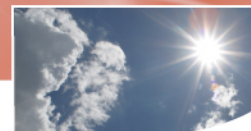




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Data Sources and Methods for the International Urban Air Quality (O₃ and PM_{2.5}) Indicators.

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1 Introduction

The international air quality indicators are a part of the Canadian Environmental Sustainability Indicators (CESI) program, which provides data and information to track Canada's performance on key environmental sustainability issues.

Air quality indicators report on two air pollutants: ground-level ozone (O_3) and fine particulate matter ($PM_{2.5}$). Although it is important to report on Canada's ambient O_3 and $PM_{2.5}$ concentrations at a local, regional, and national scale, it is also of interest to see how air quality in Canadian urban centers compares internationally.

2 Description and rationale of the international air quality indicators

2.1 Description

The international urban air quality indicators present, for 2009, ambient ground-level ozone (O_3) concentrations based on the average of the 8-hr daily maximum concentrations, and fine particulate matter ($PM_{2.5}$) concentrations based on the 24-hr daily average concentrations. A comparison of air quality among Canadian and international urban areas is presented.

The International urban areas compared are members of the Organization for Economic Co-operation and Development (OECD) and selected based on data availability and population size. Ozone levels are provided for 30 urban areas and $PM_{2.5}$ levels for 27 urban areas.

2.2 Changes since last report

Five additional international urban areas were added to the analysis because sufficient O_3 or $PM_{2.5}$ data became available. These urban areas have population sizes that are comparable to Canadian urban areas. The following urban areas were added: Denver, Washington, Madrid, Brussels and Helsinki. Two Canadian urban areas were also added: Ottawa-Gatineau and Edmonton.

Two urban areas (Cleveland and Rotterdam) were removed from the comparison due to limited data. The definition and metrics of the indicators remained the same, except for the definition of a urban areas. In the last report, all stations within 40 km of a main city were used in air quality calculations; now only stations listed as being in the city (or other clearly defined urban areas, as in the cases of London, Paris, and Ottawa-Gatineau) are included.

3 Data

3.1 Data source

Air quality data for the international comparison came from a variety of databases, including: Canada-wide air quality database, the European Union's (EU) AirBase Viewer Database (EU) available from: <http://www.eea.europa.eu/themes/air/airbase>, and the United States Environmental Protection Agencies' (U.S. EPA) Air Quality System (AQS) available from: <http://www.epa.gov/ttn/airs/airsaqs/>. Some O_3 and $PM_{2.5}$ data for individual urban areas came from their country's annual air quality reports or websites (Australia, Paris, and London). Population data were retrieved only from government-affiliated (national) sources. For a complete list of all the data sources refer to section 6 References.

3.2 Spatial coverage

The data cover urban areas in Canada, the United-States, and member countries of the Organization for Economic Co-operation and Development (OECD).

3.3 Temporal coverage

The values used for the indicators are calculated for the year 2009.

3.4 Data completeness

The international urban areas chosen for the indicators, were selected because they have similar urban populations to six of Canada's largest urban areas (urban population greater than one million) and because O_3 and $PM_{2.5}$ data is available. For any given monitoring station to be used in a urban area's calculations, at least 75% of the data for the year needed to be available to be included. This criterion was applied at the hourly, daily, and yearly level. No other selection criteria were used for this comparison. For Australia, only $PM_{2.5}$ data were compatible with our methodology.

3.5 Data timeliness

The gap between a given year and publication of data for that year varies considerably among urban areas. For some urban areas, annual data is available within a few months of a reported year, while for others, the quality assurance and control process is lengthier.

For population data, timeliness varies considerably- some countries/cities only publish in census years, others publish yearly estimates.

4 Methods

Concentrations data were taken directly from various air quality monitoring networks and agencies. Data was either copied from reports or downloaded. In some cases, concentrations data were found in the needed format and did not require any further modifications. In other cases these data were unavailable in the required format. The concentrations data by monitoring station (hourly measurements) were used to calculate the average concentrations.

For O_3 , the annual average 8-hour daily maximum was calculated and for $PM_{2.5}$ the annual 24-hour mean was calculated for each station found in the urban city boundaries. The annual values from each monitoring station in the urban area boundary were then averaged. Each station was equally weighted and the data were not population-weighted.

O_3 levels were reported in several units (i.e. ppb, ppm and $\mu g/m^3$). In order to provide readers with a more clear and compatible comparison, all international units were converted to ppb. Internationally, $PM_{2.5}$ is measured in $\mu g/m^3$, therefore no conversion was necessary.

5 Caveats and Limitations

Caution must be taken when comparing air quality from different urban areas. Beyond population, other factors influence air pollution such as climate, geography, local emissions, transboundary pollution and elevation. Technical and methodological factors such as the type of monitoring equipment used, station location, and number of stations for one urban area can also influence the results of the comparison.

For example, Montreal's fine particulate matter ($PM_{2.5}$) monitors are based on newer technologies than other cities in Canada. These newer methods measure a portion of the $PM_{2.5}$

(semi-volatile) mass that was not captured by the older instruments. When comparing the reference method (filter-based) measurements, the PM_{2.5} concentrations for Toronto and Montreal are nearly identical.

6 References and further reading

6.1 References

Air Quality Data

AIRPARIF Historique-statistiques. Retrieved on 21 January 2011. Available from: <http://www.airparif.asso.fr/pages/resultats/histostats>

Environmental Protection Department (2011) Air Quality Data (Hourly). Retrieved on 14 February 2011. Available from: <http://epic.epd.gov.hk/ca/uid/airdata/p/1>

Environment Protection and Heritage Council (2011) Monitoring Reports. Retrieved on 19 January 2011. Available from: <http://www.ephc.gov.au/taxonomy/term/34>

European Environment Agency (2011) AirBase- The European air quality database. Retrieved on 14 April 2011. Available from: <http://www.eea.europa.eu/data-and-maps/data/airbase-the-european-air-quality-database-3>

Ministerio del medio ambiente (2009) Sistema de Información Nacional de Calidad del Aire. Retrieved on 9 February 2011. Available from: http://sinca.conama.cl/index.php/regiones/index?airviro_domain=RM

Secretaría del Medio Ambiente SIMAT Recursos Técnicos. Retrieved on 11 February 2011. Available from: <http://www.sma.df.gob.mx/simat2/informaciontecnica/>

UK Department for Environment, Food and Rural Affairs (2011) UK Air Quality Archive. Retrieved on 19 January 2011. Available from: <http://uk-air.defra.gov.uk/data/exceedence>

US Environmental Protection Agency. Air Quality System Data Mart [internet database] available at <http://www.epa.gov/ttn/airs/aqsdatamart>. retrieved on January 31, 2011.

US Environmental Protection Agency (2011) AQS Data for Downloading. Retrieved on 20 January 2011. Available from: <http://www.epa.gov/ttn/airs/airsaqs/detaildata/downloadaqsdta.htm>

Population Data

Australian Bureau of Statistics (2010) National Regional Profile. Retrieved on 4 February 2011. Available from: <http://www.ausstats.abs.gov.au/ausstats/nrppmaps.nsf/NEW+GmapPages/national+regional+profile?opendocument>

European Commission (2011) Eurostat Database. Retrieved on 6 July 2011. Available from: http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban/data_cities/database_sub1

Statistics Canada (2011) Population of census metropolitan areas. Retrieved on 6 July 2011. Available from: <http://www40.statcan.gc.ca/l01/cst01/demo05a-eng.htm>

U.S. Census Bureau (2010) Metropolitan and Micropolitan Statistical Area Estimates. Retrieved on 6 July 2011. Available from: <http://www.census.gov/popest/metro/CBSA-est2009-annual.html>