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## **Eco-efficiency monitoring and evaluation mechanism**

[www.environment.fi/syke/ecoreg](http://www.environment.fi/syke/ecoreg) > Eco-efficiency monitoring and evaluation mechanism

### **Manual**

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# ECOREG calculation mechanism: file opening and start-up

The operational tool of the eco-efficiency monitoring and evaluation mechanism is the calculation mechanism, which is operated with the file ECoreg-calculation\_tool.xls. The calculation mechanism in the file is pre-filled with the regional data collected in the ECoreg project (2002–2004).

Copy the file to your own computer and open it with Microsoft Excel. The file can be downloaded from the web pages of the ECoreg project: [www.environment.fi/syke/ecoreg](http://www.environment.fi/syke/ecoreg) > Eco-efficiency monitoring and evaluation mechanism.

When the file is opened, Excel informs the user that the file includes macros. The original version of the file has been scanned for viruses. A warning is activated by the macros that operate the mechanism. Therefore the right alternative to be chosen is **"Use the macros"**.

The application opens into a view of the entire eco-efficiency monitoring and evaluation mechanism. To use the calculation mechanism start by clicking the command button **Start >>** with the left mouse button.

A few common guidelines and principles for using the calculation mechanism:

- You can move between the work phases of the calculation mechanism by clicking the picture object of the phase with the mouse.
- The arrow button "**<<**" in the upper left corner of every sheet returns the user to the main menu of the tool.
- The phase-specific manuals can be opened and closed with buttons **"Open guide"** and **"Close guide"**.
- The sheets have been protected to prevent accidental changes into wrong cells. When necessary, the protection can be removed (Tools > Protection > Remove protection). No password is needed.
- Except for the inventory sheets, the white background colour of the cells tells the user that the data can be modified.
- The calculation mechanism is meant to be operated with the help of the documentation reports published by the ECoreg project. The documentation reports are the manuals for the collection of indicator and inventory data to the different phases. In practice, it is necessary to make oneself closely familiar with the documentation reports to ensure that the data will be correctly entered into the mechanism. The reports are:
  - FE 697en: Environmental analysis and indicators for the Kymenlaakso region.
  - FE 698en: Economic and material flow indicators for the Kymenlaakso region.
  - FE 699en: Social and cultural indicators supporting the measurement of eco-efficiency in the Kymenlaakso region.
  - FE 735en: Measuring regional eco-efficiency - case Kymenlaakso. Key results of the ECoreg project.

# Annually updated indicators



After choosing the objects of annually updated indicators the user finds time series that can be complemented for as many as 20 years. Example series can be replaced or supplemented according to case-specific needs. The total number of indicators can be 24–54, depending on the theme in question.

## **2.1 Economic and material flow indicators**

Selection of economic and material flow indicators is based on the data collected for different industry sectors.

- Indicator values can be entered in the tables yearly.
- Calculation and data sources of the economic and material flow indicators chosen for Kymenlaakso are documented in Documentation report 2 of the ECOREG project (FE 698en). Calculation of the total material input (TMI) is described in the main report of the project (FE 735en).
- If new indicators are selected, they can be added to the free rows of the tables. The new indicators are named and they need to be provided with acronym names (for chart use), units and reference years.
- If some of the indicators prove to be unnecessary, they can be deleted and replaced with more suitable ones.
- The year chosen for the reference year is given the value 100% in the comparison of the time series (I Time series of annually updated indicators). The values of other years are expressed in relation to it.

### **Sources:**

Ilmo Mäenpää and Esa Mänty 2004. Economic and material flow indicators for the Kymenlaakso region. Documentation report 2 of the ECOREG project. The Finnish Environment 698en.

Matti Melanen et al. 2004. Measuring regional eco-efficiency - case Kymenlaakso. Key results of the ECOREG project. The Finnish Environment 735en.

## **2.2 Environmental indicators**

The environmental indicators are chosen on the basis of environmental impacts derived from inventory results and their regional valuation.

- Indicator values can be entered in the tables yearly. The range of the years is automatically the same as the one selected for the economic indicators.
- Calculation and data sources of the indicators chosen for Kymenlaakso are documented in Documentation report 1 of the ECOREG project (FE 697en).
- If new indicators are needed, they can be added to the free rows of the tables. New indicators are named and they need to be provided with acronym names (for chart use), units and reference years.

- Unnecessary indicators can be deleted and replaced.
- The year chosen for the reference year is given the value 100% in the comparison of the time series (I Time series of annually updated indicators). The values of other years are expressed in relation to it.

**Source:**

Sirkka Koskela (ed.) 2004. Environmental analysis and indicators for the Kymenlaakso region. Documentation report 1 of the ECOREG project. The Finnish Environment 697en.

**2.3 Social and cultural indicators**

The social and cultural indicators supporting the measurement of eco-efficiency are chosen on the basis of regional valuation of socio-cultural issues.

- Indicator values can be entered in the tables yearly.
- Calculation and data sources of the social and cultural indicators chosen for Kymenlaakso are documented in Documentation report 3 of the ECOREG project (FE 699en).
- If new indicators are needed, they can be added to the free rows of the tables. New indicators are named and they need to be provided with acronym names (for chart use), units and reference years.
- Unnecessary indicators can be deleted and replaced.
- The year chosen for the reference year is given the value 100% in the comparison of the time series (I Time series of annually updated indicators). The values of other years are expressed in relation to it.

**Source:**

Ulla Rosenström and Per Mickwitz 2004. Social and cultural indicators supporting the measurement of eco-efficiency in the Kymenlaakso region. Documentation report 3 of the ECOREG project. The Finnish Environment 699en.

# Inventory by industrial sectors

## 3.1 Economic factors, emissions and other environmental burdens

Clicking the inventory object brings the user to Inventory 1 which is pre-filled with information from the Kymenlaakso region. The figures can, however, be replaced with figures from another region. Links to three other inventories can be found from all inventory pages. These tables will be entered with the results of inventories carried out in the future.

An inventory is implemented by industrial sectors, when the aim is to create indicators for a new region or to verify their representativeness in relation to the current environmental load in the region.

For maintaining the capability of drawing suitable time series, the factors have to be the same in all inventories.

The data in the inventories can be divided into four groups:

- economic factors (FE 698en)
- emissions to air and water in the region (FE 697en)
- emissions released to air and water outside the region ("upstream") (FE 697en)
- material flows (FE 698en and FE 735en).

Factors to be considered when entering the inventory data:

- Data should be entered in all rows with a heading in **red font** for enabling the mechanism to calculate the impact assessment procedures.
- Data should be entered in all rows highlighted in dark **yellow** in order to enable reviewing results by industrial sectors.
- Proper operation of the calculation sheets requires the sum of the data from the main industrial sectors (A01, A02, B, C, D, DD-DE ,DJ-DM ,F, etc.). The rows concerned have been highlighted with a darker background colour.
- If detailed source data are not available, automatic sum operations in the main industrial sector rows mentioned above can be replaced with absolute numerical values.

### Sources:

Sirkka Koskela (ed.) 2004. Environmental analysis and indicators for the Kymenlaakso region. Documentation report 1 of the ECOREG project. The Finnish Environment 697en.

Ilmo Mäenpää and Esa Mänty 2004. Economic and material flow indicators for the Kymenlaakso region. Documentation report 2 of the ECOREG project. The Finnish Environment 698en.

Matti Melanen et al. 2004. Measuring regional eco-efficiency - case Kymenlaakso. Key results of the ECOREG project. The Finnish Environment 735en.

## 3.2 Selecting the characterisation coefficients for emissions

In the end section of the inventory sheets there are tables that calculate the equivalent values for the environmental burdens.

- Characterisation coefficients can, if necessary, be modified in cell area H75:AH80. Alternatively, you can use default values that are pre-filled in the table. The principles for determining the characterisation coefficients are documented in Documentation report 1 of the ECOREG project (FE 697en).

- There are only six impact categories included in the calculation mechanism, because quantitative emissions and scientifically justified coefficients are available for them only: Climate change, Stratospheric ozone depletion, Tropospheric ozone formation, Acidification, Aquatic eutrophication and Aquatic oxygen depletion.
- The default impact categories can be changed, but those chosen in the first inventory should also be used in all inventories for enabling comparison of the time series.
- Case-specific weighting factors of impact categories for each inventory are selected in the phase named "Assessment of environmental impacts".

**Source:**

Sirkka Koskela (ed.) 2004. Environmental analysis and indicators for the Kymenlaakso region. Documentation report 1 of the ECOREG project. The Finnish Environment 697en.



## **4.1 Valuation and assessment of the inventory results**

The indicators describing the environment are chosen on the basis of the environmental impact assessment of the inventory data. The impact assessment procedure indicates the industrial sectors that produce the bulk of the key emissions.

1. A weighting factor is given to each impact category in each established inventory. The factors weight the different impact categories in relation to each other. The calculations are based on the data stored in the inventory tables.
2. The Results field is meant for choosing the result columns of the desired inventory into graphs. Selection is made by clicking the object of the inventory concerned. If no data are available in the selected inventory, the graphs stay empty.
3. The impact assessment results can be utilised when selecting and updating the indicators. The aim is to choose indicators that represent the major polluting industries and the most harmful emissions.
4. Before choosing the final indicators the impact assessment should also be expanded to cover the non-measurable factors that can be harmful to the environment (see Section 4.2). The results achieved directly with the calculation mechanism represent the impact assessment process in a simplified form compared with the one accomplished in the ECOREG project. Therefore, some significant aspects might be missed without a more comprehensive perspective.

**Source:**

Sirkka Koskela (ed.) 2004. Environmental analysis and indicators for the Kymenlaakso region. Documentation report 1 of the ECOREG project. The Finnish Environment 697en.

## **4.2 Assessment of the non-measurable factors**

In the ECOREG project, in addition to quantitative emissions, other environmental burdens were included in the environmental impact assessment study. Environmental experts of the Kymenlaakso region evaluated the weighting factors and estimated the relevance of the different environmental impact categories (FE 697en).

The results of the ECOREG project are illustrated with 16 different impact categories in the Results field with the title "Inventory 1, wide". The table shows the large number of impact categories that in reality are connected to various activities, even though the direct methods cannot measure or identify them.

**Source:**

Sirkka Koskela (ed.) 2004. Environmental analysis and indicators for the Kymenlaakso region. Documentation report 1 of the ECOREG project. The Finnish Environment 697en.

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## Social and cultural valuation

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The socio-cultural indicators supporting the measurement of eco-efficiency are chosen with the help of regional economic and other actors who are asked to name and value important social and cultural issues:

1. The actors of the region are asked to name social and cultural factors and values that they consider important (e.g. four).
2. The actors are asked to select the most important ones from all the factors brought up (e.g. three).
3. The share of proposals and weighted answers are proportioned to the total amount of answers. The results are utilised when choosing and updating the socio-cultural indicators.

The relevance of different factors can be compared by changing their weights. During testing it is important to remember that the sum of the factors must always be 100%. New factors can be added to the white area of the table. The results can be sorted by magnitude by clicking the command button "Update the order of factors" at the bottom of the page.

**Source:**

Ulla Rosenström and Per Mickwitz 2004. Social and cultural indicators supporting the measurement of eco-efficiency in the Kymenlaakso region. Documentation report 3 of the ECOREG project. The Finnish Environment 699en.



# Calculation of eco-efficiency indicators

## ***I Time series of annually updated indicators***

In this sheet it is possible to compare the relative change of different indicators to each other.

- The indicators are selected to the graph by clicking them with the mouse pointer.
- The reference year chosen in the indicator tables is given the value 100% (the column of the reference year is on the right side of the indicator units). The results from the other years are drawn in relation to it.
- Activate the upper window by clicking it in order to start selection of the variables.

## ***II Inventory results by industrial sector: Economic factors, environmental emissions and material flows***

In this calculation sheet the user can study the trends of economic factors, emissions and material flows by industrial sectors. Fifteen different variables can be selected to the graph simultaneously. Data points for every complete inventory are shown in the graph. The selection is made with the numbers given to different sectors and burdens. The numbering is given in the orange-coloured rows in the upper window of the sheet.

- Select the industrial sector into the lower window by entering its number to Column B
- Select the burden or other factor by entering its number to Column C.

## ***III Value added and environmental impacts***

In this sheet the user can study the changes in environmental impacts and value added simultaneously. Data points for every selected factor and for every complete inventory are shown in the graph.

## ***IV Eco-efficiency ratios***

This sheet illustrates the development of eco-efficiency by using ratio indicators.

Eco-efficiency ratios are quotients of economic factors and environmental indicators. On the basis of the scope of the indicators, the ratios can be divided into two categories: the regional indicators and the indicators covering both the region and the imports. All possible indicator choices are defined and documented in the main report of the ECOREG project (FE 735en).

The factors of the ratios are chosen by clicking the check box in front of them. The result is drawn onto a graph and the legend becomes visible at the same time.

### **Source:**

Matti Melanen et al. 2004. Measuring regional eco-efficiency - case Kymenlaakso. Key results of the ECOREG project. The Finnish Environment 735en.