

**Documentation of statistics for  
Forest Accounts 2021**

## 1 Introduction

The forest accounts are accounts for the Danish forests as a natural resource. The accounts comprise the forest land as well as the wood (timber) resource. The forest accounts were first published in 2017, as part of the Green National Accounts for Denmark. In 2021, the accounts have been extended back in time so all data series start in 1990.

## 2 Statistical presentation

The forest accounts are an annual account of the Danish forest area and the growing stock in the forests. The accounts contain opening and closing stocks as well as balancing items broken down by region. Concerning the growing stock, the accounts are in physical units (cubic meters) as well as monetary units (DKK) and are published with a division into broadleaves and conifers, whereas the forest area is accounted only in physical units (square km). The accounts are published in the StatBank as well as in general publications from the Green National Accounts for Denmark.

### 2.1 Data description

The forest accounts are an annual account of the Danish forest area and the growing stock in the forests. The accounts contain opening and closing stocks as well as balancing items. The forest area is accounted in physical units (square km), but not yet in monetary units (DKK). Concerning the growing stock, the accounts are in physical units (cubic meters) as well as monetary units (DKK). The growing stock is divided into broadleaves and conifers. Both forest area and growing stock are broken down by region. Data for the accounts are mainly from the National Forest Inventory carried out by the Department of Geosciences and Natural Resource Management, University of Copenhagen, but also from the statistics on felling of wood in the Danish forests published by Statistics Denmark, from the Danish Forest Association (market prices of timber products) and from the Danish reporting on forest land under Kyoto (LULUCF). The accounts are published in the StatBank as well as in general publications from the Green National Accounts for Denmark.

### 2.2 Classification system

The forest accounts use only a limited number of classifications:

- the areas are the 5 administrative regions of Denmark (Nordjylland, Midtjylland, Syddanmark, Sjælland, Hovedstaden)
- species of wood is categorized into broadleaves and conifers

### 2.3 Sector coverage

Not relevant for this statistics.

## **2.4 Statistical concepts and definitions**

**Forest area (Kyoto):** Land classified and mapped as forest, cf. guidelines for reporting on land cover under the Kyoto-protocol (LULUCF). This is based upon UN FAO forest definition, where forest is defined as woody vegetation that has a cover of at least 10% in an areas of more that 0.5 ha and at least 20 m wide, that can exceed 5 m at maturity.

**Growing stock:** Growing stock is the living part of the volume of standing trees, above stump measured over bark to the top. Includes all trees regardless of diameter, tops of stems, and large branches. Excludes small branches, twigs and foliage. It is measured in cubic metres.

**Broadleaves:** Broadleaved species of wood are in Denmark mainly beech, oak, ash, sycamore maple and birch. A broadleaved tree is any tree within the diverse botanical group of angiosperms which has flat leaves and produces seeds inside of fruits

**Conifers:** Conifers are cone-bearing, seed plants. Conifers in Danish forest are mainly Norway spruce, Sitka spruce, Pine, Noble fir and other types of fir.

**Revaluation:** In the monetary account for growing stock, the item revaluation covers those changes in the stock (measured in Danish kroner) that are caused by changes in prices from one year to the next.

## **2.5 Statistical unit**

The statistical unit is the individual forest.

## **2.6 Statistical population**

All forest in Denmark.

## **2.7 Reference area**

Denmark.

## **2.8 Time coverage**

1990-

## **2.9 Base period**

Not relevant for this statistics.

## **2.10 Unit of measure**

Forest area is measured in square kilometers. Growing stock (timber/wood) is measured in 1,000 cubic meters. The value of the resources is measured in millions DKK.

### **2.11 Reference period**

Opening stocks are per January 1, closing stocks per December 31. The reference period for the changes in stocks is the calendar year (the time between opening and closing stocks).

### **2.12 Frequency of dissemination**

Annual.

### **2.13 Legal acts and other agreements**

Data are collected from other institutions, there is no separate data collection for these accounts. No EU regulation governs the forest accounts.

### **2.14 Cost and burden**

Statistics Denmark does not collect data for this statistics, so there is no direct response burden associated with this statistics.

### **2.15 Comment**

The forest accounts are presented on the topic page [Natural resource accounts](#).

## **3 Statistical processing**

The forest accounts are produced separately for forest area and for growing stock. The accounts for the forest area are obtained almost directly from the Danish reporting on land cover under the Kyoto Protocol. For the physical growing stock accounts, several sources are matched and harmonized in order to compile complete and consistent accounts. From the physical growing stock accounts, the monetary accounts (in DKK) are calculated through a valuation model based on estimated prices.

### **3.1 Source data**

The accounts are based on a number of sources:

- The [Danish National Forest Inventory](#) which is produced and annually published by the Department of Geosciences and Natural Resource Management, University of Copenhagen.
- The Danish reporting on forest land under Kyoto (LULUCF). This is available at [UNFCCC](#).
- The statistics on felling of wood in the Danish forests, published by Statistics Denmark. This is documented [here](#).
- Market prices of timber products, collected from the Danish Forest Association.

### **3.2 Frequency of data collection**

The source data are collected annually.

### **3.3 Data collection**

No primary data collection takes place for the forest accounts. All sources are existing statistics or data collected for other purposes. Data collection therefore takes place primarily by collecting reports published on the websites of the relevant organizations. For information on the data collection for these sources, please see the documentation provided in the section on 'Source data'.

### **3.4 Data validation**

When the forest accounts are compiled, data from the different sources are combined and thus compared. This leads to a 'plausibility control' across the different sources. The approach consists in preserving the original data as far as possible for the physical stocks. In particular, the growing stock for each year, as published in the National Forest Inventory, is used as a fixed reference point around which other sources are aligned.

### 3.5 Data compilation

The accounts for the forest area build on the Danish reporting of forest land under the Kyoto Protocol. As part of this reporting, a matrix for changes in land cover is created (LULUCF). The accounts for the forest area are produced as a simple extract of the relevant cells from this reporting (concerning the national totals). The regional distribution is based on the National Forest Inventory.

The accounts for the growing stock integrate several sources and contain both a physical part and a monetary one.

The physical accounts for the growing stock are calculated first. Measurements of the growing stock from the National Forest Inventory are used as a starting point for the closing stock at the end of the year - and thus as opening stock at the beginning of the following year. The net increment is the difference between opening and closing stocks. Data on felling is obtained from the statistics on felling of wood in the Danish forests and is adjusted to account for mortality and other types of losses (incl. underreported felling). Gross increment is then calculated as net increment plus felling and other reductions in stock. The regional distribution of the physical accounts for the growing stock is obtained from the National Forest Inventory. All parts of the physical accounts for the growing stock are compiled not only on a national level, but also for the regions.

The economic valuation of the growing stock is based on the physical accounts using the so-called 'stumpage value' method. This is a simplified net present value method where the value of the stock is obtained by multiplying the current volume of standing timber by its stumpage price (i.e. the price a forest owner can get for the right to fell trees that are in the forest), assuming the rate of discount is equal to the natural growth rate. The stumpage prices are estimated from road side market prices of different timber products, deducting costs of felling and transport (data on prices and costs is obtained from the Danish Forest Association). Value calculations are done separately for beech, oak, other broadleaves and conifers. For the most recent year, projected price data is used. When price data becomes final in the context of next year's publication, this year will therefore be revised.

When valuing the growing stock, the value of the growing stock found in forests that are protected against felling (timber production) is set to DKK 0. The share of the growing stock that is unavailable for timber production is estimated based on data on forest conservation from the National Forest Inventory, and is subject to a certain degree of uncertainty. In 2021, 8 percent of the growing stock of broadleaves and 1 percent of the growing stock of conifers were valued at DKK 0 on this basis.

In addition, an assumption of losses during tree felling is used in the valuation, which is at 20 percent from the start of the data series until 2017 and then decreases by 2 percent each year (to 12 percent in 2021). These losses during tree felling are valued at DKK 0. This is highly uncertain and there is a lack of solid data on this.

### 3.6 Adjustment

There are no corrections other than those described under data validation and data compilation.

## 4 Relevance

The forest accounts are of relevance for administrative bodies, researchers, NGOs, businesses, the educational sector and individuals - all with interests in forest, natural resources, interactions between environment and economy, natural capital, sustainability etc. In the context of the United Nations and other international organizations, there is a large focus on green national accounts.

#### **4.1 User Needs**

Users are administrative bodies, researchers, NGOs, businesses, the educational sector and individuals - all with interests in forest, natural resources, interactions between environment and economy, natural capital, sustainability etc. In the context of the United Nations and other international organizations, there is a large focus on green national accounts.

#### **4.2 User Satisfaction**

The plans for the statistics are discussed with expert users in the user committee for economic-environmental statistics and accounts, [material in Danish only](#).

#### **4.3 Data completeness rate**

There is no EU regulation for this statistics. The forest accounts are produced following SEEA-CF, the UN statistical standard for environmental-economic accounts. Compared to a complete set of forest accounts, cf. SEEA-CF, the Danish forest accounts are lacking an account of the value of forest land. It has not (yet) been possible to produce these with sufficient validity based on available data.

### **5 Accuracy and reliability**

The forest accounts are reliable estimates of the physical size of the resources, as well as the change in these over a number of years. Smaller variations from one year to the next may however reflect uncertainties rather than real changes. Especially for the monetary valuation of the growing stock (in DKK) there is significant uncertainty, both concerning the estimated prices as well as inherent in the method used which is based on a number of assumptions. The estimate for the value of the growing stock should therefore be considered a provisional estimate of the order of magnitude.

#### **5.1 Overall accuracy**

It is not possible to give a quantitative assessment of the precision of the forest accounts as a whole. The forest accounts are based on several sources, each of which has its uncertainties. In the compilation of the accounts, these uncertainties are continued. However, consistency checks are carried out through the cross-matching of sources, which means that the primary sources are corrected if they lead to impossible results (e.g. negative gross increment).

The sizes of the physical stocks (forest area, growing stock) are considered reliable and reasonably accurate, seen over a number of years. It is not possible in practice to carry out measurements in and of all the forests on January 1, and the changes from one year to the next may therefore reflect measurement errors and other uncertainties. However, seen over a period of time, it is reasonable to assume that the order of magnitude of the numbers and the development are accurate.

It is important to point out that the parts of the accounts which relate to the size of the physical stocks are more precise than the monetary accounts. This is because the monetary accounts are based on a number of assumptions on the estimated prices as well as inherent in the method used. The estimate of the monetary value of the growing stock is therefore very sensitive to changes in several assumptions.

## 5.2 Sampling error

The forest accounts are not directly based on a sample. Thus, a sampling error for the accounts cannot be estimated. However, the main source for the accounts concerning the growing stock is the National Forest Inventory, which is sample-based. The statistics on felling of wood in the Danish forests is also sample-based, see documentation of these under 'Source data'.

## 5.3 Non-sampling error

The uncertainties in the forest accounts are described separately for each of its three parts, which each have different sources and methods, and thus different estimations of uncertainty.

The primary source of uncertainty for the forest area is that the regional distribution is calculated from data from the National Forest Inventory, which does not have the same definition of forest area. This can affect the accuracy of the forest area in different regions, to the extent that there are regional variations in how these definitions affect the calculated forest area. The annual change in forest area up until 2010 is calculated using linear interpolation and can therefore only be taken as average sizes.

Growing stocks in physical units are calculated from data collected at sample plots in the forests. Uncertainties come both from the sample size, and from the calculation of growing stocks from measurements of the trunk diameter, the height of the tree, and the tree species. For further information, see the documentation of the National Forest Inventory under 'Source data'. In general, the uncertainty is greater at the detailed level. There is also uncertainty connected to the time at which measurements were performed, which might be throughout the year, and not on January 1 every year. It is therefore best to look at developments over multiple years instead of interpreting the development in a single year in isolation.

All sources of uncertainty in the physical accounts of the growing stock are also reflected in the monetary accounts, since the former is used to compile the latter. In addition, there are multiple sources of uncertainty specifically for the monetary accounts. The valuation method is based on multiple assumptions and estimates, such as estimates of yearly timber prices for different tree species and average loss during tree felling. Valuation of growing stocks is done using the so-called stumpage value method, which is described by the [FAO](#).

## 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 physical part of the forest accounts is based on and collects other statistics on forest area and growing stock, and thus has at least the same good quality as the corresponding sources. However, it is important to point out that even though the accounts are compiled as a time series of years, it is not possible in practice to measure the forests on a specific date. Therefore, changes in stock between single years should be interpreted with caution. Instead, the accounts should rather be looked at over a time period.

Concerning the valuation of the growing stock (the monetary part), there are great uncertainties and the method used is based on a number of assumptions and estimates. This applies not least to the estimation of prices. Thus, it should be considered experimental statistics rather than a definitive estimate.

## 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

The forest accounts are revised 2 years back with each publication of a new year as this allows using the final version of all data sources. Extraordinary revisions may be done if the sources (e.g. the National Forest Inventory) are revised significantly, to ensure consistency over time.

## 6 Timeliness and punctuality

The forest accounts are normally published 18 months after the reference period ends. The accounts have always been published at the preannounced date.

### 6.1 Timeliness and time lag - final results

The accounts are normally published 18 months after the reference time. The accounts for the most recent 2 years are provisional and may be revised at the following years' publications.

### 6.2 Punctuality

The accounts have always been published as planned.

## 7 Comparability

The forest accounts are compiled according to the guidelines for asset accounts for natural resources from the UN statistical standard 'System of Environmental-Economic Accounts'. This ensures a high degree of comparability with the same type of accounts from other countries using this standard. The forest accounts are fully comparable across the published time series.

### **7.1 Comparability - geographical**

The forest accounts are compiled according to the guidelines for asset accounts for natural resources from the UN statistical standard [System of Environmental-Economic Accounts](#). This ensures a high degree of comparability with the same type of accounts from other countries using this standard.

There is no EU regulation on forest accounts, but there is a voluntary data collection via the 'European Forest Accounts Questionnaire'. To the extent possible, the accounts are compiled according to the guidelines for this questionnaire which, however, includes several parts that are not part of the Danish forest accounts yet.

### **7.2 Comparability over time**

The forest accounts are fully comparable across the published time series.

### **7.3 Coherence - cross domain**

The forest accounts are comparable to the National Forest Inventory when it comes to the data on growing stock. The forest area in the forest accounts is not fully comparable to the forest area in the National Forest Inventory. This is because the forest accounts use the forest land as in the Danish Kyoto reporting, as it is calculated more consistently over time. Forest area in the Kyoto reporting and in the forest accounts is thus completely the same. As part of the Green National Accounts for Denmark, Statistics Denmark has also published land accounts including data on land covered with forest. In this account, the area with forest land is smaller, which is related to different sources as well as different definitions. In the Kyoto reporting, areas with Christmas trees, forest roads, auxiliary areas and temporarily unstocked land in the forests are included in forest land.

### **7.4 Coherence - internal**

Full internal consistency has been ensured during the production of the accounts.

## **8 Accessibility and clarity**

The forest accounts are available in their most detailed form through the StatBank. General results are communicated through Statistics Denmark's various publications covering the Green National Accounts for Denmark. See also the topic page [Natural resource accounts](#).

### **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 Calendar can be accessed on our English website: [Release Calendar](#).

## 8.4 News release

Newsletter (Nyt fra Danmarks Statistik, in Danish only) on the forest accounts is available on [this page](#). From 2021, a newsletter on this statistics will no longer be published each year.

## 8.5 Publications

The forest accounts are presented in the publication [Green National Accounts for Denmark](#).

## 8.6 On-line database

The statistics are published in the StatBank under the subject [Natural resource accounts](#) in the following tables:

- SKOVRG01: Growing stock (physical account) by balance items, species of wood and county council district
- SKOVRG02: Growing stock (monetary account) by balance items, species of wood and county council district
- SKOVRG03: Forest area (Kyoto) (physical account) by balance items and county council district

## 8.7 Micro-data access

Micro-data are not available in Statistics Denmark.

## 8.8 Other

There are no other deliveries or dissemination channels.

## 8.9 Confidentiality - policy

Statistics Denmark's data confidentiality policy is followed.

## 8.10 Confidentiality - data treatment

No measures have been needed to ensure confidentiality, as data in the forest accounts do not refer to specific businesses or persons.

## 8.11 Documentation on methodology

No further documentation has been published by Statistics Denmark. The main source for the forest accounts, the National Forest Inventory, is documented in separate reporting by the Department of Geosciences and Natural Resource Management, University of Copenhagen. English version available [here](#).

## **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**

Administratively, the accounts belong to the unit National Accounts. The person responsible is Michael Zörner, +45 39 17 34 87, miz@dst.dk

### **9.1 Contact organisation**

Statistics Denmark

### **9.2 Contact organisation unit**

National Accounts, Economic Statistics.

### **9.3 Contact name**

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