STATISTICS DENMARK

Documentation of statistics for Economy-wide material flow accounts 2022

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1 Introduction

The material flow accounts can be used to describe and understand the interaction between the country's economy and the consumption of natural resources. In the material flow accounts, the weight of the materials used in the country's economy as a whole is calculated. Additionally, the total amount of resources globally extracted to produce the materials and goods used in the economy is estimated using raw material equivalents. Material flow accounts measured by weight have been compiled since 2014 and contain published data from 1993 onwards. Material flow accounts measured in raw material equivalents are available from 2008 onwards.

2 Statistical presentation

The material flow accounts are an annual report on the weight of Danish resource extraction, as well as the import and export of goods and natural resources distributed by material types, while the raw material equivalents indicate the amount of raw materials globally used to produce the goods included in the material flow accounts. In both accounts, three derived indicators are also calculated, namely direct material input, domestic material consumption, and physical trade balance. Raw material equivalents are also calculated for imported and exported goods and services.

2.1 Data description

The material flow accounts are of the type EW-MFA, Economy-Wide Material Flow Accounts, which are consistent records of material consumption in national economies. The accounts, as shown in table MRM2, compile the physical material flows into and out of the economy. Thus, the accounts describe the physical consumption of materials in the economy by calculating the weight of the materials and goods moving from nature to the Danish economy (Danish resource extraction) and between the Danish economy and foreign countries (import and export). The accounts also include three derived indicators, namely direct material input, domestic material consumption, and physical trade balance.

Raw material equivalents expand the physical material flow accounts by also accounting for the resource consumption associated with the production of materials and goods that are imported and exported. Raw material equivalents express both the weight of the actual material flow and the weight of the resources consumed in their production. Thus, raw material equivalents describe the amount of materials embedded in the final products included in the countries' economies. Denmark's imports and exports are converted into raw material equivalents using EUROSTAT's RME model.

Read more about Statistics Denmark's material flow accounts on the topic page Material and Waste Accountsor in the working paper Danish Material Flows - Description and Documentation of Statistics Denmark's Material Flow Accounts (only in Danish), which contains more details.

2.2 Classification system

The material flow accounts follow the material groupings classification set by Eurostat (LINK). However, the material categories 1.3M Wood increment and 3.10 Excavated earth materials (including soil) are not included unless used (voluntary reporting).

Raw material equivalents are calculated only for four of the main material types in the calculation of raw material equivalents, and the subdivision of material types is not at the same level of detail as in the physical calculation. This is because the material flows calculated in raw material equivalents are computed using a model, and therefore there is some uncertainty for certain material types at the most detailed level.

The material flows calculated in raw material equivalents are also compiled into 40 service categories, including construction, transportation services, wholesale and retail trade, and electricity supply. The raw material equivalents for goods and service groups follow Eurostat's CPA nomenclature.

2.3 Sector coverage

The material flow accounts are compiled for the entire Danish economy.

2.4 Statistical concepts and definitions

Direct material input: The sum of domestic extraction of natural resources and their imports of goods. Indicates the country's total material input.

Physical trade balance: The difference between imports of goods and exports of goods. It's a measure of Denmark's material dependence on foreign countries.

Domestic material consumption: The amount of materials either consumed or accumulated in the Danish economy. Direct material input minus exports.

Domestic extraction: Extraction of materials such as minerals, metals, fossil energy and biomass within the country's borders.

Material (material flow accounts): All natural resources, products, and byproducts (waste, air emissions, etc.) associated with Danish economic activities. Water is not included in the accounting of materials.

Raw material consumption: Domestic material consumption measured in raw material equivalent.

Raw material equivalent: The amount of raw materials globally required to produce a good or service. The raw material equivalent includes all the raw materials that need to be extracted from nature, including those used in the production processes both by the primary producer and by all subcontractors in Denmark and other countries.

2.5 Statistical unit

The quantity of materials can be calculated for a single product group (both goods and services) or for overarching categories such as total imports, exports, or consumption.

2.6 Statistical population

All units engaged in economic activity on the Danish territory.

2.7 Reference area

Denmark, however, for the resource equivalents, includes global resource extraction.

2.8 Time coverage

The EW-MFA cover the time period from 1993 and onwards.

The RME cover the time period from 2008 and onwards.

2.9 Base period

Not relevant for these statistics.

2.10 Unit of measure

The material flows are measured in tonnes per year.

2.11 Reference period

These statistics covers the calendar year.

2.12 Frequency of dissemination

Yearly.

2.13 Legal acts and other agreements

The legal authority to collect data is provided by the Act on Statistics Denmark, section 8, as subsequently amended (most recently by Act no. 610 of 30th May, 2018).

These statistics are covered by Regulation no. 691/2011 on European environmental economic accounts.

2.14 Cost and burden

There is no direct response burden in relation to the compilation of these statistics, since all information is based on existing statistics.

2.15 Comment

Further information can be found at the subject page on Material flows and waste or by contacting Statistics Denmark directly.

3 Statistical processing

The EW-MFA and the RME are compiled on the basis of internal sources on resource extraction, import and export The RME account is based on modelling.

3.1 Source data

The material flow accounts are based on information from statistics on Danish resource extraction, such as agricultural statistics, forestry statistics, and statistics on the extraction of oil and natural gas, as well as other raw materials (sand, gravel, etc.). Additionally, data on imports and exports from the Foreign Trade in Goods statistics are used.

The model calculation underlying the material flow accounts measured in raw material equivalents is based not only on the mentioned source statistics but also on data on international trade provided by Eurostat.

3.2 Frequency of data collection

Yearly.

3.3 Data collection

Deliveries from other statistics.

3.4 Data validation

Thorough troubleshooting and data validation are conducted on the various source statistics before they are delivered to the Material Flow Accounts. Since not all sources have data for the latest year at the time of the publication of the material flow accounts, the weight of some sources relies on assumptions. Not all goods are measured by weight in the source statistics. The weight of these goods is estimated based on weight measurements in other source statistics or weight estimates from Eurostat.

During the preparation of the Material Flow Accounts, the latest version is compared with previous versions. The purpose is to check the consistency of data over time and to identify any errors in loading, etc.

3.5 Data compilation

Data from the various sources on which the Material Flow Accounts are based are compiled into a unified system using the same definitions and classifications as the National Accounts.

Since the Material Flow Accounts are measured in weight, conversion from value to weight is carried out for material types where weight is not included in the source statistics. This is done using a series of conversion factors.

Material flows measured in raw material equivalents are calculated using a model developed by Eurostat. Eurostat refers to the model as the 'RME-tool', where RME stands for Raw Material Equivalent. The model estimates raw material equivalents for imports and exports and is based on, among other things, data on international trade.

3.6 Adjustment

Not relevant for these statistics.

4 Relevance

The Material Flow Accounts and raw material equivalents are relevant for anyone seeking information on the relationship between the economy and the use of natural resources. The results are pertinent for analyses of sustainable resource consumption, as domestic material consumption serves as an indicator for two of the UN's sustainability goals. The accounts are requested by ministries, agencies, consulting firms, among others. The accounts are part of the European environmental economic accounts collected by Eurostat.

4.1 User Needs

The Material Flow Accounts play a central role in building a deeper understanding of resource management and consumption patterns, both at the national and global levels. It can be used to evaluate resource efficiency, highlight sustainability challenges, and contribute to the transition towards sustainable production and consumption.

Users of the Material Flow Accounts include ministries, industry associations, research institutions, consulting engineering firms, and others who seek an overview of the connections between the economy and the environment.

4.2 User Satisfaction

The Material Flow Account is discussed with significant expert users within the Expert Committee for Environmental Economic Statistics and Accounts (EMØRS). Information on user satisfaction is not collected separately, but the needs and satisfaction of users are discussed within the contact committee.

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4.3 Data completeness rate

Import and export data, along with the derived indicators in the EW-MFA can be considered complete. In order to fulfil the Eurostat's requirements for completeness within the EW-MFA, some additional flows of residuals (emissions to air, among others), as well as material accumulation in the economy, have to be accounted for as well.

5 Accuracy and reliability

The overall Material Flow Accounts are based on a range of well-established official statistics. However, the information about the weight of different material types relies in some cases on conversion factors from other units, introducing uncertainty. Additionally, the raw material equivalents are based on a relatively new calculation method involving model calculations and a wide range of assumptions and estimates. Consequently, these figures are associated with greater uncertainty and primarily express orders of magnitude.

5.1 Overall accuracy

The overall Material Flow Accounts are based on a range of well-established official statistics. However, the information about the weight of different material types relies in some cases on conversion factors from other units, introducing uncertainty. Additionally, the raw material equivalents are based on a relatively new calculation method involving model calculations and a wide range of assumptions and estimates. Consequently, these figures are associated with greater uncertainty and primarily express orders of magnitude.

5.2 Sampling error

Not relevant for these statistics.

5.3 Non-sampling error

The compilation of imports and exports is based on information about the weight of imported and exported goods from foreign trade statistics, as well as information about the weight of energy products from energy accounts. There is a certain level of uncertainty associated with the weight information in these source data. Additionally, not all goods are measured by weight in the data sources. Therefore, for some material types, a conversion factor from economic information to material weight is used. This introduces an additional level of uncertainty to the weight information for these goods.

The Material Flow Accounts measured in raw material equivalents are based on a model calculation where the total material consumption for imports and exports of goods is calculated based on estimated raw material equivalents. Since this involves model calculations and estimates, there is a significant level of uncertainty associated with the numbers.

5.4 Quality management

Statistics Denmark follows the recommendations on organisation and management of quality given in the Code of Practice for European Statistics (CoP) and the implementation guidelines given in the Quality Assurance Framework of the European Statistical System (QAF). A Working Group on Quality and a central quality assurance function have been established to continuously carry through control of products and processes.

5.5 Quality assurance

Statistics Denmark follows the principles in the Code of Practice for European Statistics (CoP) and uses the Quality Assurance Framework of the European Statistical System (QAF) for the implementation of the principles. This involves continuous decentralized and central control of products and processes based on documentation following international standards. The central quality assurance function reports to the Working Group on Quality. Reports include suggestions for improvement that are assessed, decided and subsequently implemented.

5.6 Quality assessment

No measurements of quality has been done, however the quality of the statistics is seen as best possible, given the resources available for the compilation of accounts. The EW-MFA have the scope and the degree of detail that is on the same level as other countries, such as Netherlands, Sweden and Norway. Accounts are compiled in accordance with recommendations and quality standards provided by UN and Eurostat.

5.7 Data revision - policy

Statistics Denmark revises published figures in accordance with the Revision Policy for Statistics Denmark. The common procedures and principles of the Revision Policy are for some statistics supplemented by a specific revision practice.

5.8 Data revision practice

Preliminary numbers are compiled and published in March. The final numbers are published in March three years and three months after the reference year.

The publication of the Material Flow Accounts in December 2020 includes a revision of the previously published time series with domestic extraction of the material type 1.3.1. Timber (industrial wood, incl. firewood) for the period 1993 – 2018. The revision incorporates an error correction of the classification of Danish firewood, which must be part of the material type 1.3.1.

The revision includes the domestic extraction of the material types 1.3.1. Timber (industrial wood, incl. firewood), 1.3 Wood and products thereof and 1 Biomass.

6 Timeliness and punctuality

The statistics are published three years and three months after the end of the reference period. The statistics are typically published without delays compared to the planned timing.

6.1 Timeliness and time lag - final results

Preliminary figures are compiled and published in March. The final figures are published in March three years after the reference year.

6.2 Punctuality

The environmental accounts are normally published without delay in relation to the scheduled publication.

7 Comparability

The Material Flow Account follows the UN's standard for environmental economic accounts, the System of Environmental Economic Accounting (SEEA). Therefore, the account is comparable to other countries' Material Flow Accounts that adhere to the same guidelines.

7.1 Comparability - geographical

The Material Flow Account is prepared in accordance with existing international standards and follows the UN's standards for environmental economic accounts, the System of Environmental Economic Accounting (SEEA). The account is reported to Eurostat and is comparable to statistics from other countries that adhere to the same standards.

7.2 Comparability over time

The Material Flow Accounts are available for each year from 1993 until the last year that is published (from 2008 for the RME). The Material Flow Accounts are consistent and fully comparable within these years.

7.3 Coherence - cross domain

The Material Flow Account is part of the green national accounts and is prepared with the same boundaries as the National Accounts. The Material Flow Account forms the basis for the preparation of the Detailed material flow accounts (physical supply-use tables), where material consumption is reported at the industry level. The Energy Account contains the same information about fossil energy and its products as the Material Flow Account. However, the relevant quantities are reported in gigajoules.

7.4 Coherence - internal

It is ensured that data is internally consistent.

8 Accessibility and clarity

These statistics are in a Danish press release. In the StatBank, these statistics can be found under the subject Material flows and waste. In addition the statistics has a subject page.

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8.1 Release calendar

The publication date appears in the release calendar. The date is confirmed in the weeks before.

8.3 User access

Statistics are always published at 8:00 a.m. at the day announced in the release calendar. No one outside of Statistics Denmark can access the statistics before they are published.

8.2 Release calendar access

The Release Calender can be accessed on our English website: Release Calender.

8.4 News release

These statistics are published monthly in a Danish press release.

8.5 Publications

The working paper Danish Material Flows - Description and Documentation of Statistics Denmark's Material Flow Accounts describes the various material flow accounts produced and published by Statistics Denmark in the Statistics Bank. The paper provides an overview of the data available in the Statistics Bank and describes the methods and source data used in compiling the accounts.

These statistics are included in the Statistical Decade Overview. Material flows measured in raw material equivalents were part of the DST analysis How does our consumption affect the world's natural resources?.

8.6 On-line database

The statistics are published in the StatBank under the subject Material flows and waste in the following table:

- MRM2: Economy-wide material flow accounts by material type and indicator
- RME1: Material flows converted to raw material equivalents by type of raw material and indicator
- RME2: Import and export in raw material equivalents by goods and services and type of raw material

Furthermore, an SDG indicator is published based on the Material Flow Accounts, measured in tons per capita:

- SDG08043: Domestic material consumption unit of measurement

8.7 Micro-data access

Accounts are published at the most detailed level.

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8.8 Other

Not relevant for these statistics.

8.9 Confidentiality - policy

The statistics are published at a level that does not require further disaggregation.

8.10 Confidentiality - data treatment

Not relevant for these statistics.

8.11 Documentation on methodology

- Statistics Denmark (2018): Green National Accounts for Denmark 2015-2016.
- European Commission. Eurostat (2018): Economy Wide Material Flow Accounts Handbook
- Statistics Denmark (2019): How the Danish consumption affects the world's natural resources
- Eurostat (2019): Documentation of the EU RME model
- Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank (2012): System of Environmental-Economic Accounting 2012 - Central Framework.

8.12 Quality documentation

Results from the quality evaluation of products and selected processes are available in detail for each statistics and in summary reports for the Working Group on Quality.

9 Contact

The administrative placement of these statistics are in the division of National Accounts. The person responsible is Aya Permin, tel. +45 39 17 38 64, e-mail: aya@dst.dk

9.1 Contact organisation

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9.2 Contact organisation unit

National Accounts, Economic Statistics

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