

'Eco-Benchmark' for consumer-oriented LCA-based environmental information on products, services and consumption patterns

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Content

Content.....	2
Summary.....	3
Introduction.....	4
Material and Methods	5
Life cycle impact assessment.....	6
Results and Discussion.....	8
Basic elements of Eco-benchmark	8
Some details and remarks	10
Using Eco-Benchmark.....	10
Users of Eco-Benchmark	11
Disseminating the tool	12
International and country-specific Eco-Benchmarks?.....	12
References.....	13

Summary

Science-based approaches like life cycle assessment (LCA) were proposed as a basis for consumer information tools in the 2002 World Summit on Sustainable Development. LCA has been recognized also e.g. in EU in the context of 'Integrated Product Policy' (IPP) as providing "the best framework for assessing the potential environmental impacts of products currently available."

In this study, a consumer-oriented, illustrative benchmark was developed to enable consumers to see the role of various products and consumption patterns in the whole of their environmental impacts, using LCA as the method to determine the impacts. Environmental communicators and environmentally conscious consumers were identified as key target groups for this type of information. But it also offers a tool for manufacturers to present understandable information of their products. And it can be valuable for experts in administration and research organisations when participating in the development and justification of policy instruments in the field of integrated product policy.

Surveying LCA studies of products and services and developing the presentation formats and figures yielded material for the preparation of a brochure, which can be seen as a 'backbone' of the development work. The brochure preparation was a participatory, iterative process involving discussion with consumer focus groups, communication in stakeholder workshops, and questionnaire-based feedback. In addition to learning what works and what does not, detailed suggestions on improved wording and figures were obtained, as well as a wealth of ideas for future applications.

Here we present the development process and the final outcome, i.e., the 'Eco-Benchmark'. Country-specific eco-benchmarks could be developed also in other countries, and products like passenger cars offer a possibility for an international eco-benchmark.

See also www.environment.fi/eco-benchmark

Keywords: Benchmarks; Eco-Benchmark; Environment; Sustainable; Consumption; Consumers; Communication; Environmental impacts; Life cycle assessment; LCA; Products; Services; Integrated Product policy; IPP

Introduction

In the 2002 United Nations World Summit on Sustainable Development, science-based approaches like Life Cycle Assessment were proposed as a basis for consumer information tools [1]. LCA has been recognized also in the EU in the context of Integrated Product Policy as providing the best framework for assessing the potential environmental impacts of products currently available [2].

Although LCA could provide information that environmentally conscious consumers need, the forms in which it has been provided have been highly inaccessible. Published LCA reports tend to be extremely technical, featuring long lists of environmental pollutants and abounding with technical terms. On the other hand, there have been some efforts to develop illustrative presentation formats in the LCA community. It is common to benchmark the various effects against the total effects in an area or country; e.g., in the Eco-indicator method the environmental effects are normalized by the effects caused by the average European during a year [3]. Further, the normalized results can also be weighted according to the assumed seriousness of each effect: in Eco-indicator, these weights are determined by a panel method. After normalization and weighting, the resulting 'ecopoints' can be shown in illustrative forms, e.g., using the common column format [3, 4].

Several Finnish research institutes designed in 2003 a three-year project to develop 'eco-benchmarks', i.e. illustrative presentation formats and benchmarks for presenting LCA-based information to consumers and various stakeholders.

Material and Methods

Several important tasks were identified for realizing an understandable, reliable and well-known tool to deliver LCA-information (Fig. 1). The core assumption was that LCA results would be easier to understand if they were linked to a familiar frame of reference, and compared to an everyday object. Therefore LCA-studies of consumer products were surveyed and their suitability for the benchmark was assessed. The presentation format and figure were designed, and both the whole idea and the benchmarking alternatives were tested both in consumer focus groups as well as in seminars with various stakeholders. The final format was developed on the basis of the various alternatives and the feedback.

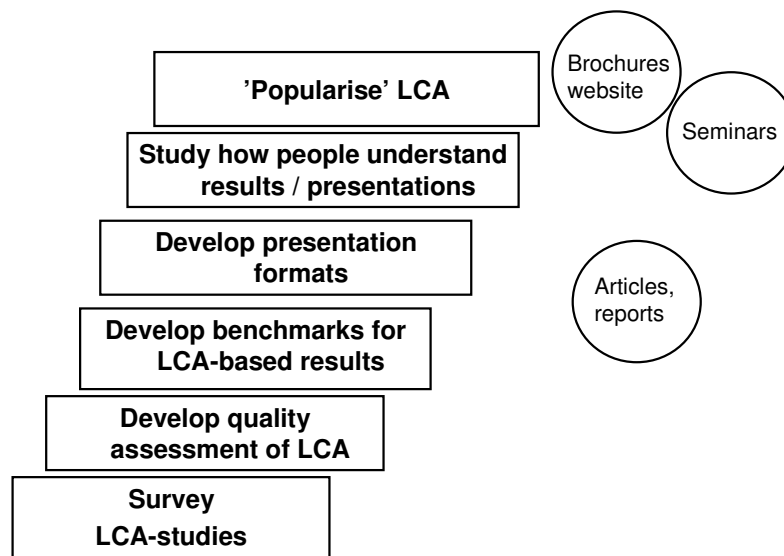


Fig. 1. Tasks in the project to develop the Eco-Benchmark.

Two conditions were set for the product benchmarks: 1) there must exist an LCA of the product which is of good quality, and can be updated and modified (if needed) to be relevant to the conditions of Finnish consumers, and 2) the product must be a familiar 'everyday' product to Finnish consumers.

In order to screen suitable LCA studies, a survey was conducted of existing LCA studies, using literature databases (e.g., Cambridge Scientific Abstracts). Tens of LCA studies were pre-evaluated, and more than ten studies were thoroughly assessed, so that the results of the selected

LCA studies could serve as reliable benchmarks. A group of 4-8 researchers evaluated together a predefined list of aspects concerning e.g. the age of data and relevance and reliability of the information sources, in order to select only LCA studies with a low risk of the results being far from correct. Regarding anchoring to the everyday life of Finnish people, it was also important that the results should correspond to the environmental impacts of similar products in present-day Finnish conditions, or that the study could be modified to provide relevant results for Finnish consumers.

Five LCA studies were selected for further work, i.e. updating and modifying to Finnish consumption. The original idea was to finally select one product to be used as the product benchmark, and the idea of putting together a ruler and all the five products was arised in a seminar with stakeholders.

Rye bread and cheese were the food products selected as benchmarks, largely due to the importance of food in everyday consumption and considerations of data availability and quality. Rye bread and cheese make up only a small portion of the daily food intake, and thus also of a consumer's total daily environmental load caused by food, but they provide an illustration of the environmental loads of commonly used food products. Other benchmark products are also common and typical products for Finnish households: a wash of laundry, a two-bedroom apartment and a car trip (see [5] and [6] for more description of the products and their role in Finnish consumption).

Some modifications and updating were needed to all of the selected LCA studies. A general modification was to use new data for the environmental effects of electricity and district heating, representing the year 2003 and average values for whole Finland, also taking into account imported electricity on the basis of country-specific values.

Life cycle impact assessment

In the study, the impact assessment methodology is based on the general phases of life cycle impact assessment (LCIA): selection of impact categories, classification, characterization, normalization and weighting. The selected impact categories and contributing emissions were:

- 1) climate change (CO₂, N₂O, CH₄),
- 2) acidification (SO_x, NO_x, NH₃)
- 3) tropospheric ozone formation (NO_x, VOC/HC, CH₄)
- 4) terrestrial eutrophication (NO_x, NH₃)
- 5) aquatic eutrophication (NO_x, NH₃, N(w), P(w)).

Other impact categories such as human toxicity, eco-toxicity, particulate matter and effects of land use were not modelled and shown in the presentation formats at this stage of the development work.

Characterisation factors for Finland were used for acidification [7], tropospheric ozone formation [8], and aquatic eutrophication [9] (thus the impacts were calculated as if all the emissions had occurred in Finland). For normalization, the reference values for each impact category were calculated on the basis of the total Finnish emissions and energy use. Finland-specific weighting factors were available from an earlier study [4].

See [5] and [10] for more details.

Results and Discussion

Basic elements of Eco-benchmark

The basic benchmark was given the form of a ruler, which aims to serve as a yardstick for scaling the environmental impacts of different products, services or activities (see this 'Eco-Benchmark' in Fig. 2). The backbone of the benchmark-ruler is based on the average daily per capita environmental impacts of the whole Finnish economy. This ruler also integrates the different benchmark products, which serve as additional – and perhaps more down-to-earth – benchmarks.

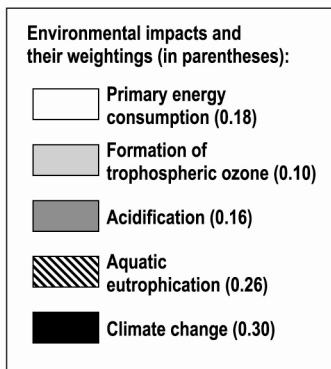
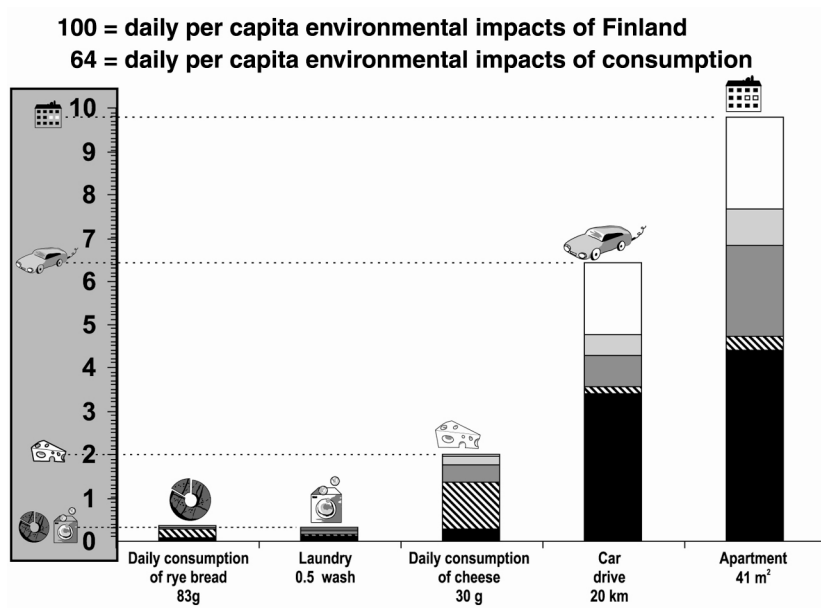


Fig. 2. The elements of the benchmarking: the ruler, the scale, and the benchmark products. Together they form the 'Eco-Benchmark'. In addition, the aggregated environmental impacts of the benchmark products are shown here .

Eco-Benchmark now takes into account five important environmental impacts, which are weighted according to their importance (please note that each product also has other important environmental effects). The scale is based on the per capita daily total environmental impacts of Finland, which are set at 100.

In addition, five products are placed on the Eco-Benchmark (ruler), serving as additional benchmarks along-side the scale itself. In Fig. 2, next to the actual Eco-Benchmark, you can see the various environmental impacts (aggregated) of the benchmark products. Typical daily use

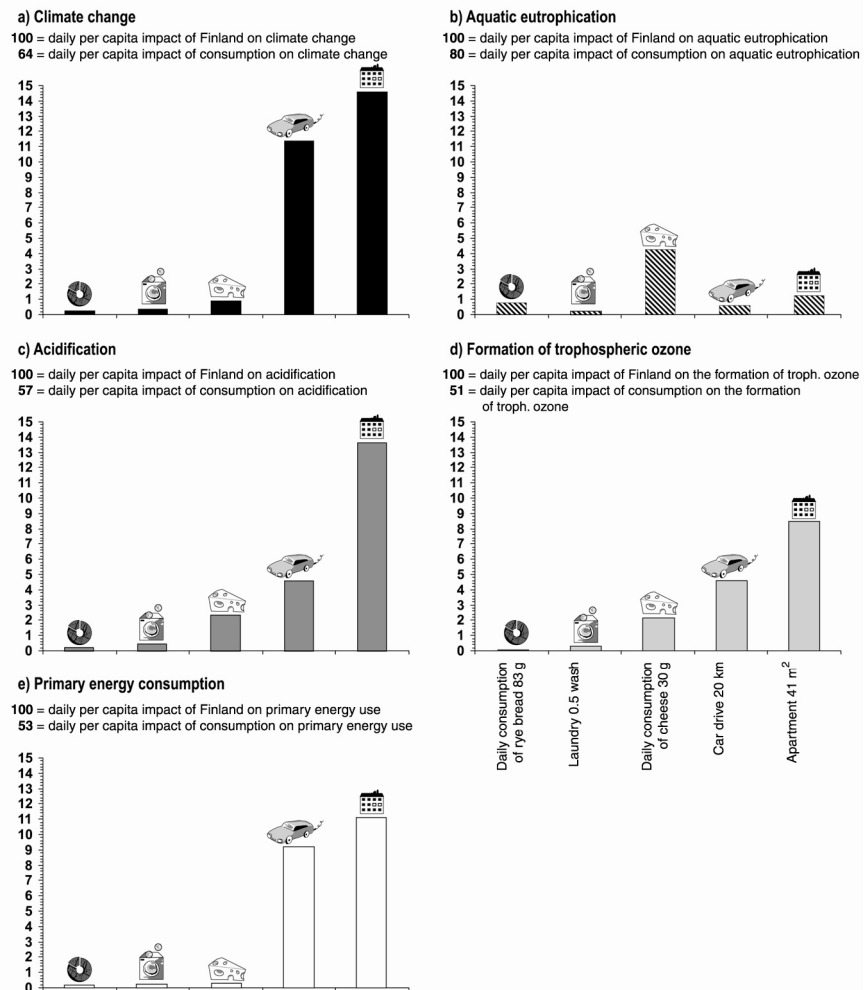


Fig. 3. The various environmental impacts of the benchmark products. The benchmark in Fig. 2 aggregates all these impacts.

of Finnish consumers served as the basis for the impact calculation. Same type of figure can be used to show the environmental impacts of any consumer product or service for which an LCA has been conducted.

In addition to the aggregated presentation, it can often be valuable and informative to show the values for each environmental impact class, as in Fig. 3. The ruler is not shown in these figures, only the scale, in order to differentiate from the basic presentation format, which aggregates the various environmental impacts.

We suggest that the presentation types in Figs. 2 and 3 would be used in a combination. When using ordinary A4 paper, the first page could present the aggregated results, and the second page show the results for each impact class. This kind of combination of the presentation types would cater to the needs of both those who prefer aggregated data, and those who prefer to draw their own conclusions on the relative importance of different environmental impact categories.

Some details and remarks

The total daily environmental impacts per person (=scale) are calculated on the basis of the annual emissions and energy consumption in Finland. For example, eutrophication effects have been calculated on the basis of the annual emissions of nutrients from industry, agriculture and human settlements.

It is worth noting that a large share of Finland's emissions and energy consumption are caused by the production of export products. On the other hand, imported products cause emissions too, which are not included in these calculations. Using the input-output method, we can estimate that private consumption amounts to about 64 % of Finland's environmental impacts (please notice that the value 64 is shown in figure).

The environmental impacts have been weighted (i.e. given priorities) according to their relative importance. The weights are based on the views of almost a hundred environmental experts in Finland, and they are shown in the legend of the figure.

Using Eco-Benchmark

Comparing the environmental impacts of a car trip and a bus trip serves as an example of using the benchmark presentation (Fig. 4).

The figure shows that a car trip and a bus trip are both ‘products’ that are very significant in comparison to other products. It also shows that there is a large difference between these alternatives. A conclusion can be easily drawn: This is certainly a choice that counts.

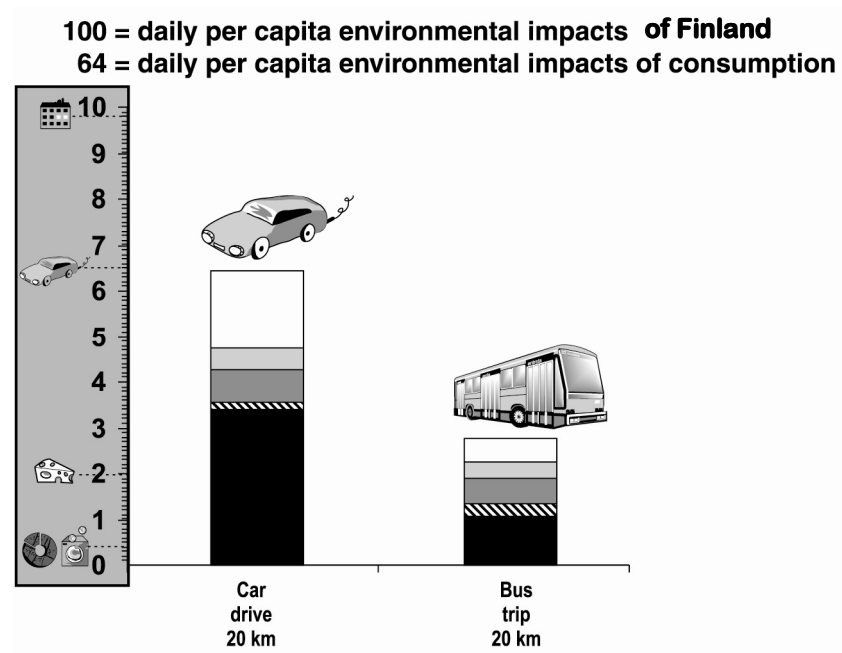


Fig. 4. An example of using the benchmark presentation, for comparing the environmental impacts of a car trip and a bus trip.

Users of Eco-Benchmark

Who will use Eco-Benchmark, and how? We consider environmental educators as the primary target group, suggesting that Eco-Benchmark can be used when informing citizens on the environmental impacts of products and consumption patterns (a brochure was already produced to serve this purpose). Offering the Eco-Benchmark directly to consumers in a situation in which the number of published LCA studies is low might raise false expectations. But LCA activities are expected to increase rapidly in coming years.

The benchmarking method will also help manufacturers and retailers to provide information about the environmental impacts of their products. In Finland one application was produced by Finnish Oy Panimolaboratorio-Bryggerilaboratorium AB (PBL), its owner companies, as well as Altia Group Ltd and GrowHow Ltd. They utilised Eco-Benchmark when launching the results of an LCA study concerning Finnish beer production

[11]. According to the study, 0,23 litre daily beer consumption leads approximately to the same total environmental impact as a daily portion of rye bread or half of a wash of laundry. In addition to the assessment of total environmental impacts of beer, improvement options of the beer chain were identified in the study [11].

Participated companies highlighted that the Eco-Benchmark approach considerably increased the applicability of LCA-based data. It was very useful when sustainability improvements were sought and communicated. On the other hand, it can help to better assess possible sustainability effects of process, product and system development aimed at economical improvements in the supply chain of beer.

Finally we think that the illustration of product environmental impacts can also be valuable for experts in administration and research organisations when participating in the development and justification of policy instruments in the field of integrated product policy.

Disseminating the tool

Brochures, a tv-program, a press release, seminars, a website and scientific publications were produced in order to make the Eco-Benchmark well known among environmental educators of consumers, product policy experts in administration, and the research community (Fig. 1). This will be of course an ongoing activity. The webpage www.environment.fi/eco-benchmark is a key dissemination channel.

International and country-specific Eco-Benchmarks?

We suggest that country-specific Eco-Benchmarks could be developed also in other countries, and products like passenger cars could offer a possibility for an international eco-benchmark. See [6] for some more discussion about this.

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