STATISTICS DENMARK

Documentation of statistics for Detailed material flow accounts (physical supply-use tables) 2018

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1 Introduction

The purpose of the detailed material flow accounts is to shed light on the type and quantity of all materials (natural resources, goods, residuals) linked to industries, private and government consumption, etc.

The accounts can be used for analysis of the physical proportions of resource use, output of goods and residuals, external trade, etc. Thereby they give information, which are useful in relation to analysis of circular economy, etc.

The accounts are available for 2018.

2 Statistical presentation

The accounts present information about flows of natural resources, goods and residuals (waste and emissions to air, etc.) measured as tonnes per year. The accounts include all type of materials, which are used or supplied.

The flows are recorded by industries and other categories, e.g. extraction from nature, imports, exports, private and government consumption, emissions to the environment, etc.

The accounts are balanced, which means that the quantity of materials used by an industry equals the quantity of materials, that leaves the industry as sold products and residuals.

2.1 Data description

The detailed material flow accounts present information on flows of materials (natural resources, waste and other residuals), which take place in relation to the economic activities.

The flows are measured in tonnes per year.

The material flow accounts include all types of materials, that are used or produced in Denmark. The flows are allocated by industries, etc. and by supply or use.

The material dimension of the accounts include four main groups:

1) Natural resources

2) Goods

3) Residuals

4) Balance

Each of the three first main groups are further allocated to a number of more specific groups.

The supply and use dimension includes on one side information on where the materials come from (nature, imports, output from industries or from accumulations). On the other side, it is shown in what way the materials are used (emissions to nature, intermediate consumption, private or government consumption, exports or accumulation).

The accounts are balanced, which means that the quantity of materials an industry uses is equal to the quantity that leaves the industry as sold products and residuals (waste, air emissions, etc.).

In principle, the accounts have a complete coverage in the sense that all Danish material flows are described.

At the most detailed publishing level, the accounts include 182 material types and 48 categories for supply and use.

The categories for supply and use follow broadly speaking the classification used by the national accounts for industries and other uses in the form of private and government consumption, capital formation, exports, etc.

2.2 Classification system

The detailed material flow accounts include two dimensions (besides the time dimension):

A) Type of materials and B) supply and use categories.

A) Material type consists of four main groups :

1) Natural resources are grouped according to type (biomass, minerals, fossil energy) and whether they are e.g. primary crops, crop residues, wood, fish, chalk, sand, gravel, crude oil and natural gas, etc.

2) Goods are in general grouped according to the principle in Classification of products by activity in the European Union (CPA)
(see CPA classifikation). However, certain adjustments of codes and text has been made in order to clarify the content in relation to the material flow accounts.

3) Residuals are grouped according to the following:

- Primary waste include the same types and quantities, which are included in the waste accounts (see Statistical declaration for waste accounts),i.e. quantities which have been collected but are not treated yet.
- Secondary waste are the results of primary waste, which to some extent have been treated by a waste treatment facility before being brought to recycling.
- Waste products, not elsewhere counted, are similar to waste, but is not recorded in the waste accounts (typically scrap).
- Waste for incineration are quantities of waste, which are actually incinerated with energy production.
- Other residuals include manure, materials to sewer and materials spread in environment (e.g. salt and wood chips).
- Emissions to air, energy related cover carbon, sulphur, water, hydrogen, etc. included in fuels and released to the atmosphere during combustion. Oxygen, etc., which originates form combustion air is not included.
- Emissions to air, process related include substances, which are released by various chemical processes, for instance emissions generated by cement production.

4) Balance is an accounting item, which expresses a lack of full coherence between supply and use for a given industry or other category, when natural resources, goods and residuals are considered. If, for instance, the use of natural resources, products and residuals in a specific industry (inputs) is bigger than the supply from the industry (outputs), the balancing item will make sure that total supply equals total use.

The balancing item can be interpreted partly as uncertainties related to other items in the accounts, partly as materials that are (de-)accumulated in the industry/category. Also evaporation of water, not included elsewhere, will be part of the balancing item.

The most detailed level (StatBank tables MSR3O, MSR3T, MSR3A) presents 182 material types. At the intermediate level (StatBank tables MSR2O, MSR2T, MSR2A) they have been aggregated to 57 groups. The most aggregated StatBank tables (MSR1O, MSR1T, MSR1A) include 24 groups.

B) Categories of sypply and use The categories on the supply side (tables MSR1T, MSR2T, MSR3T) show the origin of the materials:

- Extraction of natural resources (origin in the environment)
- Imports (materials received from abroad)
- Residuals from private and government consumption (waste and other residuals)
- Disposals and scrap from capital, etc.
- Reductions in inventories
- Industries' output

Industries are - with minor changes - classified as in the national accounts (10a3, 19a2 and 69a3, see the classification of the national accounts)

- Total supply is the sum of the above items
- Output from industries, total is the sum of supply from all industries
- Other supply, total is the sum of extraction of natural resources, imports, residuals from private and government consumption, disposals and scrap from capital, etc. and reductions in inventories

Categories on the use side (tables MSR1A, MSR2A, MSR3A) show the recipients/destinations of the materials:

- Residuals to the environment (e.g. emissions to air)
- Exports
- Private and government consumption
- Capital formation
- Increases in inventories, etc.
- Industries' intermediate consumption. Industries are classified in the same way as on the supply side (see above).
- Total use is the sum of the above items
- Intermediate consumption, total is the sum of intermediate consumption of all industries.
- Other use, total is the sum of residuals to environment, private and government consumption, capital formation and increases in inventories, etc.

The categories on the supply and use side may be interpreted as representing the same units (environment, rest of the world, industries, households, capital and inventories)

2.3 Sector coverage

The accounts includes the entire Danish economy.

2.4 Statistical concepts and definitions

Consumption in production: The value of the goods and services used in production, including the cost of repair and maintenance.

2.5 Statistical unit

The units used in the accounts are all physical flows between industries, households,capital, inventories, rest of the world and the environment.

2.6 Statistical population

The accounts cover all physical flows, which takes place within the Danish territory. However, also physical flows abroad related to Danish transport companies' bunkering, etc. for ships air planes and vehicles are included.

2.7 Reference area

Denmark exclusive of the Faroe Islands and Greenland.

2.8 Time coverage

The accounts cover 2018

2.9 Base period

Not relevant for these accounts.

2.10 Unit of measure

Tonnes per year.

2.11 Reference period

The accounts cover physical flows, which have taken place during the year.

2.12 Frequency of dissemination

Has not been decided yet.

2.13 Legal acts and other agreements

The accounts are implemented as part of the work on environmental-Economic Accounts (cf. the Finance Act for2021 $15 (in Danish))

2.14 Cost and burden

The accounts are based on data, which are collected by Statistics Denmark in relation to other kinds of statistics. Thus, there is no direct response burden in relation to the compilation of these accounts.

2.15 Comment

Further information can be obtained by contacting

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STATISTICS DENMARK

3 Statistical processing

The accounts are based on several sources, for instance, International trade in goods, Purchases and sales by manufacturing industries, and Environmental-Economic Accounts, etc. supplemented by data from reports and websites. The primary data are processed and supplemented by estimations and allocations, after which they are organised in a so-called physical supply-use table. Finally, this table is adjusted in such a way that supply equals use.

3.1 Source data

The detailed material flow accounts are based on several statistical sources and accounts from Statistics Denmark. The most widely used are International trade in goods, Purchases and sales by manufacturing industries, and *Environmental-Economic Accounts*. Energy and emissions, Materials and waste and Annual national accounts.

Detailed information from the annual national accounts by industries (in 1000 DKK) are used as keys to allocation of the material flows on the use side when no direct sources are available.

Other data are obtained from reports and websites of the Danish Environmental Protection Agency, Danish Energy Agency, etc. and from websites etc. from companies and organisations.

3.2 Frequency of data collection

Data used for the detailed material flow accounts are retrieved from the basic statistics when the accounts are implemented. Data for most of the basic statistics are collected yearly. However some (e.g. the International trade in goods) are collected monthly.

3.3 Data collection

The main part of the data are delivered electronically from the primary statistics in Statistics Denmark. In addition, supplementary data are retrieved from freely accessible report and webpages.

3.4 Data validation

Besides the validation of data that takes place in relation to the primary statistics, further validation procedures are carried out specifically in relation to the material flow accounts. There is no uniform validation procedure applied for all data, but, typically, an assessment is made of whether the data have the right sign and order of magnitude. Further, different data are confronted to ensure, for instance, that the supply of each good is equal to the use.

Often, the validations lead to further investigations of a specific industry or material type. The breadth and depth of the various validation procedures are dependent on how important the specific data are assumed to be for the complete accounts' accuracy.

3.5 Data compilation

1) Data from the primary statistics are first converted and enumerated in order to ensure that all data are in tonnes, and that they have a complete coverage. The conversion factors are densities, unit weights and prices per kilo.

2) All available data are organised in a so-called supply-use table. On the supply side it shows extraction of natural resources, output and imports and on the use side it shows intermediate consumption, private and government consumption, capital formation, and changes in inventories, exports and emissions to the environment. The supply-use table at this level includes approximately 2000 natural resources, goods and residuals and a few hundred supply and use categories.

3) Missing data are estimated, typically by balancing procedures and use of allocation keys.

4) Obvious inconsistencies are assessed and adjusted, for instance, if total use of a good are greater than the total supply of the same good.

5) Each of the supply and use categories is assessed and adjusted in order to ensure that for the category (e.g. an industry) there is a balance between inputs on one side and outputs from the category on the other. The adjustments are made, for instance, by moving the use of materials from one industry, which has too much inputs to an industry that has to little inputs. The adjustments are as far as possible made in a way that do not alter the original primary data.

6) After the adjustments along both the material dimension (step 4) and the supply-use dimension (step 5) have been made, the detailed supply-use table is aggregated into the supply-use table that are published.

3.6 Adjustment

There are no adjustments besides those already mention under Data compilation.

4 Relevance

The accounts are of relevance to all, who are interested in information about those physical material flows that take place in relation to the Danish economy. It can be used as a basis for analysis of the circular economy, e.g. for analysis of which industries that use or produce certain types of materials.

4.1 User Needs

The detailed material flow accounts may be used by everyone interested in information about the physical material flows, which take place in the Danish economy.

It can be expected that the primary users will be professionals, that wish to analyse, for instance, aspects of the circular economy. It could be, for instance, analysis of which industries that use or produce certain material types.

4.2 User Satisfaction

Feedback can be given directly to the contact person.

4.3 Data completeness rate

The accounts cover the full area they are supposed to cover.

The accounts are in accordance with the guidelines, that can be derived from the international standard for environmental-economic accounts: System of Environmental-Economic Accounting - Central Framework SEEA CF

5 Accuracy and reliability

In general it can be assumed that there are less uncertainties associated with data obtained directly from primary statistics, while data that results from estimations and allocations will be associated with more uncertainties.

The balancing item, which is represented in the accounts, is to some extent a result of inaccuracies related to other items in the accounts. However, it cannot directly be used as a measure of the uncertainties, since it may also reflect other special relations.

No estimations of the magnitude of the uncertainties have been made.

5.1 Overall accuracy

It should be expected that the parts of the accounts that are closely linked to the primary statistics are more precise than the other parts. Data, which results from estimations and assumptions should therefore be used with caution.

No estimations of the magnitude of the uncertainties have been made. In general it can be assumed that there are less uncertainties associated with data for extraction of resources, output from industries, imports and exports, energy use, air emissions from industries and and households, and generation of waste from industries and households.

More uncertainties are on intermediate consumption in specific industries, private and government consumption, and other uses except exports. For some uses, especially for very small and uncharacteristic material quantities, it can be expected that the uncertainties are extraordinary high.

The balancing item, which is represented in the accounts, is to some extent a result of inaccuracies related to other items in the accounts. However, it cannot directly be used as a measure of the uncertainties, since it may also reflect other special relations.

5.2 Sampling error

Not relevant for these accounts.

5.3 Non-sampling error

Has not been estimated.

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

The detailed material flow accounts present a coherent exposition of, in principle, all physical flows of natural resources, goods and residuals including an allocation by industries and other supply and use categories. Generally, the primary data used in the accounts may be seen as the best that are available, while data obtained by estimations and assumptions should be used with caution.

It cannot be excluded that for specific areas other more reliable data are available than the data, which have been estimated for the accounts based on modelling and assumptions. Statistics Denmark intends on a current basis and to the extent possible, to include such specific data in future versions of the accounts.

It is an advantage that the accounts have a full coverage of all material types and all industries, etc. in the Danish economy. In addition, an internal consistency is ensured, which means that data are not in contradiction with each other. There is also a high degree of coherence with the national accounts since many of the same classifications and definitions are used.

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

No revisions are planned for published accounts, but new data sources and estimation methods may be introduced in relation to accounts for subsequent years.

6 Timeliness and punctuality

The accounts for 2018 have been published approximately 4 years after the end of the reference year (2018). The accounts are published without delay compared to the announced time of publication in the release calendar.

6.1 Timeliness and time lag - final results

The accounts for 2018 have been published approximately 4 years after the end of the reference year (2018).

6.2 Punctuality

The accounts are published without delay with reference to the announced time of publication in the release calendar.

7 Comparability

The accounts are available for 2018 and in an earlier version for 2016. The two versions are not fully comparable due to changes in source data and methods.

This type of accounts is - as far as we know - only available for the Denmark and the Netherlands, but with different classifications. Thus, it is not possible to make direct international comparisons.

For certain items it is possible to compare over time and with other countries by looking at the primary data that lie behind the accounts.

7.1 Comparability - geographical

This type of accounts is - as far as we know - only available for Denmark and the Netherlands, but with other classifications. Thus, it is not possible to make direct international comparisons.

For certain items it is possible to compare with other countries, by looking at the primary data, that are behind the accounts.

7.2 Comparability over time

The accounts are available for 2018 and in an earlier version for 2016. The two versions are not fully comparable due to changes in source data and methods.

However, for certain items it is possible to compare over time by looking at the primary data that are behind the accounts.

7.3 Coherence - cross domain

Data for extraction of natural resources, waste, supply and use of energy, and emissions to air are comparable with other data from the *Environmental-Economic Accounts*.

Import and exports data are comparable with data from *International trade in goods*.

Output of goods is comparable with data in *Purchases and sales by manu-facturing industries*

It is in general possible to compare data for output of goods and intermediate consumption with similar data from the national accounts. However, due to enumerations and consolidation of data in the material flow accounts it may not in all cases be possible to compare data across different statistics and accounts.

7.4 Coherence - internal

Data are internally coherent.

8 Accessibility and clarity

The accounts are published via StatBank. The tables can be found by following the link: Detailed Material Flow Accounts Selected items from the accounts are published in Danish publications.

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

Selected items from the accounts are published in a Danish press release, at the same time as the tables are updated in StatBank.

8.5 Publications

Description and documentation of the material flow accounts published by Statistics Denmark is available in Danish in De danske materialestrømme.

The documents Accounts for Danish Packaging Flows and Accounts and indicators for Danish Plastic Flows include descriptions of the detailed material flow accounts and presents results from analysis based on the accounts.

STATISTICS DENMARK

8.6 On-line database

The statistics are published in the StatBank in the following tables:

MSR1O
MSR1T
MSR1A
MSR2O
MSR2T
MSR2A
MSR3O
MSR3T
MSR3A

8.7 Micro-data access

There is no access to micro-data.

8.8 Other

Data from the accounts are only available as tables in the Statbank.

8.9 Confidentiality - policy

Data Confidentiality Policy for Statistics Denmark is applied.

8.10 Confidentiality - data treatment

It has not been necessary to apply specific confidentiality measures.

8.11 Documentation on methodology

Description and documentation of the material flow accounts published by Statistics Denmark is available in Danish in De danske materialestrømme.

The documents Accounts for Danish Packaging Flows and Accounts and indicators for Danish Plastic Flows include descriptions of the detailed material flow accounts and presents results from analysis based on the accounts.

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 accounts is in the division of national accounts.

The person responsible is Ole Gravgård, phone: + 45 3917 34 88, e-mail: ogp@dst.dk.

9.1 Contact organisation

Statistics Denmark

9.2 Contact organisation unit

National Accounts, Economic Statistics.

9.3 Contact name

Ole Gravgård

9.4 Contact person function

Responsible for the statistics

9.5 Contact mail address

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9.7 Contact phone number

+45 3917 3488

9.8 Contact fax number

N/A