Goal 12: Ensure sustainable consumption and production patterns
Target 12.2: By 2020, achieve the sustainable management and efficient use of natural resources.
Indicator 12.2.1: Material Footprint, material footprint per capita, and material footprint per GDP

# Institutional information

**Organization(s):**
United Nations Environment Programme (UNEP)

# Concepts and definitions

**Definition:**
Material Footprint (MF) is the attribution of global material extraction to domestic final demand of a country. The total material footprint is the sum of the material footprint for biomass, fossil fuels, metal ores and non-metal ores.

**Rationale:**
Material footprint of consumption reports the amount of primary materials required to serve final demand of a country and can be interpreted as an indicator for the material standard of living/level of capitalization of an economy. Per-capita MF describes the average material use for final demand.

**Concepts:**
Domestic Material Consumption (DMC) and MF need to be looked at in combination as they cover the two aspects of the economy, production and consumption. The DMC reports the actual amount of material in an economy, MF the virtual amount required across the whole supply chain to service final demand. A country can, for instance have a very high DMC because it has a large primary production sector for export or a very low DMC because it has outsourced most of the material intensive industrial process to other countries. The material footprint corrects for both phenomena.

**Comments and limitations:**
The global material flows database is based on country material flow accounts from the European Union and Japan and estimated data for the rest of the world.

# Methodology

**Computation Method:**
It is calculated as raw material equivalent of imports ($RME_{IM}$) plus domestic extraction (DE) minus raw material equivalents of exports ($RME_{EX}$). For the attribution of the primary material needs of final demand a global, multi-regional input-output (MRIO) framework is employed. The attribution method based on I-O analytical tools is described in detail in Wiedmann et al. 2015. It is based on the EORA MRIO framework developed by the University of Sydney, Australia (Lenzen et al. 2013) which is an internationally well-established and the most detailed and reliable MRIO framework available to date.

**Disaggregation:**

The MF indicator can be disaggregated to four main material categories, a varying number of economic sectors whose expenditure require materials and to three domestic final demand sectors (household consumption, government consumption and capital investment) and foreign final demand (i.e. exports).

**Treatment of missing values:**

- **At country level**

A zero is imputed when no positive real value was officially recorded, in the base data sets used, for any of the underlying components which make up this aggregated total. Thus "0.0" can represent either NA, or a genuine 0.0, or (crucially) a combination of both, which is a common situation. This allows for values to be easily aggregated into further aggregations; however, it should be thus noted that due to imputing missing values as '0.0', the aggregations may represent a lower value than actual situation.

- **At regional and global levels**

Similarly, missing values are imputed as zero in the regional and global aggregations. However, in the case where no data is available at all for a particular country then the per capita and per GDP estimates are weighted averages of the available data.

**Regional aggregates:**
See: http://uneplive.unep.org/media/docs/graphs/aggregation_methods.pdf

**Sources of discrepancies:**

# Data Sources

**Description:**
The global material flows database is based on country material flow accounts from the European Union and Japan and estimated data for the rest of the world. Estimated data is produced on the bases of data available from different national or international datasets in the domain of agriculture, forestry, fisheries, mining and energy statistics. International statistical sources for DMC and MF include the IEA, USGS, FAO and COMTRADE databases.

**Collection process:**
The IRP Global Material Flows and Resource Productivity working group compiles the data from countries and from other sources.

# Data Availability

**Description:**
The data covers more than 170 countries.

**Time series:**
The data set covers each nation individually, over a time period of 47 years (1970-2017).

# Calendar

**Data collection:**
Under discussion

**Data release:**
11 September 2017

# Data providers

National Statistical Offices

# Data compilers

UNEP, OECD and EUROSTAT

# References

**URL:**

**References:**
EUROSTAT (2013). Economy-wide material flow accounts. Compilation guide 2013.
Wiedmann, T., H. Schandl, M. Lenzen, D. Moran, S. Suh, J. West, K. Kanemoto, (2013) The Material Footprint of Nations, Proc. Nat. Acad. Sci. Online before print.
Lenzen, M., Moran, D., Kanemoto, K., Geschke, A. (2013) Building Eora: A global Multi-regional Input-Output Database at High Country and Secotr Resolution, Economic Systems Research, 25:1, 20-49.

# Related indicators

Indicator 8.4.1