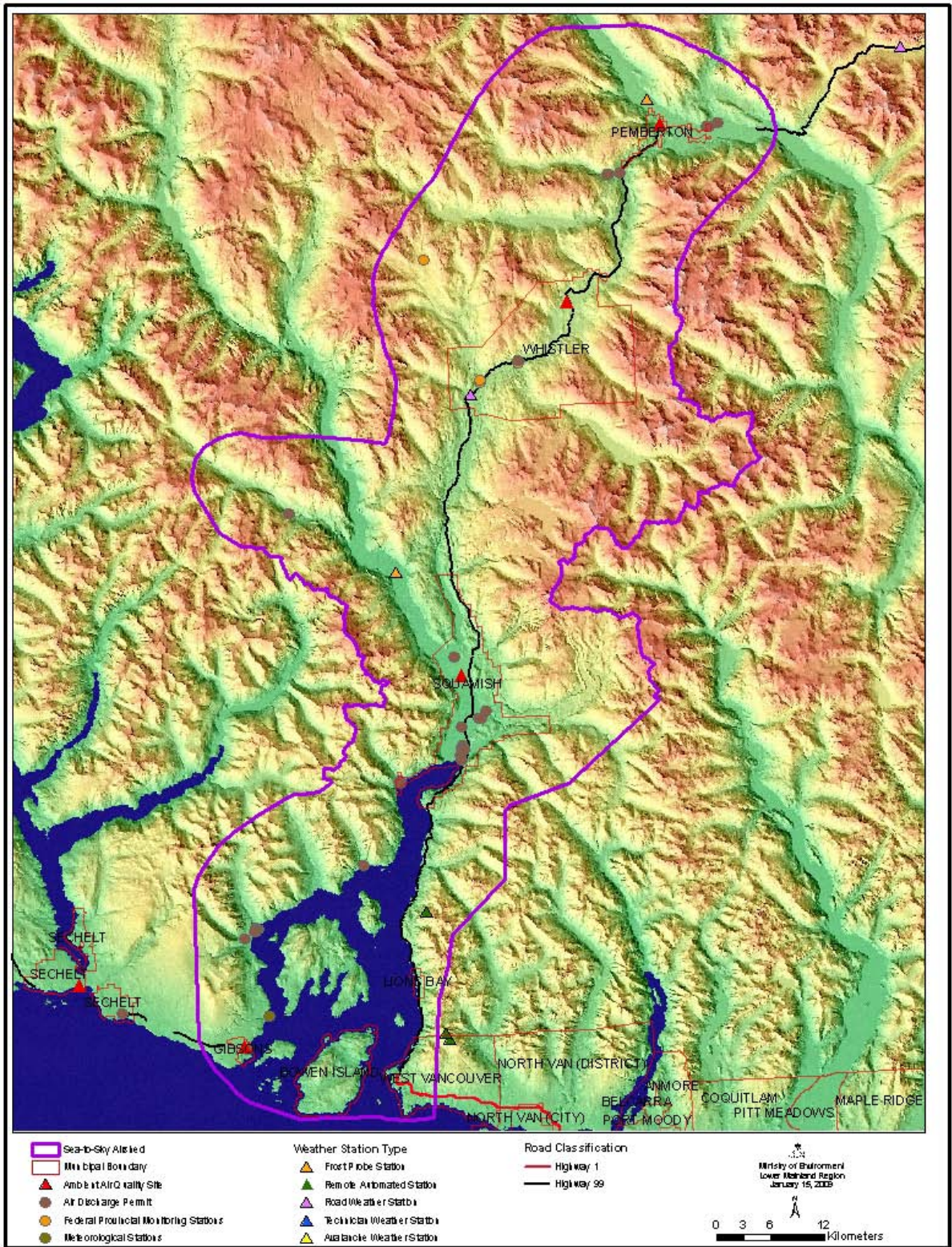


Figure 1: The Sea-to-Sky/Howe Sound Airshed

**Phase 2** continued the stakeholder engagement process and established the Air Quality Coordinating Committee (AQCC), the group initially responsible for developing and implementing the AQMP.

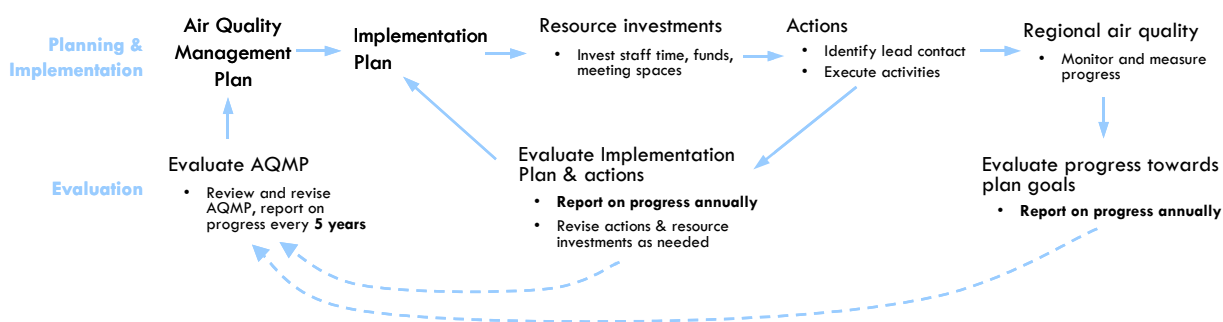
During **Phase 3**, the AQCC collectively built the AQMP through a series of meetings. The planning framework developed in Phase 1 was provided to the group to help them organize their work. The AQMP underwent public consultation in the winter of 2006-2007 and the revised plan was presented to councils and boards in April and May 2007<sup>4</sup>.

**Phase 4** involves the development and execution of an AQMP implementation strategy and ongoing monitoring and reporting<sup>5</sup>. During this phase the AQCC transitioned into the Sea-to-Sky Clean Air Society (SSCAS), a registered BC non-profit society. The SSCAS is responsible for implementing the AQMP and monitoring progress toward the vision and goals through annual and five-year reports. MoE continues to support the AQMP by providing technical expertise in air quality monitoring and reporting, communication and outreach about pollution sources and management strategies, and regulatory activities.

### 1.3. Report Objectives

Annual and five-year reporting is important to keep both the AQMP and the actions relevant to the current situation in the airshed. The annual report focuses on the status of the actions and the air quality in the airshed. Reporting is based on the calendar year. This allows nationally accepted air quality calculations to be used in reporting.

The five year update report provides an opportunity to re-evaluate the AQMP and its actions, updating or adding actions where necessary. The annual reports will help to inform the five-year update report by identifying which actions have been completed and reporting on the progress towards the vision and goals (see Figure 2).



**Figure 2: Reporting and Evaluation**

The development and approval of the AQMP has proceeded as outlined in the timeline in Figure 3. The current phase (2009 and beyond) involves the implementation of early and high priority actions and monitoring and reporting on progress made to date.

<sup>4</sup> The Sea-to-Sky Air Quality Management Plan is available at: <http://seatoskyairquality.ca/wp-content/uploads/aqmp2007.pdf>

<sup>5</sup> The AQMP implementation framework is available at: <http://seatoskyairquality.ca/wp-content/uploads/framework2008.pdf>

This document represents the third State of the Sea-to-Sky/Howe Sound Airshed Annual Report and was prepared by Stantec Consulting (formerly The Sheltair Group), based on information provided by the Sea-to-Sky Clean Air Society and air quality data provided by the BC Ministry of Environment.

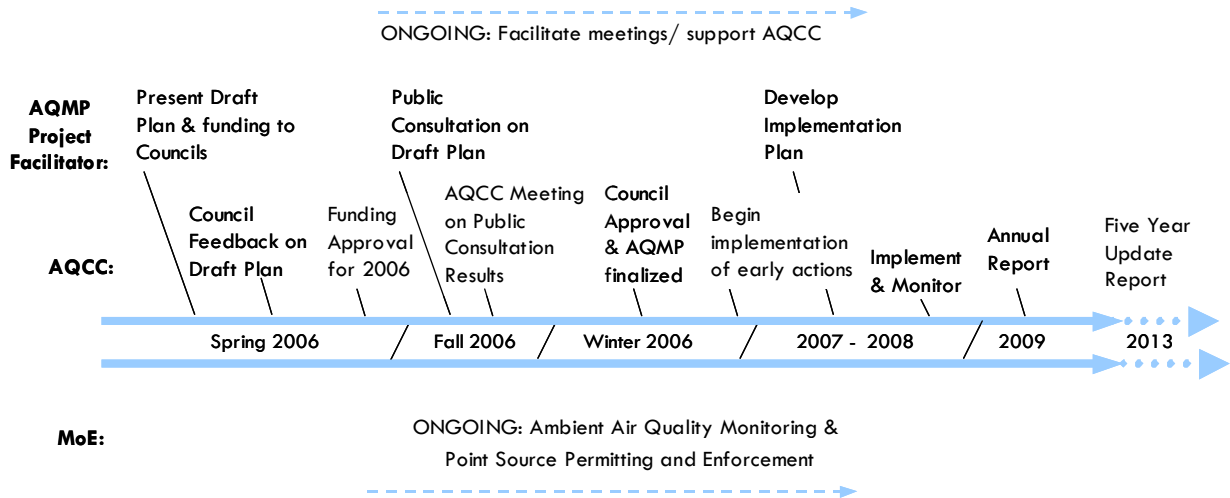


Figure 3: AQMP Implementation Timeline

## 2 AQMP Vision & Goals

The AQMP vision and goals were developed by the AQCC and are provided here for reference purposes. The full version of the AQMP can be found on the Sea-to-Sky Clean Air Society's website (<http://seatoskyairquality.ca>). The plan provides a framework and initial direction for achieving the identified vision and goals. Specific actions may change over time to align with other processes and initiatives occurring in the region, as long as the activities align with the vision and goals developed in the AQMP process. These initiatives may include SmartGrowth activities, municipal and regional district energy planning, the Howe Sound Community Forum, and others as they are identified.

### 2.1. Vision

The following describes the vision for the airshed in 2025:

***Communities in the Sea-to-Sky/Howe Sound airshed will enjoy clean air that sustains and contributes to the health of our residents and guests, our economy, and our environment and wildlife.***

In 2025, residents and guests throughout the Sea-to-Sky/Howe Sound airshed will enjoy clean mountain air, crisp scents of ocean and forest, crystal clear views and vistas, and abundant, diverse wildlife. Clean air will contribute to our residents' and guests' enjoyment of the natural surroundings and help them to maintain a healthy lifestyle. Due to the cleaner air, everyone will benefit from improved quality of life and visitors will come here to breathe our fresh air and enjoy our panoramic views.

Despite continued growth in the airshed, air quality will improve beyond 2005 through the use of good planning principles such as Smart Growth, new technologies, and clean energy sources. We will continue to consider air quality and its contributions towards our goals in all planning processes, such as climate change initiatives. All residents and businesses will recognize that the quality of air is connected to all aspects of the communities' activities.

Exceptional air quality and visibility in the airshed will continue to generate many economic opportunities for local businesses and will, in part, build on our multi-season outdoor tourism opportunities. We will develop new technologies and industries that contribute to healthy air as well as to our diverse and sustainable economy.

We will continue to identify and develop innovative best practices for air quality management. We will share results of actions we have already implemented and those that will be implemented through the AQMP, nationally and internationally. In 2010, at the sustainable Winter Olympics, and beyond we will be internationally recognized for our clean air, crystal clear views, our leading edge initiatives, and progressive management of air quality.

## 2.2. Goals

We will strive towards our vision by meeting these goals by 2025:

To address **Human Health**, we have improved regional air quality so there are substantially fewer incidences of respiratory related medical visits and health care costs.

To address **Ecosystem Health**, we have continued to maximize green space and vegetation in community planning and land development to help maintain healthy air.

To address **Economic Health**, we have a strong and sustainable local economy having a positive impact on air quality.

To address **Climate Change**, we have managed the airshed's air emission contributions to climate change and its effects.

To address **Visibility**, we have maintained, protected and are improving aesthetic views and vistas through management of the emissions contributing to poor visibility events.

To address **Odour**, we have controlled the emission of odour causing substances that negatively impact on human, economic and ecosystem health.

To demonstrate **Leadership**, we have showcased our AQMP, partnerships and resulting successes regionally, nationally and internationally, and have maintained the perception of clean, healthy air for which we are recognized.

### 3 Sea-to-Sky Clean Air Society (SSCAS)

#### 3.1. Background

In 2005 the Air Quality Coordinating Committee (AQCC) was established to guide the development of the AQMP for the Sea-to-Sky/Howe Sound airshed. The AQCC was an integrated committee of representatives from local and regional government, First Nations, utilities, transit providers and the B.C. Ministry of Environment and other agencies. After the publication of the AQMP, the AQCC guided the development of an implementation plan and initiated the implementation of the plan.

In 2010, the AQCC underwent re-structuring into a non-profit society governed by a Board of Directors. The Sea-to-Sky Clean Air Society was formed and an executive director was hired part-time to coordinate the society's activities. The SSCAS is now responsible for continued implementation of the AQMP and monitoring and reporting on the progress of implementation.

#### 3.2. Organizational Structure

In 2010, the Sea-to-Sky Clean Air Society was created as a registered non-profit society in British Columbia. A **Board of Directors** was formed with seven members from various locations and organizations in the airshed:

- Peter Frinton (Chair): Councillor, Bowen Island Municipality
- Barry Janyk: Mayor, Town of Gibsons
- Caroline Ashekian: Environmental Technician, District of Squamish
- Nicolette Richer: Environmental Coordinator, Resort Municipality of Whistler
- Brooke Carere: Resident, District of Squamish
- Ruth Simons: Councillor, Village of Lions Bay
- Ian Holl: Planner, Squamish Lillooet Regional District

An **Advisory Board** was also created with three representatives from stakeholders in the airshed:

- Kimberley Armour: Squamish River Watershed Society
- Lorien Chilton: Village of Pemberton
- Brent Moore: Head, Environmental Quality Section, Environmental Protection, BC Ministry of Environment

In addition to the Board of Directors and Advisory Board, representatives from Squamish Nation, Lil'Wat Nation, Metro Vancouver, Ministry of Environment, Vancouver Coastal Health Authority, Howe Sound Pulp and Paper, BC Ferries, BC Transit and BC Hydro are invited to attend meetings and receive updates.

Also in 2010, one part-time **staff position** was created: Ione Smith became Executive Director for the organization.

### **3.3. Funding**

In 2010, the SSCAS received \$23,067 funding, all of it from government grants. MoE contributed \$12,500 and the partner communities contributed a combined total of \$10,567. Partner communities include the six municipalities in the airshed (Bowen Island, Gibsons, Langdale, Lions Bay, Squamish, Whistler and Pemberton) and the Squamish-Lillooet Regional District.

The funding was used to pay for a part-time executive director position (\$14,628) and operating expenses (\$3,480). The operating expenses included insurance, conference registration, Board meeting travel, and office expenses. Remaining funds (\$4,959) were received at the end of the year and were carried forward for use in 2011. The 2009 Annual Report was completed with funds remaining from the 2009 budget year.

In 2010, SSCAS initiated the process of becoming a Federal Charity in order to increase access to other funding sources. SSCAS also submitted a successful application to the Woodstove Exchange program, and received funding for a second staff position (short term, part-time) for 2011.

### **3.4. Board Meetings**

Three Board meetings were held with respect to the AQMP in 2010. There was one final AQCC meeting held on Bowen Island in June 2010. After this meeting, the AQCC was dissolved and replaced by the SSCAS Board of Directors. Two SSCAS Board Meetings were held in 2010: Whistler (October), and Squamish (December).

### **3.5. Provincial Role**

MoE is responsible for monitoring and reporting on ambient air quality and regulatory activities associated with point sources, some area sources and some motor vehicle related emissions under the Environmental Management Act. Recognizing that air quality is an issue with many contributing factors, MoE initially proposed the development of airshed-based planning to address unregulated emission sources, including transportation (mobile sources) and area sources (electricity use, space heating, agriculture, etc.) at the local level.

The development and implementation of the Sea-to-Sky AQMP has enabled the provincial government to work with local and regional level governments, First Nations and other stakeholders to address air quality issues. A regional approach is important since air quality should be managed across the entire airshed to be most effective. The MoE continues to support the process by attending meetings, providing funding for staff positions and monitoring air quality at several stations located throughout the airshed.

## 4 2010 Implementation Activities

2010 was a year of significant changes for the oversight of AQMP implementation. As described in the previous section, a part-time staff position was created, and the committee was re-structured into a non-profit organization called the Sea-to-Sky Clean Air Society. Further to this, SSCAS reviewed and revised the priority of the AQMP actions and created a new 15-month work plan. SSCAS also fostered new relationships with organizations in the airshed that are working on related activities, and continued implementation of several initiatives. This section describes the year's initiatives in greater detail.

### 4.1. Priority Actions Review and Work Plan

The first three quarters of the year involved hiring a new staff member and re-structuring the organization into a non-profit organization. Once the new structure was in place, the Board undertook strategic planning that included a review of the AQMP actions. This resulted in a 15-month work plan covering October 2010 to December 2011 to guide SSCAS resource allocations over this period.

The review identified three key areas of focus for the remainder of 2010 and 2011:

- a) Implementation of initiatives related to: communications, education, and transportation.
- b) Fundraising: as a non-profit society, this is expected to require a constant level of attention over the short, medium, and long term.
- c) Updating priority AQMP actions: removing references to the 2010 Winter Olympics, reviewing timelines, consolidating actions as appropriate.

### 4.2. Actions in Progress in 2010

Although the focus of 2010 was on re-organization, branding and communication, progress was also made on the implementation of several AQMP actions. The following highlights the activities that took place for seven AQMP action items in 2010.

#### **AQMP Action #1: Integrate transit systems**

#### **AQMP Action #3: Promote opportunities to access public transportation and other transportation alternatives**

During 2010, continued efforts were made to enhance transit and ridership in the airshed. Activities included:

- Meetings were held regarding corridor residents commuting to Vancouver (between Lions Bay, Furry Creek and Britannia Beach) to identify options for reducing traffic.
- Squamish undertook a Multi-Modal Transportation Plan to 2031. The plan is to focus on community transportation, but will also to consider connectivity with adjacent communities.

Also during 2010, the bus service between Squamish and Whistler was cut, which is counter to AQMP goals and actions. SSCAS will seek opportunities to engage transportation planners and authorities in the airshed on this issue in 2011.

#### **AQMP Action #4: Reduce vehicle idling through education and bylaws**

In 2010, Lions Bay and Squamish both enacted anti-idling bylaws requiring drivers to turn engines off if engines are running while the vehicle is parked. All municipalities in the airshed now have anti-idling



bylaws in place (Pemberton, Whistler, Bowen Island and Gibsons already had anti-idling bylaws prior to 2010). However, the bylaws in each community have different standards, allowing from two up to ten minutes of idling time. As a next step for this action, the SSCAS may wish to review and provide recommendations for aligning the bylaws between all communities in the airshed. Communities across the airshed have also undertaken ongoing education (installation of “Idle free” signage at idling hot spots and delivery of education campaigns). Municipalities have raised concerns over the cost of enforcing the anti-idling bylaws with limited Bylaw Officer resources.

**AQMP Action #8: Develop airshed-wide smoke control strategy**

In 2009, Metro Vancouver launched the Woodstove Exchange Program (available to Metro Vancouver municipalities). In 2010, the SSCAS applied to the provincial government to obtain funding for a Woodstove Exchange Coordinator dedicated to the Sea-to-Sky airshed. The application was successful and the position began in 2011.

Bowen Island completed the wood-waste study that began in 2009 investigating alternative methods of managing wood waste with funding from MoE. Study recommendations include:

- centralizing or site of origin as an approach,
- phasing out backyard burning,
- developing a central wood waste composting or incineration site, and
- phasing out land clearing burning.

**AQMP Action #14: Share successes and information via the Sea-to-Sky Air Quality website**

The website was redesigned to represent the new SSCAS structure and branding. The website is maintained by SSCAS staff with regular news and information updates. It continues to provide a broad spectrum of information on air quality issues relevant to the airshed.

**AQMP Action #15: Implement an airshed-wide public outreach and education campaign**

Staff developed an Education Program Strategy with the goal of introducing SSCAS to the public through initiatives and communication about air quality in the airshed.

**AQMP Action #16: Coordinate air quality initiatives with other organizations**

Staff and Board members reached out to communities and organizations in the airshed, including Squamish CAN (Climate Action Network), adjacent communities (West Vancouver, Gambier and Keats Islands), and First Nations (Squamish and Lil’wat). Staff represented SSCAS at the Federation of Canadian Municipalities Sustainable Communities Conference.

Several other actions in the AQMP are supported by initiatives in progress at the community level, where communities are working independently and providing updates at SSCAS meetings.

### 4.3. Other Airshed Activities in 2010

SSCAS members discuss air quality issues and events that arise in the airshed on a regular basis in order to exchange information and understand changes occurring that may impact the air quality in the region. Notable activities in the airshed in 2010 include:

- 2010 Winter Olympics were held in Vancouver and Whistler, with significant transportation impacts for the Sea-to-Sky corridor, with a significant shift to buses as the primary mode of transportation. Additional air quality monitoring was undertaken during the period and results indicated that the air quality was as good, or possibly better, than those typically observed during that time of year<sup>6</sup>.
- Changes to the bus service between Squamish and Whistler occurred due to low ridership relative to the costs. The cuts lead to reduced alternative transportation choices for residents and visitors.
- Howe Sound Pulp and Paper (HSPP) plan on updating the power boiler to burn wood more efficiently and expect it to reduce emissions, especially particulate matter.
- Howe Sound Pulp and Paper received permission from MoE to burn construction and demolition materials for a two-year period starting October 2009 due to a diminishing supply of wood fuel for the power boiler<sup>7</sup>. In 2010, HSPP applied to allow permanent use of construction and demolition materials.
- An environmental assessment was underway for the proposed McNab Valley Aggregate Project for the development of a sand and gravel aggregate mine located approximately 22km southwest of Squamish.
- Residents expressed concerns regarding operation of an asphalt plant adjacent to Whistler's Cheakamus Crossing neighbourhood.

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<sup>6</sup> VANOC Sustainability Report 2009-10; page 50

<sup>7</sup> <http://www.hspp.ca/environment/2010%20Air%20Permit%20Amendment/HSP%20-%20Variance%20Order.pdf>

## 5 Indicators and Targets

### 5.1. The Importance of Using Indicators to Monitor Progress

An indicator is a measure that reveals a condition, a trend, or an emerging issue. Its purpose is to reveal the direction the airshed is moving in. More specifically, indicators can show if the community is moving towards meeting the air quality goal or away from it. Indicators are tools that help track changes over time and are a yardstick for measuring future change relative to a baseline.

Indicators also provide an opportunity to identify and address policy gaps, shortfalls in implementation, or trends that may affect air quality. The presentation of indicators and trends helps decision makers, businesses, and residents see where changes are needed and desired.

Monitoring is a critical activity as it shows changes over time and identifies things that are working (what we should celebrate and protect) and areas where we are not making progress (where we need to direct more resources). Indicators provide feedback on how the community is doing through ongoing monitoring and feedback. Feedback in itself does not facilitate change as it merely indicates past performance. Learning from the feedback is required to allow the community to “correct its course” by modifying and adjusting its actions as it goes forward.

Three types of indicators have been developed for this airshed: context, air quality and performance measures. Context and air quality indicators are used to evaluate the progress towards or away from the air quality goals whereas the performance measures allow us to evaluate progress on plan implementation. These are described in more detail below.

“What gets measured tends to get done. If you don’t measure results, you can’t tell success from failure. If you can’t recognize success, you can’t reward it. If you can’t recognize failure, you can’t learn from it.”

David Osborne and Ted Gaebler (Reinventing Government, 1992) suggesting why indicators are important for making progress.

- Context indicators are important indicators that provide context for the other indicators, but in themselves are outside the sphere of influence of local government or other organizations.
- Air quality indicators directly measure the state of air quality in the airshed and are important for tracking trends and monitoring progress.
- Performance measures track the actions that are being implemented across the region. Performance monitoring is different from the indicators and targets outlined in the AQMP.

#### **Limitations of Indicators**

There are limitations to the use of indicators. A community or region comprises many subsystems with complex relationships and interdependencies. Indicators can only show one thing within an individual system and therefore are simplified. They do not explain the workings of a system, causality or the reasons for a particular condition or trend. Many of the indicators are too crude to capture any type of site-specific condition or qualitative condition. They also rely on “after-the-fact” information. As such, they are useful for basic information provision, but should be supplemented by observation, studies, survey research, and more detailed assessment and analysis.

## 5.2. The Air Quality Monitoring Network

There are air quality monitoring stations located in several communities in the airshed (Langdale, Gibsons, Squamish, Whistler and Pemberton) and visibility cameras installed in Lions Bay. Table 1 identifies the pollutants that are monitored at each of the stations. Additional monitoring took place for the duration of the 2010 Winter Olympics.

**Table 1. Air quality monitoring stations in the airshed**

Station location	Pollutants monitored
Langdale elementary	Hydrogen sulphide, nitrogen dioxide, sulphur dioxide, nitrogen oxide, PM <sub>10</sub> (continuous)
Gibsons	PM (non-continuous)
Squamish	Hydrogen sulphide, nitrogen dioxide, ozone, sulphur dioxide, nitrogen oxide, PM <sub>10</sub> (continuous), PM <sub>2.5</sub> (non-continuous)
Whistler	Nitrogen dioxide, ozone, nitrogen oxide, PM <sub>2.5</sub> (continuous)
Pemberton	PM <sub>2.5</sub> (non-continuous) – increased frequency to 1 day in 3 over the 2010 Winter Olympics period (November 2009 to March 2010).
Lions Bay	Two visibility cameras
Mobile monitoring lab	Mobile lab was set up at the south end of Whistler during the 2010 Winter Olympics (January to March 2010).

## 5.3. Indicators for the Sea-to-Sky AQMP

### Overview

To gauge the direction of air quality in the Sea-to-Sky/Howe Sound airshed, ten indicators were identified in the AQMP to be tracked on an ongoing basis. Two indicators provide context, by measuring population and tourism growth in communities throughout the airshed. The remaining eight indicators look at air quality conditions, by analysing data from ambient air quality monitoring stations in the airshed and other sources.

Each indicator is discussed by answering the following questions:

- What is being measured?
- Why is this indicator important?
- What is happening?

### Baseline Year

The baseline year for monitoring air quality in the Sea-to-Sky airshed is 2008; however, baseline data for greenhouse gases (AQ-3) is only available for 2007<sup>8</sup> and data for continuous improvement (AQ-8) is reported for 2005 and 2008. The baseline year for the performance measures is 2008, the first year of implementation.

<sup>8</sup> MoE, as part of the Community Energy and Emissions Inventory (CEEI) initiative, has recently begun preparing an inventory of community energy consumption and greenhouse gas (GHG) emissions for each community in BC. This initiative will provide each community in the province with standardized greenhouse gas inventories. The CEEI initiative does not include certain contributors to greenhouse gases, such as agricultural activities and, in many cases, industrial activities.

### Context Indicators

This section presents the two context indicators outlined in Table 2.

**Table 2: Context Indicators (CTX)**

	Context Indicators	Units	Rationale	Targets
1	<b>Resident Population:</b> (a) Total population of airshed by community (b) % total population growth change	# of people, % change	Measure of population growth	Not applicable
2	<b>Visitor Population:</b> (a) Total visitor population of airshed by community (b) % visitor population growth	# of people, % change	Measure of tourism growth	Not applicable

#### CTX-1: Resident-Population

##### What is being measured?

There are two components to this context indicator:

- a) The number of people residing in each community, according to B.C. Stats population estimates. These estimates are derived from Statistics Canada Census data and are updated annually.
- b) The percentage change in population in the entire airshed over time.

##### Why is this indicator important?

A significant proportion of air quality and greenhouse gas emissions in the Sea-to-Sky airshed can be attributed to transportation and space heating. Both of these are directly dependent on the size of the resident population. As the population continues to grow, there will be increased demand for transportation and space heating.

##### What is happening?

The population of the airshed has increased approximately 12% between 2005 and 2010. There was a 2.4% increase in population between 2009 and 2010, with the majority of growth occurring in Whistler and Squamish, as shown in Figure 4. Squamish-Lillooet experienced the second highest annual growth of all regional districts in BC (2.8%).

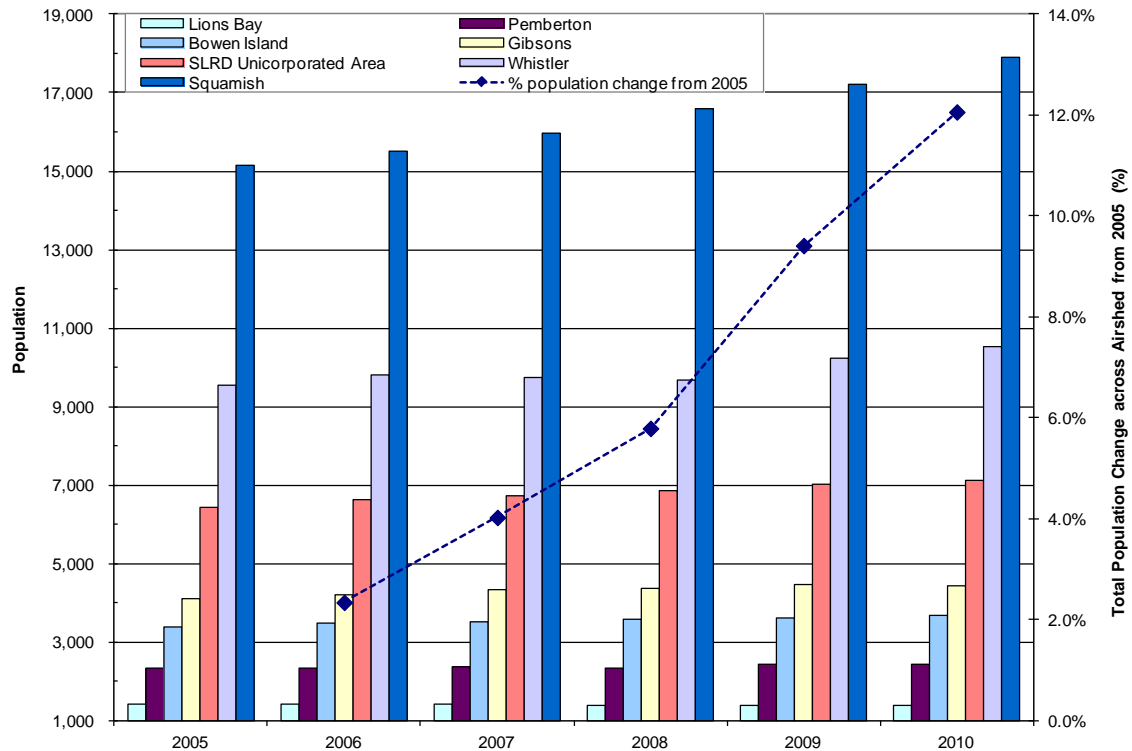


Figure 4: Population by Community and Total Population Change in the Airshed (2005 to 2010)

## CTX-2: Visitor Population

### What is being measured?

There are two components to this context indicator:

- The visitor population by community is reported using visitor counts from Tourism BC visitor centres. These visitor counts are tracked and reported annually. There are visitor centres located in Bowen Island, Gibsons, Pemberton, Squamish and Whistler.
- The percent change in visitor population over time is also reported. Although visitor centre data does not provide a full estimate for the number of visitors in the airshed, looking at the change in numbers of visitors over time may provide insight into the changing pressure due to tourism. These counts can provide a very general guideline only, as there are several factors that may influence the counts beyond the number of tourists visiting the area.

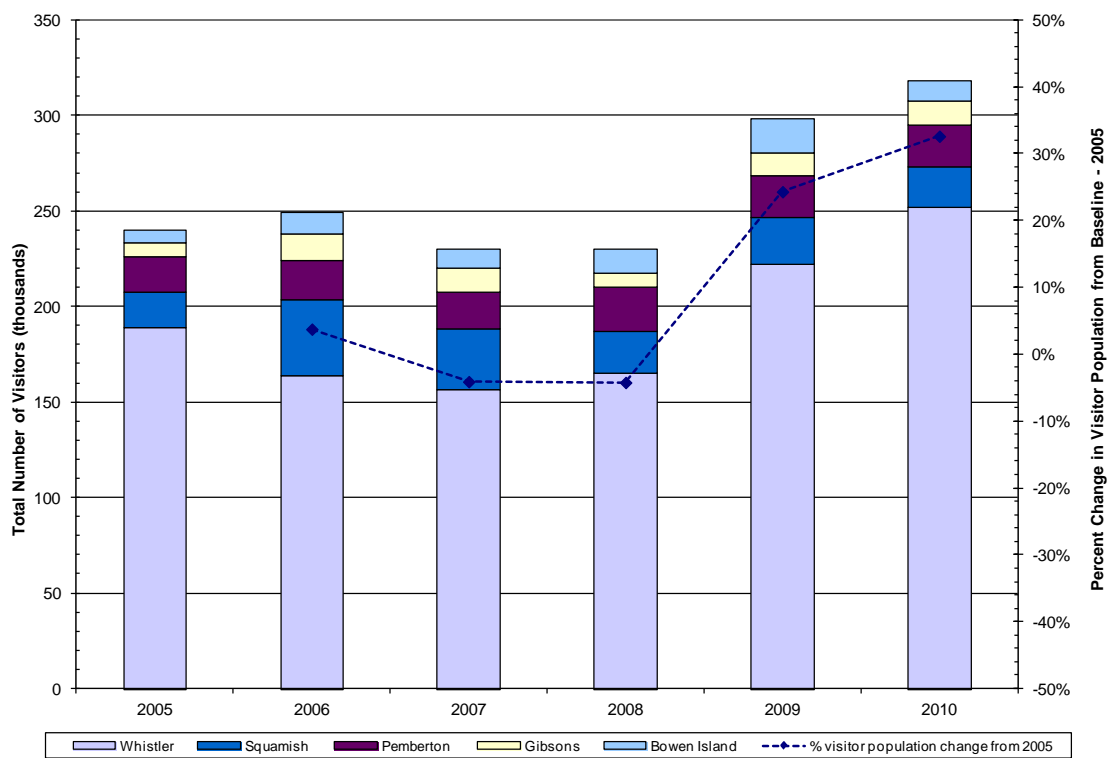
### Why is this indicator important?

Tourism is a vital part of the economy in the airshed, and the level of tourism has a strong impact on energy demand in the airshed – both with respect to transportation and space heating for accommodations. Tracking visitor population in addition to resident population will provide a more complete picture of the demand for energy in the airshed, and the potential additional pressure placed on the region's air quality.

**What is happening?**

Visitor centre records indicate an overall increase of 7% in visitor population during 2010 compared to 2009. The levels of visitor population varied between communities, with increases observed in Whistler (13%) and Gibsons (8%). Bowen Island, Pemberton, and Squamish experienced a decrease in visitors. The overall increase in tourism may in part be due to the 2010 Winter Olympic Games. Since 2005, there has been a 33% increase in visits in the airshed<sup>9</sup>, which could have a negative impact on local air quality during peak travel times, particularly when the primary mode of travel is personal vehicles.

Due to the large volume of visitors going to Whistler for the 2010 Winter Olympics, additional air quality monitoring took place before, during and after the event. Transportation occurred primarily by bus during this time period. Monitoring results indicated that the air quality was as good, or possibly better, than those typically observed during that time of year.



**Figure 5: Number of Visitors (thousands) and Percent Change from 2005**

<sup>9</sup> BC Stats regional data was also examined for this indicator. The hotel room revenue recorded in 2010 shows an increase of 18% in room revenues relative to 2005 for the Sunshine Coast Regional District and the Squamish Lillooet Regional District combined.

### Air Quality Indicators and Targets

This section presents the eight air quality indicators outlined in Table 3. At this time, two indicators are not reported: economic impacts of air quality in this airshed (AQ-2) and visibility (AQ-4). There is currently no method available for quantifying these; ideally these indicators will be reported in the future. During the 5-year review of the AQMP implementation, SSCAS should review these indicators for data availability and applicability to support the most effective monitoring over the long-term.

**Table 3: Air Quality Indicators (AQ)**

	Air Quality Indicators	Units	Rationale	Targets
1	<p><b>Health Reference Levels (HRL)</b> Number of 24-hour periods per year in which the Health Reference Level<sup>10</sup> for:</p> <p>(a) PM<sub>10</sub> is greater than 25 µg/m<sup>3</sup> (b) PM<sub>2.5</sub> is greater than 15 µg/m<sup>3</sup></p>	# of 24-hour periods	Indication of health risk	Annual reduction in the number of 24-hour periods exceeding the HRL
2	<p><b>Economic Impacts</b> (an ideal indicator to be measured in the future)<sup>11</sup> Economic cost of air quality impacts (health &amp; business) per capita</p>	Cost (\$); \$/capita	Influence of air quality on economic health of the region	Reduction in costs
3	<p><b>Greenhouse Gases</b> (a) Total GHG emissions by sector/source, and (b) Per capita GHG emissions, by municipality</p>	Tonnes, and tonnes per person	Indicator of regional energy efficiency and contribution to global climate change	Decreasing trend from baseline year (2007)
4	<p><b>Visibility</b><sup>12</sup> Number of poor or compromised visibility events per year</p>	# of poor visibility days	Visual measure of compromised air quality which can effect tourism, recreational activities (site-seeing) and public perception	Zero poor visibility events in a year
5	<p><b>Odour</b> (a) Number of odour complaints per year by municipality, and (b) Number of hours per year where Odour Index is above 25</p>	#	B.C. Odour Index is an indicator of sulphurous odours (mainly a result of pulp mill operations). Odour complaints may give an indication of municipal type odours (wastewater treatment, composting operations, municipal solid waste treatment).	(a) Zero odour complaints per year (b) Zero exceedances of B.C. Odour Index level of 25

<sup>10</sup> The HRL is the level of pollutant at which there is a demonstrated statistical effect on health. MoE guidelines are based on rolling 24-hour averages.

<sup>11</sup> The calculation of this indicator is challenging, as it requires labour intensive full cost accounting methods.

<sup>12</sup> Method to assess visibility as related to air quality is still under development.



	Air Quality Indicators	Units	Rationale	Targets
6	<p><b>Canada-wide Standards (CWS)</b></p> <p>Number of occurrences of:</p> <p>(a) PM<sub>2.5</sub> exceeding the CWS exposure limit (30 µg/m<sup>3</sup>),</p> <p>or</p> <p>(b) Ground-level ozone (O<sub>3</sub>) exceeding the CWS exposure limit (65 parts per billion)</p>	3-year average in µg/m <sup>3</sup> or ppb	All communities in Canada must aim to meet CWS by 2010, and those already below CWS levels must demonstrate commitment to continuous improvement and keeping clean areas clean. This indicator allows for national comparison of PM <sub>2.5</sub> and ground-level ozone levels.	Zero exceedances of standard
7	<p><b>Air Quality Index (AQI)</b><sup>13</sup></p> <p>Number of hours per year in a community when the AQI is greater than 50.</p>	hours	An AQI of 50 is equivalent to the National "maximum acceptable" level for all Common Air Contaminants (CACs). An air quality advisory is issued whenever the AQI>50. AQI is useful in analysing short-term air quality episodes.	Zero hours per year
8	<p><b>Continuous Improvement</b><sup>14</sup></p> <p>Trends for 3-year annual average of</p> <p>(a) 8-hour maximum daily level for O<sub>3</sub></p> <p>(b) Annual 24-hour average level for PM<sub>10</sub></p> <p>(c) Annual 24-hour average level for PM<sub>2.5</sub></p> <p>(d) 8-hour maximum daily level for NO<sub>2</sub></p>	3-year average in µg/m <sup>3</sup>	Long term average which has a smoothing effect on short-term air quality episodes. Useful in determining the long term trends of air quality in the region.	Decreasing trend from baseline year (2005)

<sup>13</sup> The AQI is a dimensionless index in which air contaminant concentrations are used to define the level of air quality. The AQI scale range is: Good: 0-25; Fair: 26-50; Poor: 51-100; and Very Poor: >100. The Air Quality Health Index (AQHI) may replace the AQI. The AQHI is a new index that correlates ambient air quality with health effects. The AQHI is based on a combination of factors. The older AQI from any given station is based on the value of the single highest air contaminant at that particular station. The AQHI has been implemented at one station in the airshed (Whistler) but the AQI also remains in place at Whistler, Squamish and Langdale.

<sup>14</sup> This measurement is currently recommended in the CWS Guidance Document on Continuous Improvement (CI) and Keeping Clean Areas Clean (KCAC). SO<sub>2</sub> is not included in the continuous improvement metrics since current levels of this pollutant in the Sea-to-Sky Airshed have decreased and are now extremely low. Levels are expected to continue to decrease and it is unlikely that in the future there will be any significant new sources of SO<sub>2</sub> in the airshed. CWS is not an exposure limit; it is a standard. There are still health effects below the CWS levels.

**Health Reference Levels (HRL): AQ-1****Target**

Annual reduction in the number of 24-hour periods exceeding the HRL.

**Trend**

Several years of data collection are required to infer the direction of a trend. This is the third year data is being reported, which is too soon to identify a trend. Future reports will be able to indicate the trend over time. Relative to the previous two years, PM<sub>2.5</sub> and PM<sub>10</sub> concentrations triggered less exceedances in 2010.

**What is being measured?**

Particulate matter with an aerodynamic diameter of 2.5 micrometres or smaller (called PM<sub>2.5</sub>) and particulate matter with an aerodynamic diameter of 10 micrometres or smaller (called PM<sub>10</sub>) are measured at various monitoring stations in the Sea-to-Sky/Howe Sound airshed.

This indicator measures exceedance of the Health References Levels (HRL) for PM<sub>2.5</sub> and PM<sub>10</sub> as recommended in the National Ambient Air Quality Objectives for Particulate Matter (1998).

The HRLs that trigger an exceedance are:

- a) PM<sub>10</sub> concentration greater than 25 µg/ m<sup>3</sup>
- b) PM<sub>2.5</sub> concentration greater than 15 µg/ m<sup>3</sup>

Air quality monitoring stations in the Sea-to-Sky sky/Howe Sound airshed use two different methods to monitor HRLs: 1) using a rolling 24 hour average, and; 2) using a midnight-to-midnight 24 hour or “daily” average. Although “rolling” averages are capable of capturing additional exceedances that are not captured in “daily” averages, certain locations only have non-continuous samplers, and therefore are only included in the “daily” totals. Although MoE guidelines are based on rolling averages (1-hour intervals), both methods are reported here in an effort to represent HRLs across the airshed.

**Why is this indicator important?**

Particulate matter (PM) is the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. It contributes to poor air quality which can negatively affect human health. The Canada-wide Standard is often used to assess air quality (see AQ-6) and ensure all communities in Canada meet a minimum standard of air quality. However, current research shows that there is no safe level (threshold level, below which there are no effects) for particulate matter.<sup>15</sup> Therefore, this indicator tracks the number of days that air quality exceeds an established reference level that is lower than the national standard.

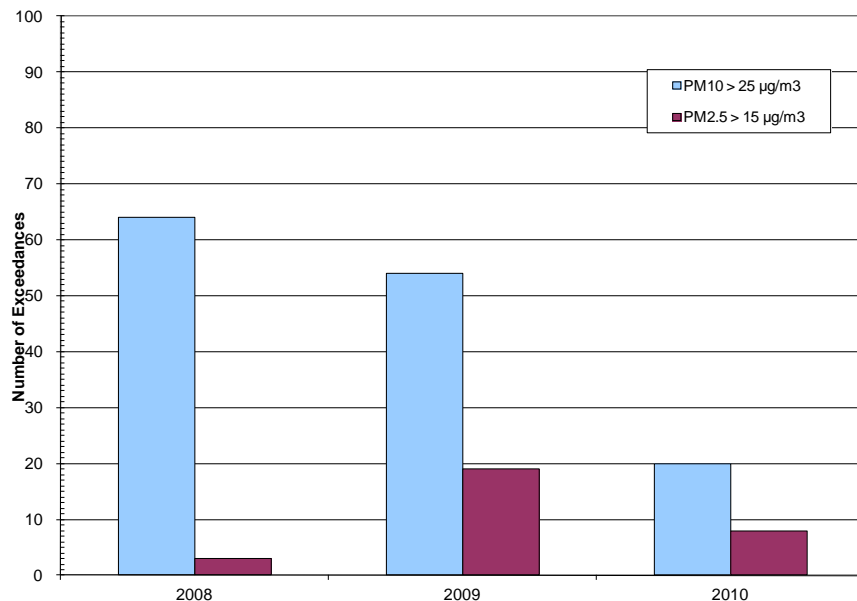
**What is happening?**

Based on a rolling 24-hour average from continuous monitoring, there were (shown in Figure 6):

- a) 20 days on which the HRL for PM<sub>10</sub> was exceeded in 2010, 34 days less than in 2009
- b) 8 days on which the HRL for PM<sub>2.5</sub> was exceeded in 2010, 11 days less than in 2009

<sup>15</sup> Environment Canada, Clean Air Online, Pacific and Yukon Region. [www.ec.gc.ca/cleanair-airpur/Clean\\_Air\\_Picture-WSE59D691A-1\\_En.htm](http://www.ec.gc.ca/cleanair-airpur/Clean_Air_Picture-WSE59D691A-1_En.htm)

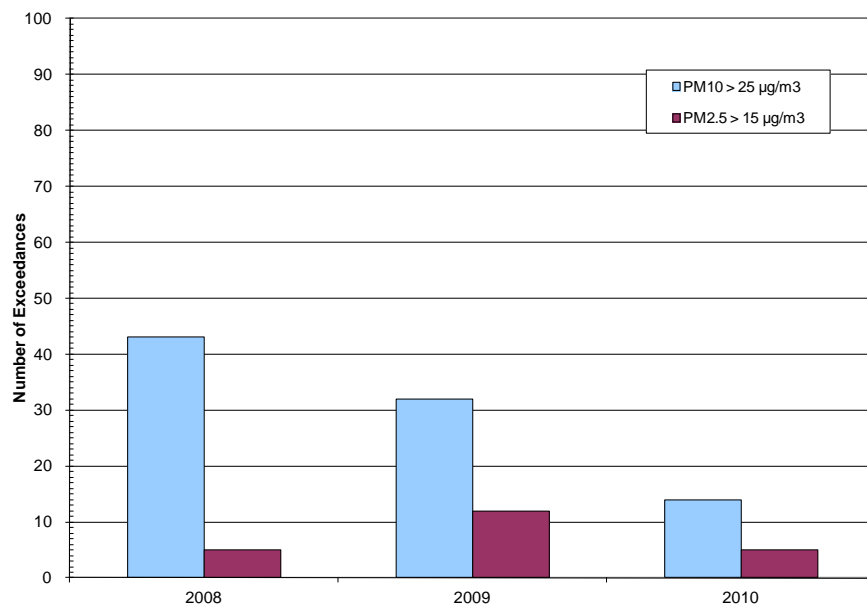
There were less forest fires in 2010, contributing to a decrease in PM<sub>2.5</sub> HRL exceedances.



**Figure 6: Number of 24-hour periods per year in which the HRL are exceeded over a rolling 24-hour average**  
*Note: includes only continuous monitor results*

Using a midnight-to-midnight 24-hour or “daily” average, considering all PM monitoring in the airshed, there were (shown in Figure 7):

- (a) 14 exceedances of the PM<sub>10</sub> HRL in 2010, a decrease of 16 from 2009
- (b) 5 exceedances of the PM<sub>2.5</sub> HRL in 2010, a decrease of 7 from 2009



**Figure 7: Number of 24-hour periods per year in which the HRL are exceeded over a “daily” average**  
*Note: includes results from continuous and non-continuous monitors*

**Economic Impact: AQ-2****Target**

Reduction in economic impacts (costs) from baseline year.

**What is being measured?**

This indicator is not currently measured for the airshed. To report this indicator, a methodology needs to be developed to associate air quality levels with costs for the Sea-to-Sky/ Howe Sound airshed. The BC Visibility Coordinating Committee ([www.clearairbc.ca](http://www.clearairbc.ca)) will be conducting an economic benefit assessment of improving visibility in the Lower Fraser Valley as a pilot project in 2012. Results from this assessment may be useful to the Sea-to-Sky airshed/Howe Sound as well.

Previously, studies for the Lower Fraser Valley airshed have measured cost impacts for health care, tourism revenue loss and crop damage associated with poor air quality in BC. Results of these studies include:

- Estimated health care savings of \$195 million annually with a 10% improvement in ozone and PM<sub>2.5</sub> in the Lower Fraser Valley (*Health and Air Quality 2005. Phase 2: Valuation of Health Impacts from Air Quality in the Lower Fraser Valley Airshed*, RWDI).
- Estimated loss of \$9 million in future tourist revenue for a single extremely poor visibility event in the Lower Fraser Valley (*The Impact of Visual Air Quality on Tourism Revenues in Greater Vancouver and the Lower Fraser Valley*, R. McNeill and A. Roberge).
- Estimated loss due to crop / vegetation damage due to poor air quality (*Clean Air Benefits and Costs in the GVRD* by Bovar-Concord and *Review of Costs and Benefits of the Greater Vancouver Regional District (GVRD) Air Quality Management Plan: The Assessment of Injury to Vegetation (Crops and Forests)* by Vic Runeckles).

**Why is this indicator important?**

Poor air quality may have economic impacts, such as reduced work attendance and participation in the labour force; an increase in health care costs; decreases in tourism, and; potential impacts on the forest and agricultural industries due to reduced growth rates.

**Status**

This indicator will not be reported for 2010, as a methodology has not yet been developed to quantify the cost impacts associated with measured air pollutant levels in the airshed.

**Greenhouse Gases (GHGs): AQ-3****Target**

Decreasing trend from baseline year (2007).

**Trend**

Data is currently only available for the baseline year (2007). The data is expected to be reported by the Province for 2010, then every second year after that. At the time of writing this report, the 2010 data is not available. The trend will be discussed in future reports when more data is available.

**What is being measured?**

The primary sources of greenhouse gas emissions are from burning fossil fuels for transportation, heating, cooling and using power in our buildings, and from the solid waste that is disposed into our landfills. This indicator measures greenhouse gas emissions from each of these sources for the airshed as well as total per capita greenhouse emissions for each municipality in the airshed.

The greenhouse gas emissions indicator was calculated using data from the MoE's 2007 Community Energy and Emissions Inventory (CEEI). This is the baseline year for this data, and the data reported are based on the revised methodology and data released in September 2010<sup>16</sup>. The Province is currently in the process of developing the 2010 inventory reports for every community in BC, however, these were not released at the time of writing this report. These are expected to be included in the 2011 annual report.

**Why is this indicator important?**

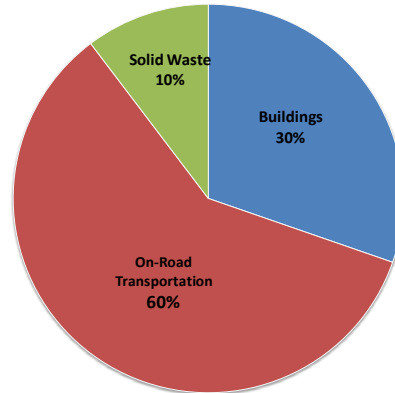
The United Nations Intergovernmental Panel on Climate Change (IPCC) report in November 2007 draws three key conclusions: that the Earth's climate is changing, that the change is being caused by human activities, and that its effects will worsen if no action is taken. The use of natural gas, gasoline, diesel and other fuels along with landfill gas emissions result in greenhouse gases being emitted to the atmosphere. Monitoring GHG emissions provides a measure of regional energy efficiency and contributions to global climate change. These measures can help us assess our efforts to reduce our emissions by monitoring our greenhouse gas emissions.

**What is happening?**

In 2007, approximately 316,000 tonnes of GHGs were emitted from community-based activities in the airshed. Estimated on-road transportation emissions were the largest contributors to greenhouse gas emissions in the airshed (60% of the emissions). Emissions from energy used in buildings accounted for 30% and emissions from solid waste decomposition accounted for 10%. This is illustrated in Figure 8. Note that GHG emissions from large industrial facilities are not included in the community inventories prepared by MoE.

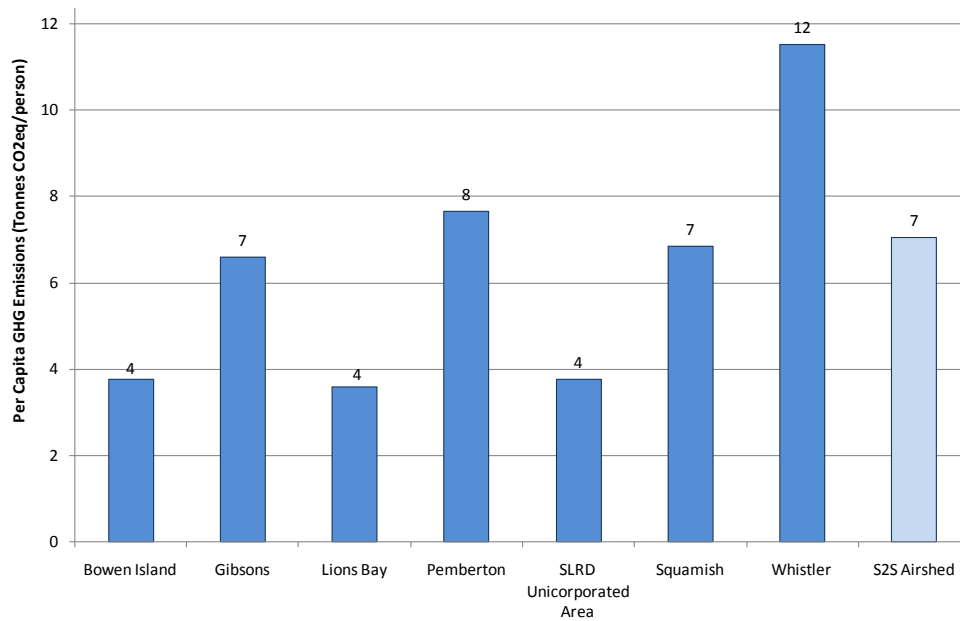
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<sup>16</sup> For details about the CEEI methodology, refer to the "Technical Methods and Guidance Document for 2007 CEEI Reports" at [http://www.env.gov.bc.ca/cas/mitigation/ceei/CEEI\\_TechMethods\\_Guidance\\_final.pdf](http://www.env.gov.bc.ca/cas/mitigation/ceei/CEEI_TechMethods_Guidance_final.pdf).



**Figure 8: Greenhouse Gas Emissions, by sector (2007)**

GHG emissions on a per capita basis are shown in Figure 9. Per capita GHG emissions were higher in Whistler than in other municipalities within the airshed. In Whistler, per capita emissions were almost 12 tonnes of CO<sub>2</sub>eq per person. Building emissions account for the majority of Whistler’s emissions (48%). Bowen Island, Lions Bay and the unincorporated areas of the SLRD have the lowest GHG emissions, all emitting approximately 4 tonnes of CO<sub>2</sub>eq per person<sup>17</sup>. On-road transportation emissions are the largest source of emissions for each of these areas. Per capita emissions for the entire airshed are 7 tonnes of CO<sub>2</sub>eq per person.



**Figure 9: Greenhouse Gas Emissions per Capita in 2007, by municipality**

<sup>17</sup> The lower GHG emissions in these communities may be related to a higher use of wood-fired heating. Although wood-fired heating is considered GHG neutral, other emissions are released (e.g. Fine Particulate Matter) that have a negative impact local air quality.

**Visibility: AQ-4**

**Target**

Zero poor visibility events in a year.

**Why is this indicator important?**

Poor visibility events can impact tourism, recreational activities and public perception.

**Status**

This indicator will not be reported for 2010 as it is not currently evaluated. However, a visibility camera is installed in Lions Bay to record the quality of visibility on an hourly basis. Figure 10 and Figure 11 show photos taken in 2009 that represent good and poor visibility days taken from the Lions Bay camera.



**Figure 10: Lions Bay photo showing high visibility (July 18, 2009, 3:30pm)**  
Source: Environment Canada



**Figure 11: Lions Bay photo showing low visibility (June 6, 2009, 8:50am)**  
Source: Environment Canada

**Odour: AQ-5**

**Target**

- (a) Zero odour complaints per year.
- (b) Zero exceedances of B.C. Odour Index level of 25.

**Trend**

This is the third year data is being reported, an insufficient number of data points to infer a trend. Future reports will be able to indicate the trend over time.

**What is being measured?**

This air quality indicator has two components:

- a) The number of odour complaints, as reported by i) Howe Sound Pulp and Paper, and ii) the B.C. Ministry of Environment. Note: MoE did not track the number of odour complaints in 2010, but has implemented a new tracking system that will provide complaint information for 2011.
- b) Number of hours per year where Odour Index is above 25. This index is developed by the Ministry of Environment and is based on ambient monitoring station measurements of sulphurous odours.

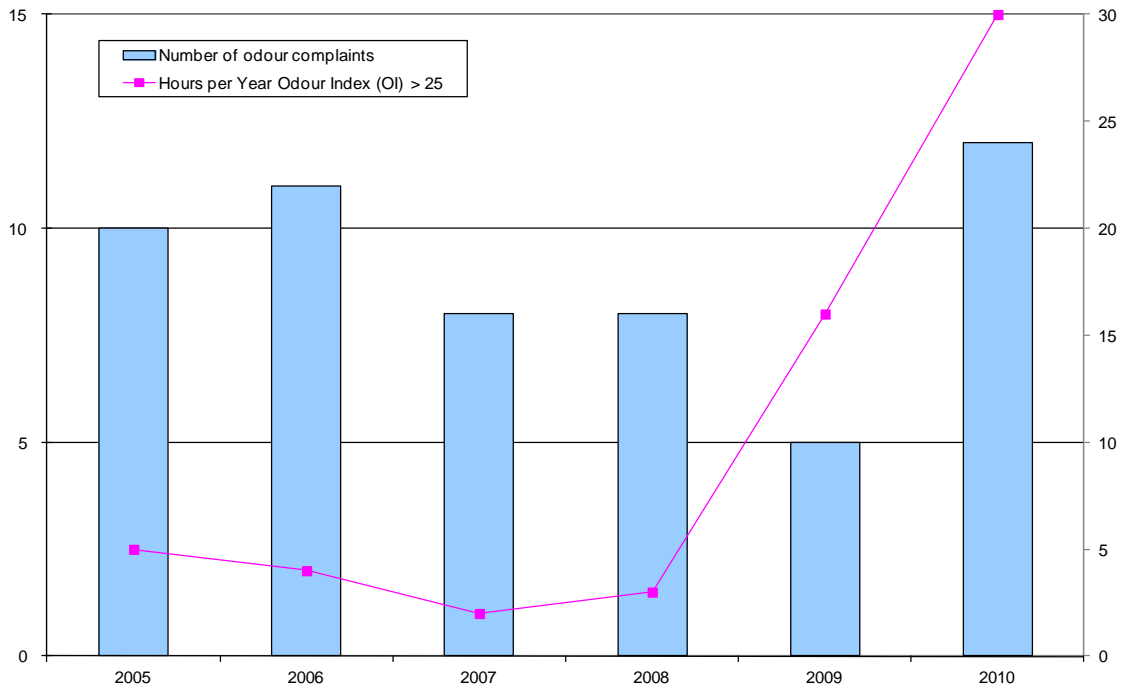
**Why is this indicator important?**

Clean, fresh-smelling air is a vital component of the fresh-air experience boasted by the Sea-to-Sky/Howe Sound airshed for both its residents and visitors.

**What is happening?**

- a) Howe Sound Pulp and Paper reported receiving 12 odour complaints in 2010, which is an increase from the five complaints received in 2009. Due to the discontinuation of the old complaint tracking system in 2010 and delays in implementation of a new system, accurate data on the number of odour complaints for 2010 is unavailable. However, anecdotal information indicates that odour complaints were received from the Langdale/Gibsons area related to emissions from the local pulp mill and the Cheakamus Crossing area in Whistler related to an asphalt plant.
- b) The Odour Index was exceeded for 30 hours in 2010, all at the Langdale station. This is an increase from 16 hours in 2009 and 3 hours in 2008.





**Figure 12. Odour complaints and number of hours Odour Index was >25**

**Canada-wide Standards (CWS): AQ-6****Target**

Zero exceedances of standards for PM<sub>2.5</sub> and ground level ozone.

**Trend**

This is the third year this indicator is being reported. Future reports will be able to indicate the trend over time. Neither PM<sub>2.5</sub> or O<sub>3</sub> are on a trend toward exceeding the CWS at this time.

**What is being measured?**

This indicator measures exceedances of the Canada-wide Standard (CWS) for either particulate matter with a diameter of 2.5 micrometres or smaller (PM<sub>2.5</sub>) or ground-level ozone (O<sub>3</sub>). The CWS provides a national standard that all communities must strive to achieve. If the CWS is exceeded, communities must make concerted efforts to reduce emissions. According to the CWS:

- a) PM<sub>2.5</sub> must not exceed 30µg/m<sup>3</sup> in a 24-hour period; on the annual 98<sup>th</sup> percentile value, averaged over 3 consecutive years.
- b) O<sub>3</sub> must not exceed 65ppb based on 8-hour moving averages; on the 4<sup>th</sup> highest annual ambient measurement, averaged over 3 consecutive years.

Data for this indicator was available from two monitoring stations:

- PM<sub>2.5</sub> is measured at a monitoring station in Whistler, and
- O<sub>3</sub> (ground-level ozone) is measured at monitoring stations in Whistler and Squamish.

**Why is this indicator important?**

Air pollution has been shown to have detrimental effects on human health – particularly to at-risk persons such as those with respiratory and cardiovascular ailments, children and the elderly. The Canada Wide Standard has set thresholds for particulate matter and ground-level ozone because they are the pollutants of most concern from a human health perspective:

- Particulate matter can impair respiratory function. Natural processes contribute to increases in particulate matter (e.g., forest fires, volcanic ash and dust storms), but a particular concern arises from combustion-based particulate which is composed of extremely small particles that can travel deep into the lungs.
- Ground-level ozone (i.e. smog) can cause decreased lung function and inflammation in the lungs. Some at risk people may experience difficulty breathing. Smog is formed when NO<sub>x</sub> and VOCs react in the atmosphere in the presence of sunlight. Concentrations are typically higher in the summer.

Monitoring long-term ambient air quality levels, especially ground-level ozone and particulate matter concentrations, helps to evaluate the overall exposure of the population to contaminants.

**What is happening?**

- a) PM<sub>2.5</sub> – No exceedances. The 2-year average for 2010 at the Whistler station was 14.7 µg/m<sup>3</sup>, a decrease of 13% from the 3-year average calculated for 2009 as shown in Figure 13.

- b) Ground-level ozone – No exceedances. The 3-year averages for 2010 were 50.3 ppb at the Squamish station and 54.3 ppb at the Whistler station, very similar to 2008 and 2009 levels as shown in Figure 14.

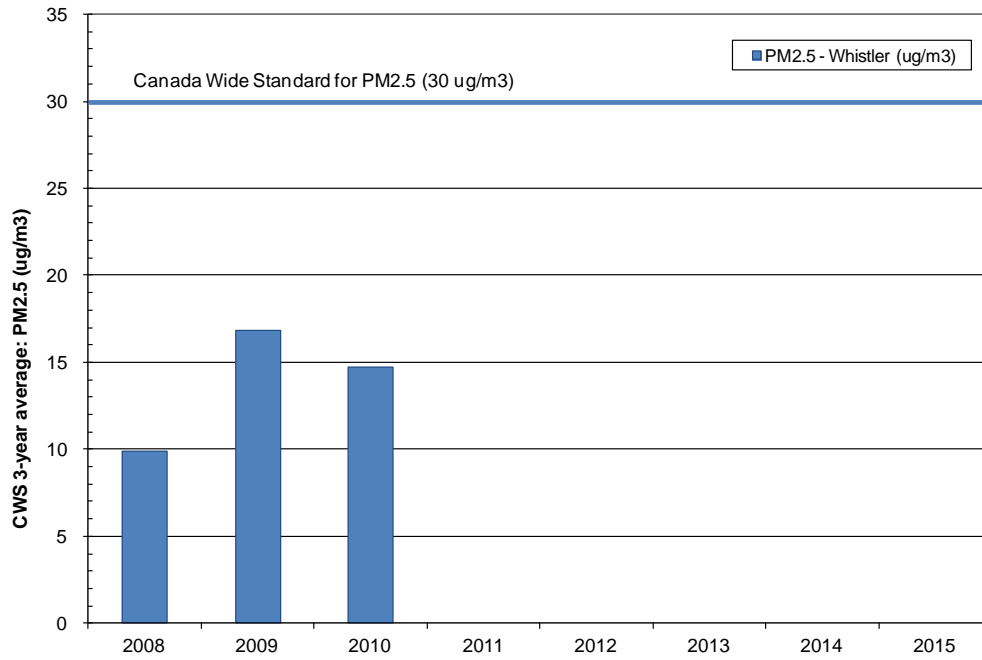


Figure 13: PM2.5 levels from Canada Wide Standard (CWS) calculations

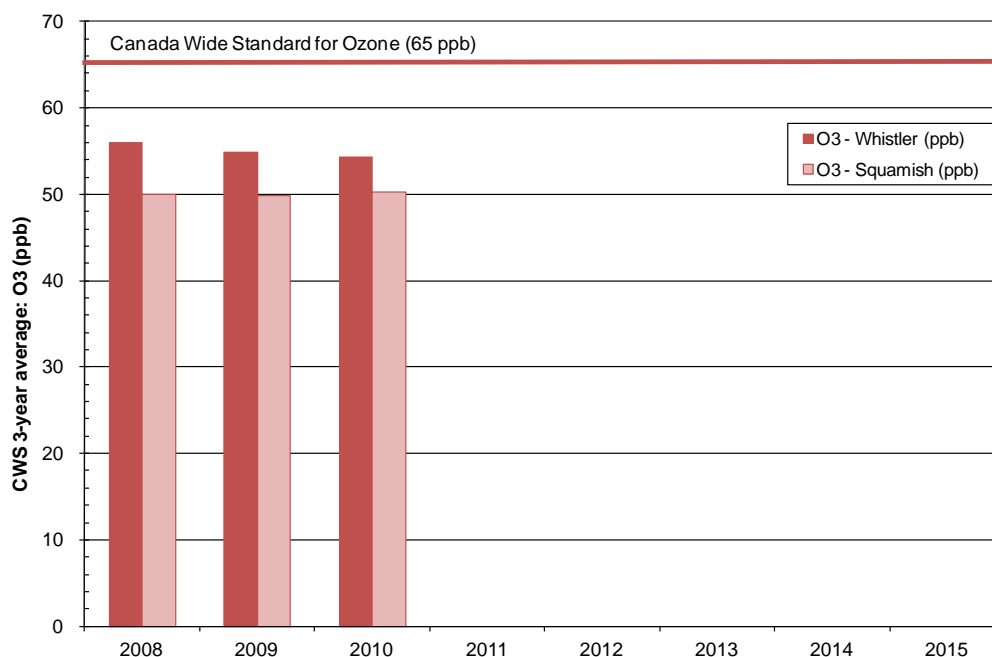


Figure 14: O3 levels from Canada Wide Standard (CWS) calculations

#### Air Quality Index (AQI): AQ-7

##### Target

Zero hours per year during which the AQI exceeds 50.

##### Trend

Trends emerge after several years of data collection. This is the third year data is being reported; therefore it is too early to infer a trend. Future reports will be able to indicate the trend over time.

##### What is being measured?

The AQI describes the measured air quality in a manner that is simple for presentation to the public.<sup>18</sup> The AQI values are sorted into 4 categories, Good, Fair, Poor and Very Poor, where:

- 0 to 25 is GOOD,
- 26 to 50 is FAIR,
- 51 to 100 is POOR, and
- 100+ is VERY POOR.

The AQI reaches 50 when the concentration of at least one air contaminant exceeds its ambient objective. There are objectives for particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), ground-level ozone,

<sup>18</sup> The Ministry of Environment has recently started using a new air quality measure called the Air Quality Health Index. The Air Quality Health Index (AQHI) is a public information tool developed by Health Canada and Environment Canada, in collaboration with the provinces and key health and environment stakeholders. The AQHI is not being reported in this report because Whistler is currently the only location with AQHI reporting in the Sea-to-Sky/Howe Sound airshed.

nitrogen dioxide and sulphur dioxide. An air quality advisory is issued when the AQI exceeds 50. This indicator measures the number of hours per year in a community where the AQI is greater than 50.

#### Why is this indicator important?

The main purpose of the AQI is to inform the public, on a daily basis, about the current state of air quality. It enables the public to draw comparisons between the measured air quality and what they directly sense. At risk people and other concerned residents can use this information to modify their behaviour as necessary. For example, in a situation where the AQI is high (above 50) those with respiratory problems may choose to refrain from strenuous exercise or temporarily avoid the polluted region. The AQI is useful in analysing short-term air quality episodes.

#### What is happening?

In 2010, the AQI exceeded 50 (a rating of POOR) for 0 hours at the monitoring station in Langdale, 51 hours at the monitoring station in Squamish (due to high PM<sub>10</sub>), and for 68 hours in Whistler (due to high PM<sub>2.5</sub>). For comparison, in 2008 there were no occasions on which the AQI was POOR at any of the stations.

One air quality advisory was issued in the airshed in 2010 on August 4<sup>th</sup> due to smoke from wildfires (particulate matter). The advisory was cancelled on August 7<sup>th</sup>.

### Continuous Improvement: AQ-8

#### Target

Decreasing trend from baseline year (2005).

#### Trend

Trends emerge after several years of data collection. It is currently too early to infer a definitive trend. Future reports will be able to indicate the trend over time. Generally the parameters are relatively stable, with a slight increase noticeable in PM<sub>2.5</sub>.

#### What is being measured?

Continuous Improvement measures the continual incremental reductions in both the higher and the everyday concentrations of ground-level ozone, PM<sub>2.5</sub>, PM<sub>10</sub> and NO<sub>2</sub> over the long term. The continuous improvement indicator measures the 3-year annual average (in µg/ m<sup>3</sup>) of four different air contaminants:

- 1) 8-hour maximum daily level for O<sub>3</sub>
- 2) Annual 24-hour average level for PM<sub>10</sub>
- 3) Annual 24-hour average level for PM<sub>2.5</sub>
- 4) 8-hour maximum daily level for NO<sub>2</sub>

There are three monitoring stations in the airshed that collect the air quality data, however each station does not measure all the contaminants:

- O<sub>3</sub> is measured at the Squamish and Whistler monitoring stations,

- PM<sub>10</sub> is measured at the Squamish and Langdale stations,
- PM<sub>2.5</sub> is measured at the Whistler station, and
- NO<sub>2</sub> is measured at all three stations.

The 3-year annual average uses the baseline year of 2005 to calculate the continuous improvement of the above air contaminants, however, not all parameters were available at each station for 2005. Where a 3-year average could not be calculated for 2005, the first year for which a 3-year value could be calculated is shown.<sup>19</sup>

#### Why is this indicator important?

Most measures used for air quality describe whether pollutant levels are high over short periods of time. These measures are important because high pollution levels over short periods of time, even less than a day, can result in adverse health effects. It is also important to track long term trends of air quality in the region since long term exposure may also affect health. Long term trends are also important to determine how effectively air quality is being managed in the airshed, and can provide direction for future AQMP activities.

#### What is happening?

There are now four data points available for each contaminant. A trend is emerging (see Figure 15), however, it is still too early to observe a clear trend. An increase of PM<sub>2.5</sub> was measured at the Whistler station (a 40% increase relative to 2006). Wildfires may be a significant contributor to the changing levels of PM<sub>2.5</sub> in the Whistler area.

Decreases have been measured in other contaminants relative to the 2005 / 2006 base years (e.g. ozone in Squamish decreased 11% relative to 2005; and PM<sub>10</sub> in Squamish decreased 6% relative to 2005). Some contaminants have shown little change (e.g. ozone in Whistler and PM<sub>10</sub> in Langdale). Note that two sets of data (Langdale NO<sub>2</sub> and Squamish NO<sub>2</sub>) did not meet the annual validity requirements, so two-year averages are used for these parameters in 2010.

Longer-term data is required to identify clear trends in each measured contaminant.

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<sup>19</sup> Using the CWS calculation methodology, a 2-year average is permitted when 3 years of valid data is not available. It is noted when this alternative average has been used.

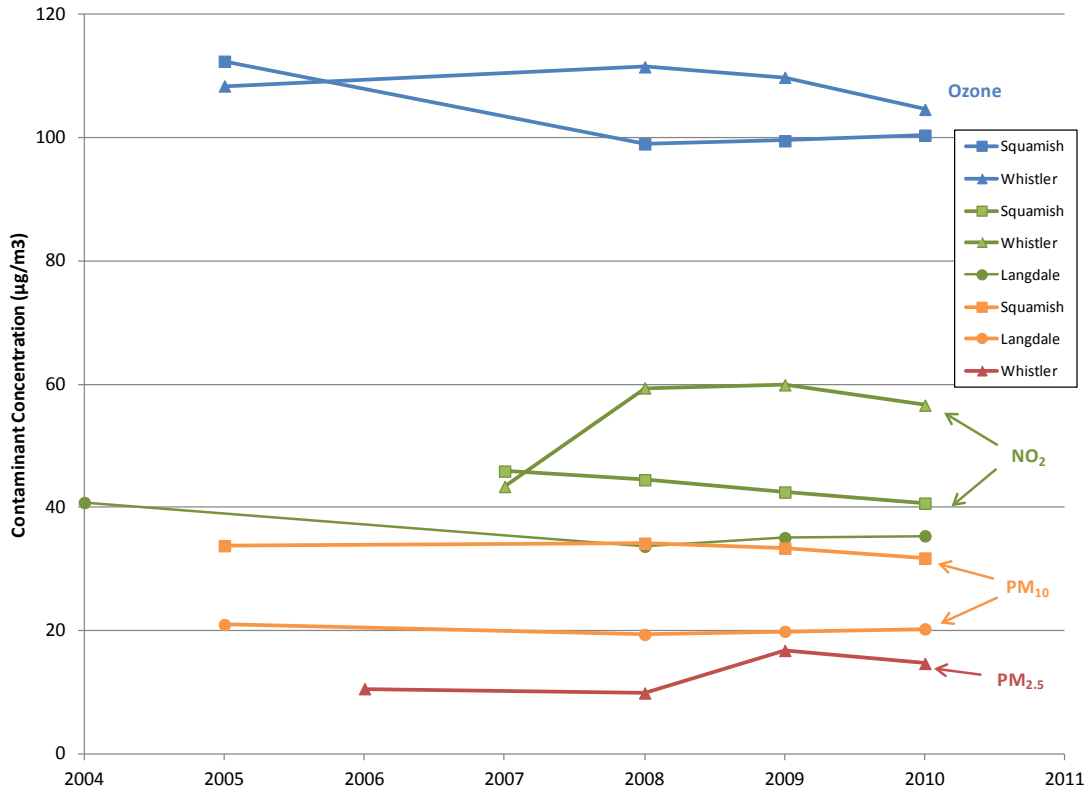


Figure 15: Continuous Improvement trends for 3-year average concentrations of Ground-level ozone, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>

#### 5.4. Performance Measures

As part of the monitoring and reporting process, four performance measures have been developed to enable the tracking of actions that are being implemented across the region.

Performance monitoring is different from the indicators and targets outlined in the AQMP. The indicators in the AQMP will be used to evaluate the progress towards or away from the air quality goals, whereas the performance measures allow us to evaluate progress on plan implementation.

**Table 4: Performance Measures (PFM)**

	Performance Measure	Units	Rationale	Targets
1	Plan Progress Number of actions completed	# of actions; percent complete	Indicator of plan progress to date	Not applicable
2	Plan Progress Number of actions in progress	# of actions	Indicator of progression of plan	5 per year
3	Meeting Involvement Percentage of funding members participating in meetings (average of yearly meetings)	%	Indicator of level of engagement among funding SSCAS members	80%
4	Website Usage Number of website visitors annually	Number of visits; annual percent increase	Measure of website use and usefulness of information	5% annual increase in visitors

#### Plan Progress – Number of actions completed: PFM-1

##### What is being measured?

This indicator tracks the total number of actions from the AQMP that are considered complete for the airshed as a whole.

##### Why is this measure important?

Tracking the completed actions provides an indication of progress in implementing the AQMP. There is no target for this indicator.

##### What is happening?

Implementation of the AQMP started in 2008 and several actions were initiated (see indicator PFM-2) during the first four years. Due to the ongoing nature of several of these actions, no actions are considered complete for the airshed as a whole as of 2010.



**Plan Progress – Number of actions in progress: PFM-2****Target**

Five actions in progress per year.

**What is being measured?**

This performance measure reports on the number of actions that are in progress. Actions that are in progress typically have a clear champion leading them at the airshed or regional scale, and have been identified by SSCAS as a priority to implement.

**Why is this measure important?**

This measure identifies how many AQMP actions are being undertaken. This will help SSCAS determine whether the approach to implementation and structure of the organization is effective in carrying out the identified actions.

**What is happening?**

In conjunction with re-structuring into a non-profit organization in 2010, the Society's Executive Director and Board of Directors undertook a review of the AQMP actions in October 2010. This review resulted in a 15 month work plan that addresses the highest priority actions based on the new organizational structure and context, including the completion of the 2010 Winter Olympics which was referenced in a number of the AQMP actions.

Activities undertaken during 2010 support the following seven actions from the AQMP at a regional scale:

- Action #1 and #3: Integrate transit systems and promote opportunities to access public transportation and other transportation alternatives
- Action #4: Reduce vehicle idling through education and bylaws
- Action #8: Develop airshed-wide smoke control strategy
- Action #14: Share successes and information via the Sea-to-Sky Air Quality website
- Action #15: Implement an airshed-wide public outreach and education campaign
- Action #16: Coordinate air quality initiatives with other organizations

**Meeting Involvement – Percentage of SSCAS funding members participating in meetings: PFM-3**

*Note: this indicator has been modified due to the change in structure from the AQCC to SSCAS. Performance measures should be reviewed and potential alternatives identified during the AQMP five-year review, particularly as funding is derived from more varied sources.*

**Target**

AQMP target: 80% of funding members participating in meetings, averaged on an annual basis

**What is being measured?**

This performance measure was previously used to indicate the level of involvement of the initial funding members in the implementation process (i.e. the seven local governments and the BC

MoE). It measured the percentage of funding members that participated in meetings on an annual basis. In 2010, SSCAS formed with funding from the same core local governments and MoE. Therefore, for 2010, the measure continues to look at the level of participation of these funding members. In future this may be reviewed as funding may come from a broader variety of sources.

#### What is happening?

On average over the year, 75% of funding members had representatives at the meetings. Funding members are all representatives from local governments in the airshed and MoE. The majority of funding members were represented at two or three of the meetings (seven out of eight funding members). Table 5 provides a summary of participation in the SSCAS meetings in 2010. Other organizations that were represented at one or more meetings include: Squamish River Watersheds Society (attended all meetings), Vancouver Coastal Health, BC Ferries, Howe Sound Pulp and Paper, Metro Vancouver, and the District of Sechelt.

**Table 5: Attendance at SSCAS meetings in 2010**

Meeting date	Location	Number of Funding Members Attending	Number of Others Attending <sup>(a)</sup>
June	Bowen Island	7	6
October	Whistler	8	1
December	Squamish	5	1

Table note (a): attendance numbers do not include the SSCAS staff member and facilitator.

**Website Usage – Number of website visitors annually: PFM-4**

**Target**

5% increase in visitors annually.

**What is being measured?**

The number of hits to the Sea-to-Sky air quality website ([www.seatoskyairquality.ca](http://www.seatoskyairquality.ca)) on an annual basis.

**Why is this measure important?**

This measure allows SSCAS to determine if the website is being well-used, either by the public for educational purposes, or by SSCAS members to exchange information.

**What is happening?**

Visits to the website were not being tracked until October 1, 2010. The total annual visits will be reported starting in 2011. Between October 1 and December 31 2010, there were 274 visits to the website. Approximately 45% of these were new visits. The majority of visits originated in Vancouver (97), Nanaimo (48), Whistler (30) and Squamish (26).

## 6 Outlook for 2011

### 6.1. 2011: Fourth Year of Implementation

In 2011, SSCAS will continue the implementation of the AQMP with a concentration on communication and engagement efforts. Activities will focus on wood smoke reduction through the Woodstove Exchange Program, initiatives to improve transit connectivity and access to other alternative transportation, and continued communication and engagement with stakeholders, organizations and communities in the airshed.

SSCAS will also continue to seek out other avenues of funding beyond the current funding partners. SSCAS Board of Directors is expected to meet three times in 2011.

### 6.2. Annual Reporting

An annual report will continue to be produced to track changes in the identified context indicators, air quality indicators, and implementation performance measures.

### 6.3. Five-Year AQMP Update Report

The five-year report will provide a summary of past years and include a review of the actions completed, in progress and outstanding. The review of actions will provide the SSCAS with an opportunity to revise actions or add new ones in order to achieve the vision and goals of the AQMP by 2025. The first five-year report is scheduled for 2013.

An outline of the five-year AQMP update report is provided here. Note that a template for this report has not been developed as it is anticipated that changes may be made over the next five years. The proposed outline is as follows.

State of the Sea-to-Sky Airshed: Five Year AQMP Update Report proposed outline:

1. Introduction – background, about the SSCAS and process to date
2. Where are we now?
  - a. Indicator results and progress towards targets
  - b. Review of Actions
    - i. Completed
    - ii. In Progress
3. Where are we headed?
  - a. Current and future airshed context (e.g. increased traffic, more future development, etc)
  - b. Proposed New Actions (if necessary)
4. Next steps
  - a. Results
  - b. Recommendations

## 7 Conclusions

This report focused on two aspects of the implementation of the Sea-to-Sky/Howe Sound airshed AQMP:

- a) the quality of the air in the airshed throughout 2010, and
- b) the implementation process for the 2010 calendar year.

It is difficult to determine clear trends in the quality of the air in the airshed after three years of reporting data. However, there are indications that:

- Canada-Wide Standards for PM<sub>2.5</sub> and ground level ozone are not being exceeded in the airshed,
- PM<sub>2.5</sub> levels worsened in 2009 and 2010 (measured in Whistler) – mostly related to increases in forest fires,
- Ozone levels have improved in Squamish but not changed in Whistler, and
- Odour in Langdale worsened in 2009 and again in 2010.

There was one Air Quality Advisory issued for the airshed in 2010 due to POOR air quality ratings related to particulate matter from forest fires.

The implementation of the AQMP began in spring of 2008 with the development of an implementation framework document. Through the first three years of implementation, several actions were initiated and coordinated at an airshed scale. In 2010, the body overseeing implementation of the AQMP re-structured into a registered non-profit society and hired a part-time staff to facilitate the process and implement certain AQMP actions. These activities are expected to continue through 2011 working towards improved air quality in the airshed. In addition to the airshed-wide actions, each community in the airshed has several initiatives underway at the local level that address actions identified in the AQMP.

The air quality is generally good at present; however, it is important to continue implementation of the AQMP because:

- Continued increases in population and visitors that lead to increases in transportation and space heating would result in deteriorating air quality without action to keep the air clean;
- There are no safe levels of certain pollutants, and research suggests human health impacts are occurring in sensitive individuals at levels that are currently being measured in the airshed;
- Typical summer air quality conditions measured in the airshed approach, and at times reach, levels that warrant the issuance of an air quality advisory; and
- The region is known for outdoor recreational opportunities, which are important to the local economy. When air quality is considered poor, air quality advisories are issued that recommend refraining from such activities. Poor air quality conditions may therefore have an impact on the local economy.

## **Appendix A: Indicator Meta Data**

Meta data for all indicators is included with the final report in electronic format.



