

## AIR QUALITY BY REGION

The urgency of the climate change challenge requires a rapid, sustained, and effective transition to lower carbon regional economies. Apart from necessary reduction in greenhouse gases, there is also a need to cut emissions of other pollutants like toxic gases or fine particles that can severely threaten people's health. Regional and city-level policies have a key role to play in this transition.

### Definition

CO<sub>2</sub> regional emissions are imputed from national emission data allocated to grids of around 10 km × 10 km square. It

### Overview

A look at interregional disparities gives a first rationale for spatially targeted interventions. In fact, it is possible to observe large disparities in carbon dioxide (CO<sub>2</sub>) per capita produced in different regions. Regions with the highest levels of emissions per capita are located in the United States, the Czech Republic and Canada. For Canada, this result is largely explained by the low levels of population in these regions. Similarly, relative low population explains in part the very high levels observed in Wyoming (United States). The significant degree of geographical concentration of CO<sub>2</sub> emissions per capita is evident in several countries, where some regions have a value more than twice the country average.

A positive correlation is found between levels of regional gross domestic product (GDP) and CO<sub>2</sub> emissions, but there are significant differences in the "carbon intensity" of production across regions. In fact, when looking at the ratio of GDP over CO<sub>2</sub>, it is clear that the production of some regions is much more efficient, in terms of embodied CO<sub>2</sub>, than the national average. This is particularly evident in Turkey, the United States, Mexico, the Russian Federation and Brazil. In general, the regions with the highest GDP/CO<sub>2</sub> host the national capital (where service-intensive industries are concentrated). However, this is not always the case (for example, Bolzano in Italy or Shikogu in Japan). Relatively low values of GDP/CO<sub>2</sub> indicate a potential for decoupling emissions from the economic growth of the region.

Internationally comparable measures of air quality in regions can be derived from satellite-based measurement of particulate matter finer than 2.5 micrometers (PM 2.5), which can cause cardiovascular and other diseases when inhaled. While these estimates can be less precise than ground-based measurement, they have the advantage of being available for the large areas of the globe that are still without air monitoring stations. By overlaying these data on fine particulate matter with data on population distribution at 1 km resolution, it is possible to conclude that large fractions of the world population breathe air whose pollution exceeds the World Health Organization's recommended level of 10 micrograms of PM 2.5 per cubic meter. It is important to emphasise that the measured PM 2.5 concentration comes from both natural and human sources, with the fraction imputable to human activity varying significantly among regions. The share of people living in areas with health-damaging levels of pollution is worryingly high in several countries (particularly in China, India and Italy).

There are large regional variations in the extent of population exposure to high levels of particulate matters. Regional peaks are clear in China, Italy, India, Mexico and Chile, while a more equitable distribution across regions appears in Japan and Korea.

includes emissions from all sources with the exception of air transport, international aviation and shipping.

Population exposure to air pollution is calculated by taking the weighted average value of 2.5 micrometers for the grid cells present in each region, with the weight given by the estimated population count in each cell.

### Comparability

While it is increasingly clear that urban areas emanate a growing percentage of the world carbon emissions, we still lack statistics suited for global comparison and monitoring of the carbon footprints of cities. Even if many cities around the world have started collecting inventories of their carbon emissions, differences in the methodologies (techniques, input data, sources included) used to compute total CO<sub>2</sub> make any comparison of their performance very difficult. Another problem is that cities "delimit" themselves in different ways, so that inventories in different countries can refer to a very narrow (the core municipality) or a very extended (the functional area of influence) definition of city. While supporting international efforts to harmonise urban carbon inventory, the OECD is also using estimates for small geographic units, derived from national data downscaled through the use of spatial datasets. Time-varying statistics for large and medium-sized cities in the OECD are obtained by applying these estimates to urban areas that are defined through a harmonised methodology.

### Sources

- OECD (2011), *OECD Regions at a Glance*, OECD Publishing.

### Further information

#### Analytical publications

- Donkelaar A. van et al. (2010) "Global Estimates of Ambient Fine Particulate Matter Concentrations from Satellite-Based Aerosol Optical Depth: Development and Application", *Environmental Health Perspective*, 118(6), US National Institute of Environmental Health Sciences, USA.
- Hunt, A. (2011), "Policy Interventions to Address Health Impacts Associated with Air Pollution, Unsafe Water Supply and Sanitation, and Hazardous Chemicals", *OECD Environment Working Papers*, No. 35.
- OECD (2011), *OECD Environmental Outlook*, OECD Publishing.

#### Statistical publications

- OECD (2011), *Towards Green Growth: Monitoring Progress: OECD Indicators*, OECD Green Growth Studies, OECD Publishing.

#### Online databases

- OECD Regional Database.

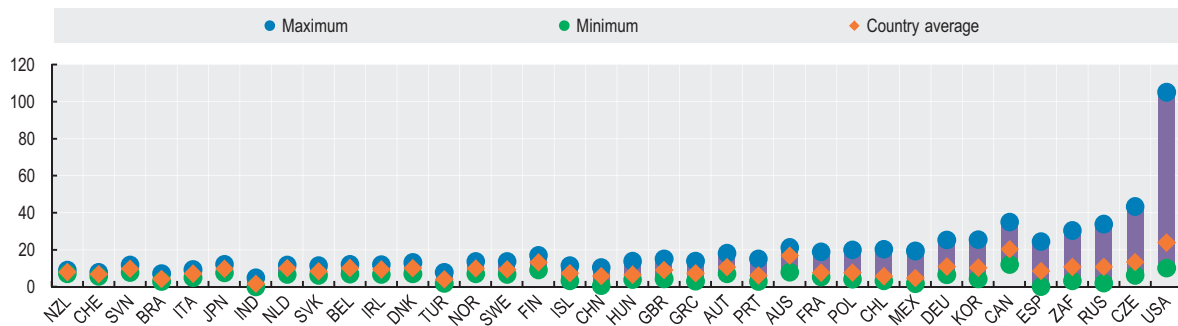
#### Websites

- Regional Development, [www.oecd.org/gov/regionaldevelopment](http://www.oecd.org/gov/regionaldevelopment).
- Regional Statistics and Indicators, [www.oecd.org/gov/regional/statisticsindicators](http://www.oecd.org/gov/regional/statisticsindicators).



**Regional range in CO<sub>2</sub> emissions per capita**

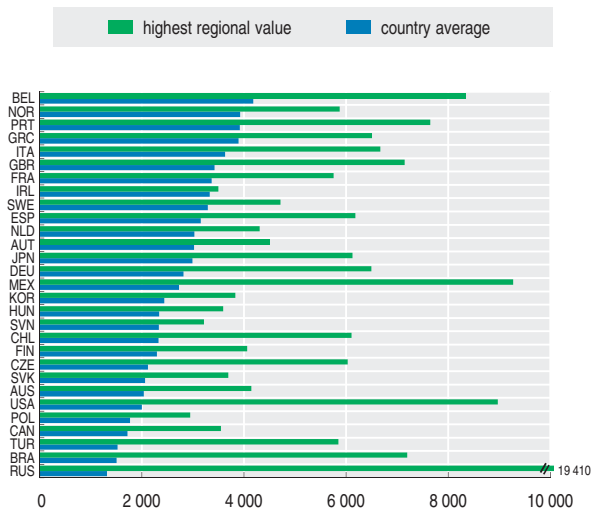
Tonnes of CO<sub>2</sub> per capita, 2005



StatLink <http://dx.doi.org/10.1787/888932506343>

**Large region with highest GDP to CO<sub>2</sub> ratio and country average**

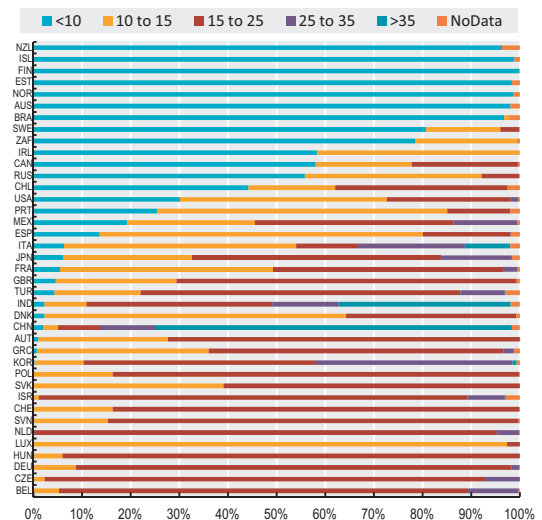
2005



StatLink <http://dx.doi.org/10.1787/888932506362>

**Population exposed to air pollution, PM<sub>2.5</sub> thresholds**

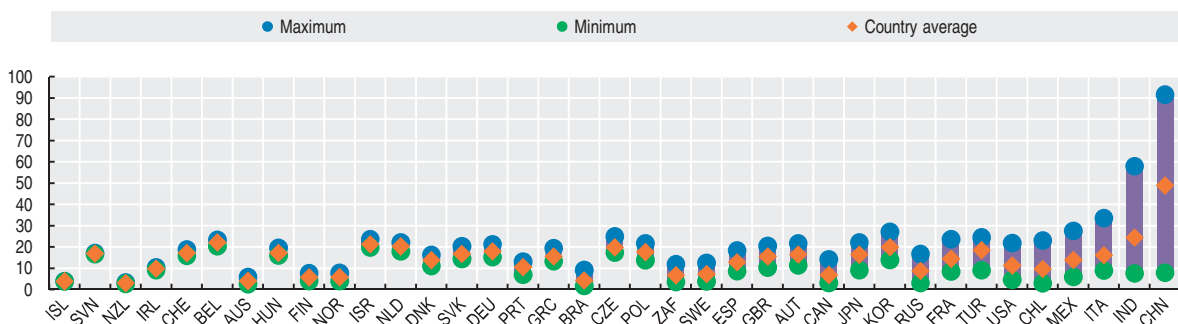
Percentage, average 2001-06



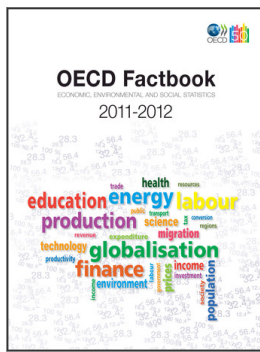
StatLink <http://dx.doi.org/10.1787/888932506381>

**Regional range of population exposure to air pollution**

Percentage, average 2001-06



StatLink <http://dx.doi.org/10.1787/888932506400>



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