Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Indicator 11.6.2: Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)

Institutional information

Organization(s):

World Health Organization (WHO)

Concepts and definitions

Definition:

The mean annual concentration of fine suspended particles of less than 2.5 microns in diameters (PM2.5) is a common measure of air pollution. The mean is a population-weighted average for urban population in a country, and is expressed in micrograms per cubic meter [$\mu g/m^3$].

Rationale:

Air pollution consists of many pollutants, among other particulate matter. These particles are able to penetrate deeply into the respiratory tract and therefore constitute a risk for health by increasing mortality from respiratory infections and diseases, lung cancer, and selected cardiovascular diseases.

Comments and limitations:

Urban/rural data: while the data quality available for urban/rural population is generally good for high-income countries, it can be relatively poor for some low- and middle income areas. Furthermore, the definition of urban/rural may greatly vary by country.

Methodology

Computation method:

The annual urban mean concentration of PM2.5 is estimated with improved modelling using data integration from satellite remote sensing, population estimates, topography and ground measurements (WHO, 2016a; Shaddick et al, 2016)

Consultation/validation process with countries for adjustments and estimates:

Data inputs, methods and final estimates are shared with countries prior to publication via WHO official communication channels with WHO Member States.

Treatment of missing values:

- ***At country level:***

Missing values are left blank.

- ***At regional and global levels:***

Missing values are excluded from the regional and global averages.

Regional aggregates:

The regional and global aggregates are population -weighted figures of the national estimates.

Cagg=SUM (Cnat * Pnat)/ SUM (Pnat)

where Cagg is the regional/global estimate, Cnat is the national estimate, Pnat is the country population. The sum is done over the countries in the region (regional aggregate) or all countries (global aggregate).

Sources of discrepancies:

The source of differences between global and national figures: Modelled estimates versus annual mean concentrations obtained from ground measurements.

Methods and guidance available to countries for the compilation of the data at the national level:

Countries which have air quality monitoring networks in places in urban areas can use the annual mean concentrations from the ground measurements and the corresponding number of inhabitants to derive the population-weighted exposure to particulate matter in cities.

Quality assurance:

Data inputs to the model are official or published data on air quality or other relevant topics. Modelled estimates are carefully crossed-checked and compared with official ground measurements.

Data sources

Description:

Sources of data include ground measurements from monitoring networks, collected for 3,000 cities and localities (WHO 2016) around the world, satellite remote sensing, population estimates, topography, information on local monitoring networks and measures of specific contributors of air pollution (WHO, 2016b)

Collection process:

Data collection process for ground measurements include official reporting from countries to WHO (after request), and web searches. Measurements of PM10 or PM2.5 from official national/sub-national reports and websites or reported by regional networks such as Clean Air Asia for Asia and the European Environment Agency for Europe or data from UN agencies, development agencies, articles from peer reviewed journals and ground measurements compiled in the framework of the Global Burden of Disease Project.

Data availability

Description:

The indicator is available for 178 countries. Missing countries include mostly small states islands in the Western Pacific and in the Latin American and the Caribbean regions.

Time series:

Forthcoming

Disaggregation:

The indicator is available by 0.1° x 0.1° grid size for the world.

Calendar

Data collection:

During 2017

Data release:

2017-2018

Data providers

Ministry of Health, Ministry of the Environment

Data compilers

WHO

References

URL:

www.who.int/gho/phe

References:

Shaddick G et al (2016). Data Integration Model for Air Quality: A Hierarchical Approach to the Global Estimation of Exposures to Ambient Air Pollution. Royal Statistical Society, arXiv:1609.0014.

WHO (2016a). Ambient air pollution: a global assessment of exposure and burden of disease, WHO Geneva.

WHO (2016b). WHO Urban ambient air quality database, WHO Geneva.

Related indicators

3.9.1: Mortality rate attributed to household and ambient air pollution