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THE PRINCIPLES FOR MONITORING THE BIOECONOMY

1. Background and purpose of bioeconomy calculations

The term **bioeconomy** refers to an economy using renewable natural resources to produce food, energy, products and services. The most important renewable natural resources include the biomass in forests, soil, fields, bodies of water and the sea, as well as fresh water. The bioeconomy is regarded as the solution for the economy of the post-fossil fuels era.

According to [the Finnish Bioeconomy Strategy](#) (2014), the growth of the bioeconomy and its significance in the national economy are monitored using the indicators provided by Statistics Finland. [The National Forest Strategy 2025](#)

(2015) emphasises the need to extend forest statistics to cover the entire bioeconomy. Other indicators of the National Forest Strategy are also used to assess the attainment of the goals of forest bioeconomy. The National Forest Strategy and regional forest programmes have been matched with the Bioeconomy Strategy.

It is up to the Natural Resources Institute Finland (Luke) to publish the calculations by Statistics Finland on the bioeconomy-related output, value added, number of people employed and investments by sector. In many sectors, there are plenty of factors reducing the reliability of the results. That is why the current bioeconomy calculations do not meet the quality criteria for official statistics.

2. Sources of information for the calculations

2.1 Sources of information

The first bioeconomy calculations were released in March 2018. The scope of bioeconomy calculations is based on the national accounts framework provided by Statistics Finland. Time series of national accounts were corrected in 2019. The bioeconomy statistics of the previous years were affected and the values have been corrected. For example for the year 2017, the number of people employed in bioeconomy was corrected from 315 000 to 303 200 persons.

The information concerning the Finnish national economy is compliant with the global SNA2008 recommendation (*System of National Accounts*) and is therefore internationally comparable. The transactions included in the calculations for national accounts are output, value added, investments (gross formation of fixed capital) and employment. In addition, exports of bioeconomy goods are reported.

The industrial division is based on the *Standard Industrial Classification TOL 2008*, which is compatible with the classification of economic activities in the European Union (NACE, rev. 2). Those sectors defined as being part of the bioeconomy have been selected in their entirety for the calculations. In addition, the relative share of the bioeconomy has been estimated for some sectors using, alongside national accounts, other statistical sources and expert opinions.

The output, value added, investments and exports are measured at basic prices and calculated using both current prices and fixed prices at the previous year's prices, the method applied in national accounts. Export volumes of bioproducts are based on the product classification applied in the supply and use tables of national accounts, which mainly follow the EU's CPA classification (*European Classification of Products by Activity*).

The calculations only take into account the direct effects generated by bioeconomy sectors. The indirect effects on sectors supplying e.g. machinery and equipment, raw materials or services as inputs to the bioeconomy are deliberately excluded.

2.2 Concepts of national accounts

Output at basic prices consists of products manufactured during a calendar year. Three categories of output are distinguished: market output, output for own final use, and other non-market output. Non-market output is excluded from the bioeconomy calculations.

Value added (gross) refers to the total value generated by units engaged in production activities. In market production, it is calculated by deducting from the unit's output the intermediates (goods and services).

Number of people employed includes in national accounts all people drawing a salary and independent entrepreneurs who participate in production activities in the national economy. The statistics are more comprehensive than those of labour force surveys, as no age limits are defined for employed people in national accounts, and men and women doing their national service, for example, are counted as employed.

Investments (gross fixed capital formation) consist of resident producers' acquisitions, less disposals, of fixed assets. Fixed assets are tangible or intangible assets produced as outputs from production processes that are themselves used repeatedly, or continuously, in processes of production for more than one year.

3. Standard Industrial Classification TOL 2008 used for bioeconomy calculations

The sectors completely or partially included in the bioeconomy are presented in the order compliant with the structure of PX-Web tables. The conventional food and forest

sectors are presented at the beginning of the tables, as they represent over half of the output and added value in the bioeconomy.

3.1 Reliability of calculations

When interpreting sector-specific figures, factors affecting the coverage and quality of calculations must be taken into account. This particularly applies to those sectors that are only partially considered as included in the bioeconomy. Whenever possible, Statistics Finland and Luke have utilised other official statistical sources, such as enterprise and energy statistics, in addition to national accounts. In many important sectors, relative shares of the bioeconomy are mainly based on expert estimates, if no statistical information is available. The most important sector-specific characteristics are as follows:

- The relative share of wood construction is estimated at 30 per cent of the whole construction sector (TOL: 412, 420 and 430). The estimate is mainly based on statistics on construction and housing, compiled by Statistics Finland.
- When calculating the bioeconomy share of the energy sector (TOL: 351–353), statistics on the production of electricity and heat, produced by Statistics Finland, were utilised. The share of renewable energy sources was calculated for each year from these statistics.
- The calculations regarding the chemical industry (TOL: 203–205) are based on expert estimates by Statistics Finland and the Chemical Industry Federation of Finland.
- Nature tourism and recreation are not classified as separate sectors in national accounts, causing difficulties in bioeconomy calculations. For instance, only part of accommodation and catering are related to nature tourism and recreation. In these calculations, a share of 25 per cent of six sub-sectors is included in the bioeconomy.

3.2. Other sector-specific practises

- Long-distance transportation of wood, and domestic transportation of forest industry products and other bioproducts are excluded from the bioeconomy calculations. They are included in main category H (Transportation and storage) in the TOL classification.
- “Printing and service activities related to printing” (TOL: 181), which sometimes are classified as part of the pulp and paper industries, are excluded.
- “Manufacture of furniture” (TOL: 310) is included in the category “Other industries”, as no separate data are available on the manufacture of wooden furniture.
- Recreational fishing has no separate code in industrial classification. As a result, it is assessed that any non-market output of fishing and aquaculture is included in recreational fishing. Market output in turn is part of primary production.

- In addition, hunting (TOL: 017) has been divided similarly into non-market output and market output.

4. Statistics on bioeconomy exports

The statistics on bioeconomy exports are produced using the CPA classification (*European Classification of Products by Activity*), a sector-oriented economic classification of goods and services used by the EU. Only the goods included in bioeconomy were selected for the statistics, not the services.

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More detailed information is available on the web pages of Statistics Finland:

[National Accounts](#)

[Standard Industrial Classification TOL 2008](#)

[CPA Classification](#)

STANDARD INDUSTRIAL CLASSIFICATION TOL 2008 **AS APPLIED IN BIOECONOMY CALCULATIONS**

The sectors are grouped and presented in the same order as in the PX-Web tables.

TOTAL FOR THE FOOD SECTOR

Agriculture

- 011_013 Growing of crops
- 014_015 Animal production
- 016 Support activities to agriculture and post-harvest crop activities
- 017 Hunting
- 030 Fishing and aquaculture (professional)

Food industry

- 101_109 Manufacture of food products
 - of which: processing fish products
- 110 Manufacture of beverages
- 120 Manufacture of tobacco products

TOTAL FOR THE FOREST SECTOR

Forestry

- 021 Silviculture and other forestry activities
- 022 Logging
- 023 Gathering of wild growing non-wood products, excl. energywood
- 024 Support services to forestry
- 025 Net increment of forests

Wood-products industries

- 161 Sawmilling and planing of wood; also wood-based panels industries, carpentry and production of wood pellets
- 162 Manufacture of products of wood, cork, straw and plaiting materials

Pulp and paper industries

- 171 Manufacture of pulp, paper and paperboard
- 172 Manufacture of articles of paper and paperboard

CHEMICAL INDUSTRY

- 201 Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms (*only 30% is included*)
- 203 Manufacture of paints, varnishes and similar coatings, printing ink and mastics (15%)
- 204 Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations (30%)
- 205 Manufacture of other chemical products (for the part of biofuels)

PHARMACEUTICAL INDUSTRY

211 Manufacture of basic pharmaceutical products

OTHER INDUSTRIES (Category C)

Manufacture of textiles

131 Preparation and spinning of textile fibres

132 Weaving of textiles

133 Finishing of textiles

139 Manufacture of other textiles

Manufacture of wearing apparel

141 Manufacture of wearing apparel, except fur apparel

142 Manufacture of articles of fur

143 Manufacture of knitted and crocheted apparel

Manufacture of leather and related products

151 Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur

152 Manufacture of footwear

310 Manufacture of furniture

ENERGY

351 Electric power generation, transmission and distribution (share of renewable energy sources)

352 Manufacture of gas; distribution of gaseous fuels through mains (share of renewable energy sources)

353 Steam and air conditioning supply (share of renewable energy sources)

CONSTRUCTION

412 Development of building projects (*only 30% is included*)

420 Civil engineering (30%)

430 Specialised construction activities (30%)

WATER TREATMENT AND SUPPLY

360 Water collection, treatment and supply

TOTAL FOR BIOECONOMY SERVICES

Nature tourism and recreational use

550 Accommodation (*only 25% is included*)

560 Food and beverage service activities (25%)

790 Travel agency, tour operator and other reservation service and related activities (25%)

900 Creative, arts and entertainment activities (25%)

910 Libraries, archives, museums and other cultural activities (25%)

930 Sports activities and amusement and recreation activities (25%)

Hunting

017 Recreational hunting

Fishing

030 Recreational fishing