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Editor: Jock A. Finlayson

GOOD AND GETTING BETTER: AIR QUALITY IN THE LOWER MAINLAND

Today, urban air quality in Canada is subject to regular monitoring as the human health impacts of exposure to various contaminants are better understood.¹ The sources of air contaminants and the interactions among them clearly affect local air quality, as do factors such as geographic location (coastal versus interior), seasonality and weather conditions, and the extent of trans-boundary pollution. In both Canada and the United States, national and provincial/state regulations exist to manage air quality and set standards for emissions. In British Columbia, Metro Vancouver (formerly the Greater Vancouver Regional District) is in a unique position within Canada because it has delegated authority from the provincial government to regulate air quality in the Lower Mainland. Recently, Metro Vancouver released the long-awaited summary of its 2005 air emissions inventory.² This issue of the Business Council's Environment Bulletin reviews the results of the inventory, examines the projections developed by Metro Vancouver staff, and considers some implications for regional and provincial policy on air quality going forward.

Metro Vancouver's 2005 emissions inventory includes criteria air contaminants (CACs) and greenhouse gases (GHGs), and covers the overall Lower Fraser Valley area (including Metro Vancouver, the southwestern part of the Fraser Valley Regional District, and Whatcom County in Washington State). This article deals only with CACs, since these have the greatest impact on local air quality.

The inventory offers a forecast and a backcast of emissions of CACs in the region. Backcasting entails updating previous inventories to ensure methodological consistency so that valid comparisons and trends can be observed. Forecasting provides estimates of future emission levels, taking into effect known government regulations and emission controls. The 2005 inventory captures three main sources of emissions: point sources (such as an industrial facility requiring a permit), area sources (such as light industrial, residential or commercial/institutional facilities not requiring a permit) and mobile sources (principally transportation). Metro Vancouver has not yet released its full inventory, but the summary points to generally improving air quality.

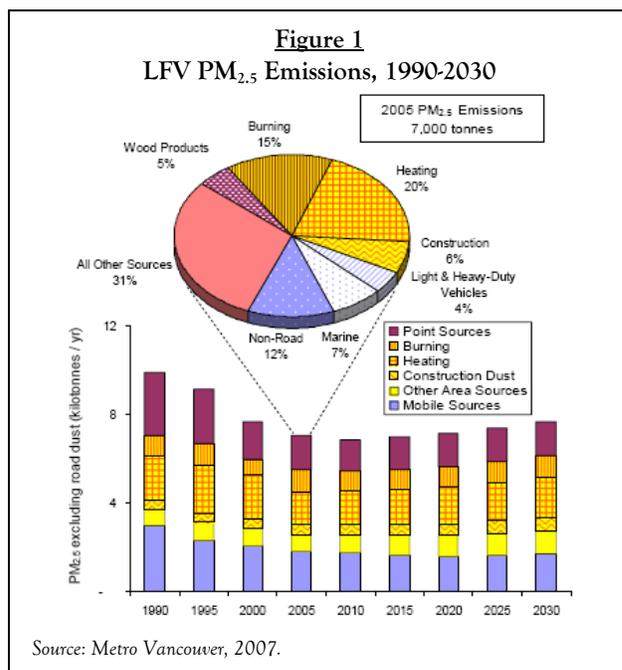
¹ At the federal level, the National Roundtable on the Environment and the Economy (NRTEE) recommended in 2004 that the government publish annual indicators to inform Canadians about air quality and other environmental influences on human health. The resulting Canadian Environmental Sustainability Indicators reports track air quality, greenhouse gas emissions and freshwater quality.

² Metro Vancouver, *2005 Lower Fraser Valley Air Emissions Inventory - Forecast and Backcast: Executive Summary* (December 2007).



Air quality trends in Greater Vancouver: a positive picture

Air quality in the Lower Fraser Valley has improved significantly over the past 15-20 years. Today, the Lower Mainland has the best air quality among major urban centres in Canada. All measured CACs except ammonia declined between 1990 and 2005. Despite this positive trend, Metro Vancouver predicts that emissions of several contaminants will rise over time, due to population growth and the changing composition of transportation activities. However, as discussed below, the regional district's emission forecasts appear to embody an unduly pessimistic outlook and to understate the impact of continued advances in technology, capital stock turnover, and future government policy initiatives. Of interest, none of the CACs tracked by Metro Vancouver is projected to have higher emissions as a principal consequence of increased industrial activity in the region.

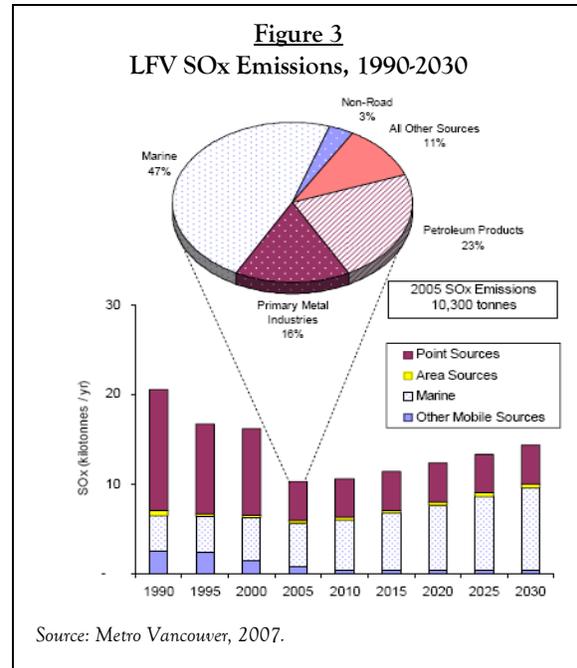
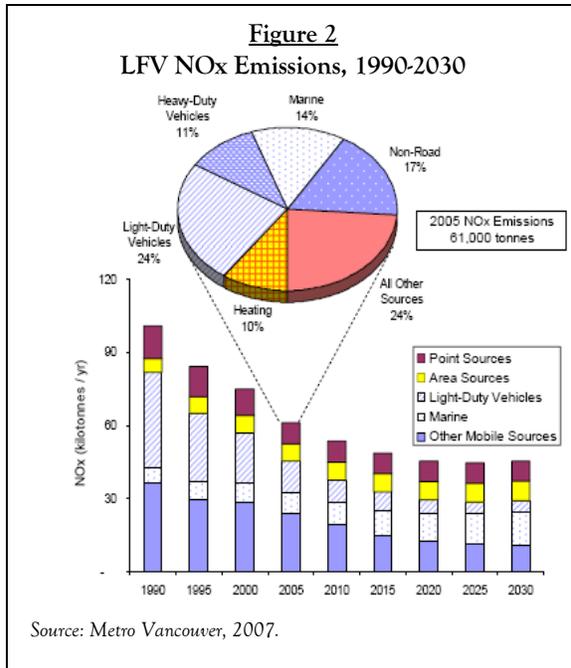


Looking at each CAC in more detail, **fine particulate matter** (PM_{2.5}) emissions decreased markedly from 1990 to 2005 (Figure 1). This can be explained by diminished manufacturing capacity and plant closures in the refining and wood products sectors, as well as reduced vehicle emissions. Heating and “burning” presently account for the largest share of PM_{2.5} emissions in the regional airshed, and together with marine transportation they will remain the primary sources of PM_{2.5} emissions going forward.

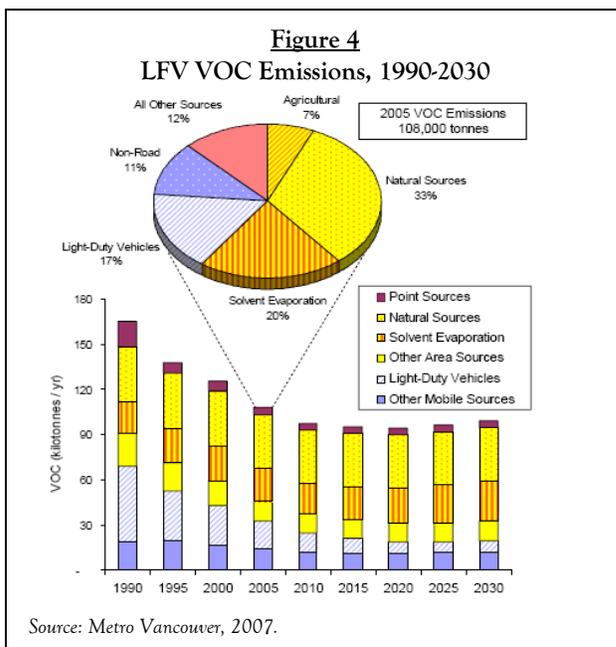
Emissions of **nitrogen oxides** (NO_x) fell steadily from 1990 to 2005, and are expected to level off in 2020 (Figure 2). Vehicles and other mobile sources are

the key drivers of NO_x emissions in the region. While cars and light trucks will continue to decline as sources of NO_x, marine sources are expected to generate a bigger share of emissions after 2010.

Sulphur oxides (SO_x) also dropped between 1990 and 2005, by almost half (Figure 3). The main reasons were lower sulphur levels in on-road vehicle fuels, and reduced emissions (in part owing to shutdowns) from several Lower Mainland and Whatcom County industrial sources in the refining, primary metals, cement, and aluminium sectors. Metro Vancouver predicts that SO_x emissions will increase after 2010, primarily because of higher marine emissions. However, this forecast discounts the stepped-up efforts being made by Canadian and US government agencies and local port authorities to address marine-related air emissions. For example the Vancouver Fraser Port Authority is proceeding with port electrification plans, as are ports down the US west coast.



Emissions of **volatile organic compounds (VOCs)** also declined significantly in the Lower Fraser Valley between 1990 and 2005 (Figure 4). Natural sources are the leading contributors to VOC emissions, followed by solvent evaporations. Emissions from solvents are expected to remain the major anthropogenic source of VOCs through the projection period.



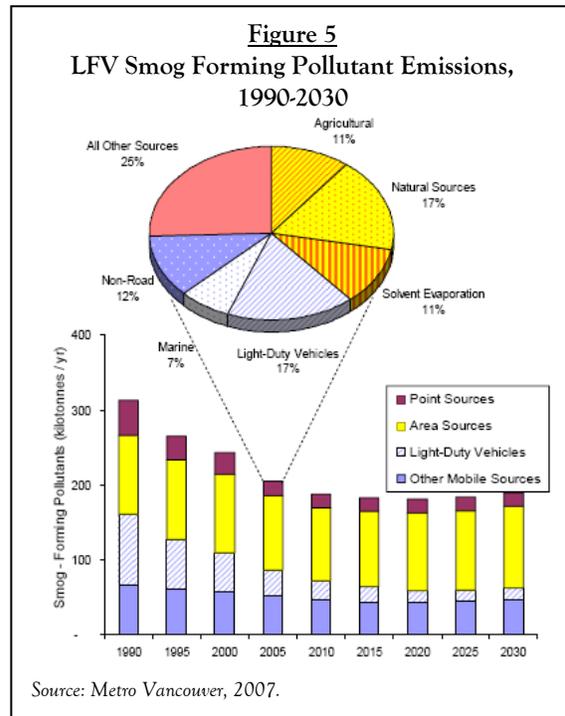
Ammonia (NH₃) (not shown) is the only measured local air pollutant whose emissions have risen since 1990. Agriculture is the biggest source and it is expected to retain this status in the next 25 years.

Tracking each air contaminant individually is useful, since the sources of pollutants vary and thus projections are based on the characteristics of future source activities. But it is how pollutants work in combination in the atmosphere that has the greatest implications for human health. Ground-level ozone (which is formed principally by the chemical reaction of NO_x and VOC in sunlight) and fine particulate matter



(either emitted directly or formed as a secondary pollutant from SO_x, NO_x, VOC and NH₃) are the key components of **smog**. In urban areas of the country, concentrations of ground-level ozone and PM_{2.5} are measured during the warm season (April through September) as indicators of risk to human health.

Metro Vancouver's emission inventory therefore aggregates the criteria air contaminants it tracks to provide a more general picture of what has been happening to **smog-forming pollutants**. Unsurprisingly, these have also been trending down, and are expected to continue falling until at least 2020 (Figure 5). The anticipated rise in smog-forming pollutants after 2020 primarily reflects solvent evaporations, the effect of agricultural sources and marine transportation. As noted below, the increase in smog-forming pollutants predicted by Metro Vancouver is likely overstated, because the district's analysis does not put adequate weight on the impact of ongoing changes in technology and tougher federal/provincial standards.



Trends in local air pollution are linked to past and projected changes in the source activities that generate the various criteria air contaminants. It is worth noting that most of the increase in CACs expected by Metro Vancouver comes from area sources rather than point or mobile sources. In other words, emissions from industrial and most transportation sources are expected to remain constant or decline slightly over time. This implies that emission reductions from road-based transportation (e.g., due to the more stringent regulatory standards for vehicle emissions and fuel types) will outweigh the emissions likely to result from growth in the region's population and increased light vehicle use.

The inventory also breaks out the historical and forecast smog-forming pollutant emissions by jurisdiction (i.e., the three jurisdictions that make up the Lower Fraser Valley airshed). Based on this, the heavily populated regional district of Metro Vancouver emerges as the largest contributor of emissions throughout the forecast period. However, the historical data also suggest that Metro Vancouver's emissions of smog-forming pollutants have fallen faster than those of the Fraser Valley Regional District or Whatcom County. Total smog-forming emissions are projected to flat-line in the latter two jurisdictions, while rising slightly in Metro Vancouver.



Local air quality in a wider context

Greater Vancouver's air quality is excellent when compared to other urban areas in Canada and the United States. The data show that air quality in the Lower Mainland consistently exceeds the Canada-Wide Standards (CWS) established by the federal and provincial Environment Ministers. The 2007 Canadian Environmental Sustainability Indicators (CESI) report outlines trends in ground-level ozone for five major regions across the country between 1990 and 2005.³ Southern Ontario and southern Quebec experienced increases in exposure to ground-level ozone of 17 percent and 15 percent, respectively. The Atlantic provinces, the Prairies, Northern Ontario, and the Lower Fraser Valley all saw no statistically significant changes in exposure.

Within Canada, the Lower Fraser Valley is the most heavily populated urban area outside of Southern Ontario and Greater Montreal. While local air quality can be affected by transboundary pollution (which helps to explain developments in Ontario and Quebec), the key finding is that air quality in the Lower Fraser Valley has remained good, according to CESI. CESI also provides a more detailed breakdown of CAC emissions across the country, and notes that emissions of NO_x and VOC have declined in urban areas, in large part owing to decreases in road transportation emissions.

The Lower Mainland business community recognizes the importance of good air quality to human health and to the region's quality of life. Fortunately, Greater Vancouver has the best air quality among 90 North American cities.⁴ The former Chief Medical Officer for the Vancouver Coastal Health Authority publicly described air quality in the region as "outstanding" and suggested that there is no risk of Greater Vancouver "becoming another Los Angeles."

An examination of developments in the United States confirms that the positive trends in air quality in the Lower Mainland are not unique to this region. Between 1980 and 2005, average levels of regulated air pollutants in American cities fell sharply – for example, concentrations of fine particulate matter dropped by 40 percent, nitrogen dioxide emissions decreased by 30 percent, sulphur dioxide emissions fell by 42 percent, and VOC emissions declined by 47 percent. Thanks to large reductions in most air pollutants, there has been a significant improvement in compliance with US federal air standards in metropolitan areas.⁵

³ Statistics Canada, Environment Canada and Health Canada, *Canadian Environmental Sustainability Indicators 2007 Highlights* (2007).

⁴ S. Vedal et al, "Air Pollution and Mortality in a City With Low Levels of Pollution," *Environmental Health Perspectives* (January 2003).

⁵ Joel Schwartz, *Air Quality in America: A Dose of Reality on Air Pollution Levels, Trends and Health Risks*, American Enterprise Institute (2007).



Looking forward: forecast assumptions

In forecasting emissions to 2030, Metro Vancouver uses a range of assumptions about the structure of the regional economy, demographic trends, living and working patterns, and the evolution of government policy. Its current projections, particularly for point sources, signal a continuing erosion of the presence of industry (notably manufacturing) in Greater Vancouver. This to some extent reflects economic forces, but it is also shaped by policy and regulatory decisions. The regional government's role in setting air quality standards and local government policies concerning land use both affect air quality. The regional district's policy orientation suggests little deviation from the path of the past decade or more - a path that has served to accelerate the decline of industrial activity in Metro Vancouver. Air quality has improved in part because of the closure or departure of manufacturing and other business operations from Greater Vancouver (although there is no benefit to regional air quality when such operations migrate to other parts of the Lower Fraser Valley). It is revealing that the principal sources for NO_x and SO_x emissions in the Lower Mainland are predicted to come from marine transportation, as the region's industrial footprint shrinks and Greater Vancouver leverages its geographic position to become a more important North American gateway for Asia-Pacific trade and travel.

Shifting patterns of industrial activity also have implications for employment prospects, wages and incomes. Recently-released Statistics Canada data indicates that the median wage (in constant 2005 dollars) for all occupations in the Vancouver Census Metropolitan Area fell by 3.6 percent in the 2001-2006 inter-census period. The number of manufacturing jobs dropped 1.3 percent while jobs in foodservices increased by 13.5 percent over the same period. While real median wages for both industry sectors declined between 2001 and 2006, most manufacturing employment categories are higher-paying than those in foodservices and a number of other service sectors.⁶

Metro Vancouver acknowledges that air quality in the region compares favourably with other North American cities, and that improvements have been made over time.⁷ However, district officials appear to hold the view that emissions of primary particulate matter, several ozone and particulate matter precursors, and greenhouse gases are set to rise significantly in the next 15-20 years, and that serious adverse human health impacts will result from this supposed deterioration in the region's air quality.⁸

The Business Council is concerned that the emissions forecasts reported in the 2005 inventory and underlying Metro Vancouver's Air Quality Management Plan (AQMP) paint a misleading picture of air quality trends in the region. Admittedly, well-informed people can come up with different projections for emissions of air contaminants. However, from a methodological perspective, a lack of detail on low and high-emission scenarios invites the

⁶ Statistics Canada, Census 2006 "Income and Earnings Highlight Tables by Census Metropolitan Area" (May 1, 2008).

⁷ *Air Quality Management Plan for Greater Vancouver* (September 2005), p. 3.

⁸ *Ibid.*, p. 3; emphasis added.



suspicion that in developing its forecasts, the district chose to follow a “worst-case” approach. Metro Vancouver predicts a levelling-off (rather than continuing decline) of emissions of most air contaminants after 2005, and slight increases in average and short-term peak concentrations of PM_{2.5}. A number of independent industry and technical experts believe these forecasts are dubious. Moreover, the experience of the past two decades – which saw greater-than-anticipated improvements in air quality virtually across-the-board – also lends credence to the argument that Metro Vancouver has adopted a too-pessimistic view of air quality trends.

In particular, Metro Vancouver’s projections take insufficient account of several factors that point to lower future levels of emissions, and thus better future air quality, than is assumed in the Air Quality Management Plan and the 2005 emissions inventory:

- 1) continued advances in technology, which are paving the way for progressively lower emissions of contaminants in many industries;
- 2) the impact of normal capital stock turnover in dampening future increases in emissions in the industrial, commercial and institutional sectors;
- 3) the adoption of more stringent vehicle and fuel emission standards, beyond those used in developing Metro Vancouver’s projections, together with significant new investments in regional public transit, both of which should lower transportation-related emissions (on- and off-road) in the coming years;
- 4) the implications of the federal government’s “Turning the Corner” plan, which proposes to sharply reduce industrial emissions of several key air contaminants;
- 5) the co-benefits for ambient air quality that will flow from announced and future federal and provincial policies aimed at reducing emissions of greenhouse gases;
- 6) increased urban densification due to local government policies such as the EcoDensity initiative of the City of Vancouver; and
- 7) the impact of initiatives by west coast port authorities and the Canadian and US governments to stem the growth of marine-related air emissions.

As the Business Council has noted in previous communications, the result of the excessively conservative forecasting methodology used by Metro Vancouver is to set the stage for an artificial non-compliance status for regional air quality, based on extremely stringent ambient standards which in some cases are “cherry-picked” from other jurisdictions – including jurisdictions like California, which routinely fall far short of achieving their own proclaimed standards.

In summary, a strong case can be made that air quality in Greater Vancouver will continue to get better in the next two decades, even with population growth, more vehicles on the roads, and increased marine traffic. A sensible air quality plan for the region should not be built on extreme or worst-case scenarios. In addition, regional government officials would be well advised to acknowledge the uncertainties associated with any attempt to predict the level



of air emissions 20 and 25 years into the future. And, in keeping with the concept of sustainable development, the regional district's decisions concerning air quality should recognize the importance of a diversified and competitive economy to Greater Vancouver's future prosperity.

Conclusion

The air quality trends identified in Metro Vancouver's 2005 emissions inventory highlight several policy areas of importance for the region and the province. In general, the data on smog-forming pollutants indicate the extent to which air quality has improved. Further, the regional district's own forecasts show that, particularly for Metro Vancouver itself, air quality should continue to be excellent by the standards of other large urban centres in North America.

The inventory takes account of known and proposed government policies touching on CAC emissions. Past and existing policies adopted by the region (together with national standards in various areas) have had a positive impact on air quality, while at the same time helping to speed the decline of manufacturing in Greater Vancouver and encouraging industry to migrate to communities in the Fraser Valley and northern Washington state. Looking ahead, Metro Vancouver should closely align its policies and standards on air emissions with those of the provincial government, instead of always (and almost reflexively) seeking to set more stringent standards - particularly since Greater Vancouver already enjoys better air quality than some other regions of BC.⁹ Nothing will be gained if the decisions of regional and municipal policy-makers lead to an accelerated loss of manufacturing and other high-paying jobs in the Lower Mainland.

Finally, it is notable that on both a regional and a national basis, improved emission standards for road-based transportation have had benefits for local air quality. In the context of CACs, this means that future population growth in the Lower Mainland need not signal worsening pollution from vehicle transportation, especially in light of provincial initiatives such as the expansion of rapid transit and other elements of the Gateway Strategy.

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Jock Finlayson, Executive Vice President - Policy
Karen Graham, Senior Policy Analyst

⁹ This is exemplified by Metro Vancouver's proposed strengthening of the regional PM_{2.5} standard, which appears to have been triggered by nothing more than the recent move by the BC Ministry of Environment bringing the provincial standard into line with Metro Vancouver's existing, more stringent standard.