STATISTICS DENMARK

Documentation of statistics for Detailed material flow accounts (physical supply-use tables) 2016

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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 2016.

2 Statistical presentation

The accounts present information about flows of natural resources, goods and residuals 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, amounts of waste, air emissions, etc.

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 and

4) Balances.

Each of these main groups are further allocated to a number of more specific and narrow 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, waste, air emissions, etc. In principle, the accounts have a complete coverage in the sense that all Danish material flows are described at a certain level.

At the most detailed publishing level, the accounts include 182 material types and 76 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. So far, the accounts have only been implemented for 2016.

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. At the overall level there is accordance with the grouping used in the economy wide material flow accounts (see Statistical declaration for EW-MFA.

2) Goods are in general grouped according to the principle in Classification of products by activity in the European Union (CPA)
(see EU's 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.
- Waste products not elsewhere counted (n.e.c) 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, including flows to environment and sewerage include manure, materials to sewer and materials spread in environment (e.g. 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. For instance, only the carbon (C) from CO2, not the oxygen (O) is 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, at the most detailed dissemination level, split into a balance for construction materials and a balance for other materials. These balances are accounting items, which express 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 materials in a specific industry (inputs) are bigger than the supply from the industry (outputs), the balancing item on the supply side will make sure that total supply equals total use.

Balancing items 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 items.

The most detailed level (StatBank tables DMR3O, DMR3T, DMR3A) presents 182 material types. At the intermediate level (StatBank tables DMR2O, DMR2T, DMR2A) they have been aggregated to 57 groups. The most aggregated StatBank tables (DMR1O, DMR1T, DMR1A) include 25 groups.

B) categories of sypply and use The categories on the supply side (tables DMR1T, DMR2T, DMR3T) show the origin of the materials:

- Extraction of natural resources (origin in the environment)
- Imports (materials received from abroad)
- Residuals from private consumption (waste and other residuals)
- Residuals from government consumption (waste and other residuals)
- Disposals and scrap from capital, etc.
- Reductions in inventories
- Industries' output. Industries are classified based on the classification of the national accounts (10a3, 19a2 and 69a3, see the classification of the national accounts), however with some modifications.
- 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, scrap, etc. from capital and decrease in inventories.

Categories on the use side (tables DMR1A, DMR2A, DMR3A) show the recipients/destinations of the materials:

- Residuals to the environment (e.g. emissions to air)
- Exports
- Private consumption
- Government consumption
- Capital formation
- Increases in inventories
- 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.

The categories on the supply and use side may be interpreted as representing the same units (environment, rest of the world, industries, households, the government, 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, government, 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 excl. the Faroe Islands and Greenland.

2.8 Time coverage

The accounts cover 2016.

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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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 at 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 for most of the primary statistics are collected yearly. However some (e.g. the International trade in goods) are collected monthly. Retrieval of data from the primary statistics for use in the detailed material flow accounts will take place with the same frequency as for the accounts, cf. Frequency of data collection.

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, 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 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 have too much inputs to an industry that have to little inputs, or the other way around. 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 (182 material types and 76 supply-use categories).

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. In additions, the accounts may be of interest in relation to the construction of models that can shed light on the material footprint of consumption.

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.

It can also be expected that the detailed material flow accounts will be of interest in relation to the construction of models, which can, for instance, estimate the material footprint of consumption, etc.

4.2 User Satisfaction

Feedback can be given directly to the contact person and via the Committee for Environmental Economic Accounts and Statistics.

4.3 Data completeness rate

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

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5.2 Sampling error

Not relevant for these accounts.

5.3 Non-sampling error

The accounts cover, in principle, the full area they are supposed to cover.

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 very 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.

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5.8 Data revision practice

The accounts are new and no procedures have been developed yet.

6 Timeliness and punctuality

The first version of the accounts are published four years and three month after the end of the reference period (2016). The accounts are released on time as stated in the release calendar. For future versions it is expected that the will be a lag of a little more than three years between the end of a year and the publication of a detailed material flow accounts for that year.

6.1 Timeliness and time lag - final results

There has been a long production period for this first version of the accounts due to the development of new methods and it-software. For future versions it is expected that there will be a lag of a little more than three years between the end of a year and the publication of a detailed material flow accounts for that year.

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 only available for 2016. This type of accounts is - as far as we know - only available for the Netherlands, but with different classifications. Thus, it is not possible to make direct international comparisons. However, for certain items it is possible to compare over time and with other countries by looking at some of 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 the Netherlands, but with other classifications. Thus, it is not possible to make direct international comparisons. However, for certain items it is possible to compare with other countries, by looking at some of the primary data, that are behind the accounts.

7.2 Comparability over time

The accounts are only available for 2016. However, for certain items it is possible to compare over time by looking at some of 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 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 conversions and enumerations it will not in all cases be possible to find an exact match of the data across the 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 a Danish press release.

8.1 Release calendar

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

8.2 Release calendar access

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

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.

8.4 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

The accounts have not yet been published in a publication.

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8.6 On-line database

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

DMR1O
DMR1T
DMR1A
DMR2O
DMR2T
DMR2A
DMR3O
DMR3T
DMR3A

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

No descriptions are available yet.

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 tel.: + 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

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