

## Indicator 11.6.2

### Indicator Name, Target and Goal

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

**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

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

### Definition and Rationale

#### ○ Definition

The definition of this indicator in Japan is the annual mean level weighted by individual prefectural populations of fine particulate matter of diameter 2.5  $\mu\text{m}$  or less (PM2.5) and suspended particulate matter (SPM) of diameter 10  $\mu\text{m}$  or less as measured by valid stations among nationwide ambient air pollution monitoring stations (hereinafter referred to as “monitoring stations”).

#### ○ Concepts

PM2.5 refers to particles suspended in the atmosphere with diameters of 2.5  $\mu\text{m}$  (1  $\mu\text{m}$  = 0.001 mm) or less. SPM refers to particles suspended in the atmosphere with diameters of 10  $\mu\text{m}$  or less. Particulate matter, such as PM2.5 and SPM, consists of various components including sulfates, nitrates, carbonaceous compounds, and inorganic elements. Japan has established environmental quality standards for PM2.5 and SPM that should be maintained to protect human health from adverse effects of air pollution.

Monitoring stations continuously measure ambient atmospheric pollution levels; these stations are distinct from roadside air pollution monitoring stations which are installed beside major intersections, roads, and roadsides to continuously monitor the influence of automobile emissions.

A valid station for PM2.5 refers to a monitoring station which measured 250 days or more annually (defined as days where the daily average is calculated from measurements with less than four hours of missing data per 24-hour period). A valid station for SPM refers to a measuring station which measured 6,000 hours or more annually.

#### ○ Rationale and Interpretation

Particulate matter, such as PM2.5 and SPM, is emitted into the atmosphere

by anthropogenic sources that are related to industry, transport, or households (heating, cooking, etc.). Further, some areas possess natural sources, such as volcanoes. This particulate matter readily penetrates far into the lungs and therefore has negative effects on not only the respiratory system but also the circulatory system.

From the perspective of public health, it is important to elucidate the extent of exposure distribution across the population in order to assess the corresponding health effects. As such, this indicator is calculated based on weighting by population.

### **Data Sources and Collection Method**

PM2.5 and SPM level data are obtained by continuous monitoring of air pollutant concentrations including those of PM2.5 and SPM by prefectures based on Administrative Processing Standards on continuous monitoring of the status of air pollution in accordance with Article 22 of Japan's Air Pollution Control Act (Act No. 97 of 1968). Measured values are verified, and the annual mean level is calculated for each fiscal year (April to March of the following year).

Also utilized are prefectural population data from the national census conducted every five years by the Statistics Bureau of the Ministry of Internal Affairs and Communications, with population estimates from the same bureau adopted for the years in between.

### **Method of Computation and Other Methodological Considerations**

#### ○ Computation Method

Annual mean levels for PM2.5 and SPM, and prefectural population data obtained from the aforementioned data sources are inputted into the following equation for calculations.

$$\text{Annual mean level weighted by prefectural populations} = \frac{\sum Cn \times Pn}{\sum Pn}$$

Here, Cn is the annual mean level of PM2.5 or SPM for each prefecture (n) measured by valid stations, and Pn is the population of that prefecture.

#### ○ Comments and limitations

Strictly speaking, Japan's method for measuring SPM differs from the method used to assess PM10 employed in other countries in that a particle analyzer that removes 100% of particles with diameters of more than 10 μm is used (in other countries, only 50% of such particles are removed). It is important to note this difference when making comparisons. The 50% cut-off diameter for SPM

corresponds to approximately 7  $\mu\text{m}$ .

Prefectural population data are used because these data are available every year.

### **Data Disaggregation**

N/A

### **References**

- Ministry of the Environment: Status of air pollution  
[www.env.go.jp/air/osen/index.html](http://www.env.go.jp/air/osen/index.html)
- National Institute for Environmental Studies: Environmental indicator database  
[www.nies.go.jp/igreen/index.html](http://www.nies.go.jp/igreen/index.html)
- Statistics Bureau, Ministry of Internal Affairs and Communications: Population statistical data  
[www.stat.go.jp/data/jinsui/2.html](http://www.stat.go.jp/data/jinsui/2.html)

### **Custodian Ministries of Data**

Ministry of the Environment

### **Custodian Ministries of Related Policies**

Ministry of the Environment

### **International Organizations**

World Health Organization (WHO)