

## Indicator 12.2.1

### Indicator, Target, and Goal

**Indicator 12.2.1** Material Footprint, material footprint per capita, and material footprint per GDP (repeat of 8.4.1)

**Target 12.2** By 2030, achieve the sustainable management and efficient use of natural resources.

**Goal 12** Ensure sustainable consumption and production patterns.

### Definition, concepts, and grounds

#### ○ Definition

Material Footprint, material footprint per capita, and material footprint per GDP

#### ○ Concepts

Material Footprint (MF) :

Material Footprint (MF) is the attribution of global material extraction to domestic final demand of a country.

#### ○ Grounds and interpretations

Same as United Nations SDG indicator metadata.

### Data source type and data collection method

Domestic extraction of materials :

- Ministry of the Environment: Statistics listed in the columns of fossil fuels, metallic minerals, non-metallic minerals, agricultural-forestry-and-fishery products, and agricultural non-edible parts of "Domestic resources" in the Table 2 of *The Figure of Material Flow in Japan and Explanation of the Items that Constitute the Material Flow*

Raw material equivalent of imports/raw material equivalents of exports:

- Ministry of the Environment: Statistics listed in the columns of fossil fuels, metallic minerals, non-metallic minerals, agricultural-forestry-and-fishery products, agricultural non-

edible parts and import of "② input of materials such as raw materials" and "⑤ Export" in the Table 2 of *The Figure of Material Flow in Japan and Explanation of the Items that Constitute the Material Flow*

- Ministry of Internal Affairs and Communications: *Input-Output Tables for Japan(Input table)*
- Ministry of Economy, Trade and Industry: *Updated Input-Output Table*
- Eurostat: *Input data country RME tool (II-1 EU RME coefficients IMP; Coefficients for calculation of RME)*

Population :

- Ministry of Internal Affairs and Communications: *Population Estimates*

GDP :

- Cabinet Office: *Annual Report on National Accounts for 2021 (2008SNA, Benchmark year = 2015)*

### **Other methodological considerations**

- Method of computation

Material footprint by type of raw material (tonnes) is calculated as:

$$MF = DE + RME_{IM} - RME_{EX}$$

Where:

$MF$  : material footprint

$DE$  : domestic extraction of materials

$RME_{IM}$  : raw material equivalent of imports

$RME_{EX}$  : raw material equivalents of exports

Material footprint per capita, by type of raw material (tonnes), is calculated as:

$$MF \text{ per capita} = \frac{MF}{\text{Annual average population}}$$

Material footprint per unit of GDP, by type of raw material (kilograms per constant 2015 United States dollar), is calculated as:

$$MF \text{ per GDP} = \frac{MF}{GDP \text{ in constant 2015 United States Dollars}}$$

United Nations Environment Programme, 2023, shows three types of methods for calculation of material footprint indicators: ①Top-down approach: (input-output analysis) , ②Bottom-up approach: material intensity coefficients, and ③Hybrid approaches: complementing input-output analysis with coefficients. ③Hybrid approaches are used to estimate material footprint in Japan. See Kovanda and Weinzettel 2012 for the formula for the ③Hybrid approaches.

Raw material equivalents (RME) mean the method to estimate the amount of upstream material requirements to produce direct imports and exports.

### **Detailed data aggregation**

None

### **References**

Schoer, K., J. Weinzettel, J. Kovanda, J. Giegrich, and C. Lauwigi. 2012. *Raw Material Consumption of the European Union – Concept, Calculation Method, and Results*. Environmental Science & Technology, 46(16), 8903–8909.

United Nations Environment Programme, 2023, The use of natural resources in the economy A Global Manual on Economy-Wide Material Flow Accounting

<<https://sea.un.org/file/19612/download?token=4e4BrthJ>>

United Nations Department of Economic and Social Affairs 2022, SDG

indicator metadata (Harmonized metadata template - format version 1.1)

<https://unstats.un.org/sdgs/metadata/files/Metadata-08-04-01.pdf>

Ministry of the Environment, Japan: *The Figure of Material Flow in Japan, Explanation of the Items that Constitute the Material Flow (in Japanese)*

<https://www.env.go.jp/content/900532601.pdf>

**Data Provider:**

Ministry of the Environment, Japan

**Policy related Ministry:**

Ministry of the Environment, Japan

**International organization:**

United Nations Environment Programme