STATISTICS DENMARK

Documentation of statistics for Environmental Multiplier Tables 2025

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1 Introduction

Dissemination of environmental multipliers is a service for users interested in the interaction between the environment and the economy. The multipliers connect environmental statistics with national accounts statistics at a detailed level and provides a picture of the effects that changes in economic final demand have on selected environmental variables. The environmental multipliers are aggregated measures of the total environmental effect on industries of specific changes in final demand in terms of waste generation, water consumption, generation of waste, CO2 emissions or other impacts.

2 Statistical presentation

The environmental multiplier tables are organized in the following way. Firstly, they contain a reproduction of certain environmental data, which are also found in the Green National Accounts. Secondly, they contain an estimate of some direct effects calculated as the relative share between the same environmental data by industry and and central national accounts variables, typically total output by industry. Finally, the tables contain direct effects (in one industry) and indirect effects (all involved industries) of various types of final demand calculated with an input-output model.

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2.1 Data description

Environmental multipliers are aggregated measures of the total effect in all industries brought about by changes in the final demand for output from one specific industry or one specific type of final demand. The total effects are measures as e.g. amounts of waste generated, consumption of water, emissions of CO2 or other environmental pressures. The statistics are able to tell e.g. how many 1000 m3 of water are required if the exports by Danish slaughterhouses are to increase by say 1 billion DKK. Alternatively, it can tell how much CO2 will be generated if consumption of food products by Danish households is increased by 1 billion DKK as well.

In the tables there is a distinction between direct and indirect effects. The direct effects can be already disseminated environmental statistics or they can be simple measures of the relationship between environmental and economic variables. Indirect effects - or multipliers - are calculations in a simple modeling framework of the effects in all the industries which are indirectly involved in production of input / intermediate consumption either to the industry under consideration or to some industry further up the production chain.

The statistics comprise 7 different environmental themes energy, emissions, waste by fraction, waste by method of treatment, waste by its dangerousness, water and waste water. Moreover, the tables are split in three different types MU1, MU2, and MU3, a total of 19 tables.

The MU1 tables concentrates on direct and indirect effects of final demand for output from single industries looked at in isolation. As an example the MU1 table for waste by fraction firstly shows the total waste by fraction generated by industries. Then, in the second step these amounts of waste are related to total output by industries in order to obtain the direct effect or the waste productivity by industries. It tells how much waste is generated by each industry in isolation if output is increased by one unit or e.g. by one million DKK. Finally, the MU1 table shows the indirect effects as a sum of the effects in all industries from an increase in demand for output from output in one specific industry.

MU2 tables are focused on direct and indirect effects on final demand categories rather than industries. Private consumption of food is produced in some industries, which thus has an environmental impact. It is the direct effect. However, all the inputs that these food-producing industries use have environmental impacts when produced in other industries. For example, there are emissions of CO2 in the electricity industry as a result of the production of piglets in the agricultural area, which later through slaughterhouses will become Danish food consumption. All these indirect effects are recognized in the environmental multiplier of food consumption.

MU3 tables are an additional dimension of the MU1 table, which indicates which direct and indirect environmental effects in individual industries can be attributed to different types of final use, such as consumption, investment or exports. For example, for the agricultural industry it can be seen how much of the total water consumption is attributable to Danish consumption, or to exports.

2.2 Classification system

The green national accounts are developed as a satellite account to the national accounts, and are therefore based on the same classifications and groupings as here. The same goes for the input-output tables.

Danish Industry Code 2007 (DB07), a Danish version of the international nomenclatures EU NACE Rev. 2 and UN ISIC, Rev. 4, contains a number of default groupings: 127, 36, 19, and 10 groupings. The final national accounts 117 industry group corresponds - with few deviations - to the 127 standard grouping and the 117 industries of the national accounts can be aggregated to the other standard groups. National accounts can thus be compared and used in conjunction with other statistics using the DB07 standard groups.

Household consumption as well as the individual part of public consumption are found in the input-output tables broken down by the COICOP classification, while the collective share of public consumption is split according to the COFOG classification.

However, comparisons with other statistics at a detailed level of industries will often show deviations, partly due to variable definition differences, partly as a result of the national accounts desire for calendar year delimitation and its requirements for overall coverage of economic activity.

Internationally, there is a high degree of comparability with other countries' national accounts, as the Danish national accounts are prepared in accordance with the ENS2010 guidelines

2.3 Sector coverage

Danish Industry Code 2007 (DB07), a Danish version of the international nomenclatures EU NACE Rev. 2 and UN ISIC, Rev. 4, contains a number of default groupings: 127, 36, 19, and 10 industry classifications. These groups are customized in the national accounts, so it is groupings of industries 117, 69, 38, 21 and 13. This includes the transport sector or the food sector, both of which can be formed by aggregating certain industries. Sectors in the national accounting sense, including the household sector or the financial sector, run across national accounts industries. No specific multipliers have been calculated for the national accounts sectors.

2.4 Statistical concepts and definitions

The Green National Accounts: The purpose of the Green National Accounts is to identify the significance of nature for the economic activities, how economic activities affect the environment and how nature is part of our national wealth in a broad sense. These are factors that are important for ensuring sustainable development, and are central to measurement and follow-up on, among other things, United Nations World Development Goal.

The Green National Accounts have been prepared based on the international guidelines set by the UN and other international organizations in the System of Environmental Economic Accounting - Central Framework. This ensures that the Danish Green National Accounts is based on a recognized and tested system, which also enables international comparisons.

Input-output tables: The input-output tables are an organized summary of detailed economic statistical information and describe the relationships between production, imports and final demand in the economy for a given year. An input-output table is a further specification of the national accounts's three main accounts for goods and services, production and income formation, respectively. At the same time, the tables form the basis for setting up a so-called input-output model, which allows for calculations of direct and indirect relationships in the economy.

Environmental multipliers: Environmental multipliers are aggregate measures for the overall environmental impact in all industries in the economy of specific changes in final demand either in a specific sector of a specific final demand category. Effects can be measured in e.g. water consumption, CO_2 emissions or other environmental variables.

2.5 Statistical unit

The unit in the national accounts industries is basically the local kind of activity unit, which is the smallest unit for which a production account can be set up.

2.6 Statistical population

All units generating Danish economic activity.

2.7 Reference area

Denmark

2.8 Time coverage

The individual multiplier tables do not necessarily cover the same time periods. The time coverage in the energy and emissions tables starts in 1990 in accordance with what is published in the emissions accounts tables. There are a couple of annual updates of both emission accounts and energy accounts. Update of the multiplier tables are done in accordance with this update as well as the annual update of national accounts and input-output tables so that the latest possible data is always available. There will typically be a more limited and less detailed coverage in the last year. The faster emissions accounts show emissions of carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), divided into only 21 industries for the past year. For this reason, the multiplier tables can not be more detailed.

The tables for water, wastewater and waste cover fewer years, dictated by what was possible at their first drafting in the years 2016-2017. The coverage depends primarily on how many years it has been possible to cover from available sources. The update of water and waste accounts was stopped in 2018 due to lack of resources, but resumed in 2019.

2.9 Base period

Time series for coefficients and multipliers are offered in current prices as well as chained values. The chain values have 2020 as the base year.

2.10 Unit of measure

The statistics contain both physical and economic variables. Therefore, there is no single continuous measurement unit. They may be, for example, Mio. DKK, Tons, 1000 Tons, m3, Tons per mio. DKK etc. The individual statistics are provided with indications of the units.

2.11 Reference period

The multiplier tables refer to the calendar year. The flow measures in the table cover transactions that have taken place during the year.

2.12 Frequency of dissemination

This is an annual statistics, but as the underlying statistics are updated more than once a year, new versions of the multiplier tables are also published more than once a year.

2.13 Legal acts and other agreements

Data are used in these tables, which are already published in other tables, and therefore no special data was collected for these statistics. The data used is based on the following legislation.

Lov om Danmarks Statistik §§ 6 og 8-12.

Europa-Parlamentets og Rådets forordning (EU) Nr. 549/2013 af 21. maj 2013 om det europæiske national- og regionalregnskabssystem i Den Europæiske Union (ESA2010) (EUT L 174 26.06.2013, s. 1).

Europa-Parlamentets og Rådets forordning nr. 691/2011 om europæiske miljøøkonomiske regnskaber.

2.14 Cost and burden

The statistics are based on information from existing statistical sources. Therefore, there is no direct reporting burden in the compilation of these statistics. Input-output tables are derived from the final national accounts.

2.15 Comment

Further information can be obtained from Statistics Denmark.

3 Statistical processing

This statistics is based on two already published sources, namely the green national accounts and input-output tables. Thus, data was not collected specifically for this statistic. Certain parts of the two sources are reproduced in the tables, but the primary contribution lie in the use of an input-output model that contains both physical environmental data and economic national accounts data in the form of input-output tables. This hybrid model is used in various configurations to calculate so-called indirect (multiplier) effects.

3.1 Source data

Green National Accounts and Input-output tables for Denmark. A description of these sources can be found in

input-output tables

Energy Accounts

Emission Accounts

Waste Accounts

Water and Waste Water

3.2 Frequency of data collection

Data is not collected from respondents specifically for this statistic. It is based on other published statistics. This is an annual statistics, but as the underlying statistics are updated a couple of time per year. New versions of the multiplier tables are therefore also updated a couple of times per year.

3.3 Data collection

Builds on already published statistics.

3.4 Data validation

The statistics are based on other statistics published by Statistics Denmark, and therefore no particular quality control has been developed of the inputs that are used as it is expected that the quality is correct at the time of receipt. Thus, in principle, it is only the method of compilation of the tables which may give rise to errors. When compiling the multiplier tables, it is ensured that all data, reproduced directly from source statistics, is the same in both statistics. Likewise, it is ensured that the multipliers have a credible size and that they evolve over time in a plausible manner.

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3.5 Data compilation

The compilation of the multiplier tables starts with the preparation of the main sources, physical data from the green national accounts and the national accounts input-output data. The physical data is extracted from the internal database, which corresponds to the StatBank, but may contain unpublished data. The extract is organized into files so it can be read instantly in the data processing program that generates the final data. Supplemented with input-output data from internal sources corresponding to the published input-output tables. The multiplier tables are typically organized so that they contain

1. A reproduction of physical data for the topic in question that is also found in the Green National Accounts

2. A calculation of the relative ratio (coefficients) between the physical data and relevant national accounting data, e.g. total output. This is referred to as the direct effect. These coefficients can also be perceived as a kind of productivity measures, which indicates how much energy or water (measured in physical quantities) will be used to produce one unit (e.g. 1 million DKK worth of output) in each industry. These ratios are calculated in both current and previous year prices, and can then be converted into so-called chained values by2010 as the base year. When calculating coefficients in chained values, price changes are excluded from the calculation and the time series expresses the sheer quantitative changes. Therefore, if less water is used in one industry's production year by year, it is not only because the price of total output (fractional denominator) grows, but because actually less water is used per unit of volume produced.

3. A calculation of the indirect effects - or multipliers with an input-output model. By setting up an so-called input-output model, some mathematical operations are carried out which means that you can calculate not only the water consumption in the industry in question, but also the water consumption that occurs in all industries that indirectly produce input related to production in the industry considered and at its subcontractors. The multiplier tells that if an industry is to produce 1 million DKK worth of output how much water consumption occurs in this industry and in all the industries that are indirectly activated in connection with its production. Direct and indirect water consumption (or CO_2 emission) is also linked to, for example, detailed components of household consumption.

3.6 Adjustment

No corrections are made.

4 Relevance

Users are, in principle, all who are interested in the extent to which different types of demand (consumption, investment, exports) have an impact on the environment (e.g. CO_2 emissions, water consumption or waste) and in which industries the direct effect appears and which derived effects appears other industries. The tables thus link environmental issues with aspects of economic development and should therefore be of interest to users working with integrated planning of economic and environmental development.

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4.1 User Needs

Users are, in principle, all interested in the extent to which different types of demand (consumption, investment, export) have an impact on the environment (CO_2 emissions, water consumption or waste) and in which industries the direct effect comes and which derived effects There are other industries. Users are primarily people who work with environmental and economic development planning. Advising the best possible policy requires detailed knowledge of the environmental impact of economic demand.

These are calculations that can be a little difficult to to carry out without prior knowledge of input-output statistics and models. The statistics should be seen as a help for these users.

4.2 User Satisfaction

The table is new and there is still very limited response from users. Preliminary response suggests, however, that a supplementary description of how the tables may be used and interpreted may be needed. In the future, the Content Description will help users gain a better insight into what this statistics contributes.

4.3 Data completeness rate

Not relevant for these statistics

5 Accuracy and reliability

The multipliers are the result of model calculations, which are based on national accounting statistics and input-output tables. In each section, polls and adjustments are made under assumptions, which together mean that the calculation process builds some uncertainty about the figures. At the most detailed level, therefore, one can not necessarily expect the results to be accurate representations of reality. Conclusions from the tables should be drawn with some caution, taking account of the uncertainties that may arise in the various stages of the process.

5.1 Overall accuracy

There is a certain degree of uncertainty associated with the calculation of the figures, primarily because values are calculated and not observed. There are uncertainties related to the sources used in the national accounts, the assumptions made in the compilation of the national accounts and those made in the compilation of the input-output tables. The national accounts are a compilation of a wide range of microeconomic sources, and in order to establish consistent national accounts, some reconciliation of the figures may be necessary, which may contribute to a certain deviation from the observed data. However, it can be said that the conceptually consistent and over time uniform processing of the sources, however, contributes to a reduction in the uncertainty of the national accounts figures. In particular, the compilation of the primary sources in a single system means that in many cases errors are not revealed, which are thus not reflected in the final national accounts or input-output tables. The transformation from national accounts to input-output tables necessitates some assumptions that are best possible from international recommendations, but which may give some imbalance in the results in some areas.

For the two most recent years (National Account's "preliminary" years), the statistics are calculated using preliminary editions of the input-output tables and may therefore be slightly more uncertain than for the years covered by final input-output tables.

The purpose of the calculations is to give a general impression of environmental and economic contexts and the structural changes that may occur over time. Conclusions, especially in the most detailed areas, should be drawn from these tables with some caution.

5.2 Sampling error

Not relevant for these statistics

5.3 Non-sampling error

The overall effect of assumptions in the compilation of the input-output tables and the model calculation of the multipliers means that at the most detailed level, expect the results to be subject to uncertainty. Uncertainty can arise in connection with model assumptions, methods, and the data used. Conclusions should be drawn from these tables with some caution.

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 quality of the two applied source statistics; input-output tables and the green national accounts is crucial for the quality of the multiplier tables.

Input-output tables are based directly on the national accounts product balance sheet, which is the foundation of the building of the Danish national accounts. An assessment of the reliability of the national accounts figures is sought to be maintained by conducting the reconciliation of the national accounts at a very detailed level, just the core variable GDP is based on both the production and income side. The compilation of the national accounts and the use of data and methods is continuously monitored by the EU. The layout of the input-output tables is based on international recommendations in the United Nations manuals and is fully integrated with the national accounts.

The quality of the Danish national accounts is assessed in the following report: Quality Report, Denmark 2018

Tables from the green national accounts that are included in the compilation of the multiplier statistics have existed for many years. Energy and emissions accounts and have been continuously improved with regard to methods and source data, but it is known that at the most detailed level uncertainty can be found in the data. A project has therefore been initiated, which will improve the quality of these statistics by 2019.

The Danish Energy Accounts has been updated during the spring of 2019. June 20 they were published based partly on new methods for compilation. An effort has been made to keep all time series intact. However, at the most detaled (117 industries) level a few breaks in time series may occur for industries with minor importance in terms of energy use.

The array of multiplier tables adds a dimension of uncertainty to its source statistics, since it is a model calculation based on certain assumptions. The quality is good when it comes to punctuality and audit policy. The first version of the statistics are published within the first year after the end of the reference year and are fully comparable over time. The statistics are considered to be a relevant tool for linking environmental statistics with economic statistics.

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

This is an annual statistics, but as the underlying statistics are updated more than one time a year, new versions of the multiplier tables are also published more than once a year. The figures are revised when the underlying environmental data is revised as well as when the input output tables are revised.

The release dates for preliminary and final figures follow the rhythm of the national accounts. For year T-3, final figures are published, while in recent years T-1 and T-2 will be preliminary figures, which can be revised when the year reaches T-3.

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6 Timeliness and punctuality

The tables have so far been published punctually in relation to the pre-announced release date. The multiplier tables, based on the energy accounts, are published for the first time approx. 6 months after the end of the reference year, while the emission multipliers are published in the first version approx. 10 months after the end of the reference year. Final figures are published at the same time as the national accounts become final, approx. 36 months after the end of the reference year.

6.1 Timeliness and time lag - final results

The production time for the statistics is not long, but as it is based on two other published statistics, it has to wait for them to be published. The multiplier tables based on the energy accounts are published for the first time approx. 6 months after the end of the reference year, while the emission multipliers are published for the first time approx. 10 months after the end of the reference year. The final version of the data is published at the same time as the national accounts become final, approx. 36 months after the end of the reference year.

6.2 Punctuality

The statistics are published at the same time as the updated source statistics are published. The statistics have so far always been punctual compared to the pre-announced release date.

7 Comparability

The statistics are fully comparable over time. The two source statistics are both consistent over time. Multipliers are calculated at constant prices, which is necessary to get a correct impression of the development in an economic time series. This is not statutory statistics, but to the extent that other countries have produced a similar statistic, the results should be fully comparable, as it is known as internationally known source data and calculation methods.

7.1 Comparability - geographical

This is not statutory statistics, but to the extent that other countries have produced a similar statistics, the results should be fully comparable, as the methods are internationally known.

7.2 Comparability over time

The statistics are basically fully comparable over time. The two source statistics are both consistent over time. Multipliers are calculated in fixed prices, which is necessary to get a correct impression of developments in an economic time series.

7.3 Coherence - cross domain

The input-output tables used are fully consistent with the national accounts, and the environmental statistics are the same as published in the context of the Green National Accounts. The green national accounts are structured as a satellite account for the national accounts, so there is a good connection to this.

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7.4 Coherence - internal

There is full internal consistency with the two sets of source data.

8 Accessibility and clarity

Data is only disseminated in the StatBank under Environmental-economic accounts, and statistics are not reported to international bodies. There are so far no publications related to it.

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 not published in a press release.

8.5 Publications

No publications

8.6 On-line database

The statistics are published in the StatBank under the subject Environmental-economic accounts.

Under Energy and air emission accounts you will find:

Energy multipliers:

- ENE2MU1N: Direct and indirect use of energy by industry, type of energy, multiplier, price unit and time
- ENE2MU2N: Direct and indirect use of energy by final demand, type of energy, multiplier, price unit and time
- ENE2MU3N: Direct and indirect use of energy by industry, type of energy, cause, price unit and time

Emission multipliers:

- EMM1MU1N: Direct and indirect air emissions by industry, type of emission, multiplier, price unit and time
- EMM1MU2N: Direct and indirect air emissions by final demand, type of emission, multiplier,

price unit and time
- EMM1MU3N: Direct and indirect air emissions by industry, type of emission, cause, price unit and time

Waste water multipliers are found under Water and waste water:

- VAN2MU1N: Direct and indirect use of water by industry, water type, multiplier, price unit and time
- VAN2MU2N: Direct and indirect use of water by final demand, water type, multiplier, price unit and time
- VAN4MU1N: Direct and indirect discharge of waste water by industry, discharge, multiplier, price unit and time
- VAN4MU2N: Direct and indirect discharge of waste water by final demand, discharge, multiplier, price unit and time

Waste multipliers are found under Material flow and waste accounts in the following tables:

- AFF1MU1N: Direct and indirect generation of waste by industry and waste category by industry, waste category, multiplier, price unit and time
- AFF1MU2N: Direct and indirect generation of waste by final demand and waste category by final demand, waste category, multiplier, price unit and time
- AFF1MU3N: Generation of waste caused by final demand by industry and waste category by industry, waste category, cause, price unit and time
- AFF2MU1N: Direct and indirect generation of waste by industry and kind of treatment by industry, kind of treatment, multiplier, price unit and time
- AFF2MU2N: Direct and indirect generation of waste by final demand and kind of treatment by final demand, kind of treatment, multiplier, price unit and time
- AFF2MU3N: Generation of waste caused by final demand, by industry and kind of treatment by industry, kind of treatment, cause, price unit and time
- AFF3MU1N: Direct and indirect use of waste by industry and hazardousness by industry, hazardousness, multiplier, price unit and time
- AFF3MU2N: Direct and indirect generation of waste by final demand and hazardousness by final demand, hazardousness, multiplier, price unit and time
- AFF3MU3N: Generation of waste caused by final demand, by industry and hazardousness by industry, hazardousness, cause, price unit and time

8.7 Micro-data access

There is no access to more detailed data than those that are published. Statistics Denmark can offer calculation of additional multipliers on request for payment

8.8 Other

Data is only disseminated in the Statbank.

8.9 Confidentiality - policy

Data Confidentiality Policy for Statistics Denmark.

8.10 Confidentiality - data treatment

There is no discretion as the statistics are based on two sets of source data, which is published at a level of detail that does not require discretion.

8.11 Documentation on methodology

Not relevant for these statistics.

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 is in the division of National Accounts, Climate and Environment, Economic Statistics. The contact person is Peter Rørmose Jensen, tel.: + 45 4013 5126 and e-mail: PRJ@dst.dk.