

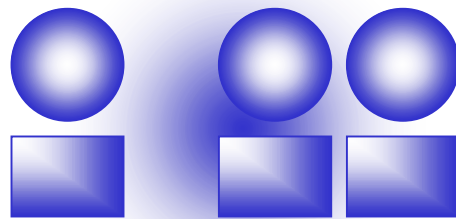


# rapport

IVL Svenska Miljöinstitutet AB

Sirii – Swedish Industrial Research Institutes' Initiative

## LCA Software Survey



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# IVL

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## **Preface**

The survey described in this report was initiated by the LCA Network within the IRIS (Industrial Research Institutes of Sweden) association in order to help the companies in finding out which LCA software tool would be the best for them to use in a given situation. No evaluation of the results has been made at this stage but hopefully these results will be the basis of further studies and evaluation of LCA softwares.

All the participating software suppliers have made a great effort to give adequate answers to the questions put to them in the form of a questionnaire. We thank the following suppliers for their cooperation:

Institute of Energy Economics and the Rational Use of Energy (IER), University of Stuttgart, Boustead Consulting Ltd, Granta Design Ltd, debis Systemhaus Industry GmbH, Pré Consultants BV, Nordic Port AB, TNO Industrial Technology, Danish Environmental Protection Agency, Assess Ecostrategy Scandinavia AB, PE Product Engineering GmbH, Öko-Institut (Institute for applied ecology), JEMAI, Japan Environmental Management Association for Industry, KCL (Finnish Pulp and Paper Research Institute), NEC Software Kansai Ltd, NEC Corporation, Chalmers Industriteknik (Ekologik), Pira International, Sinum AG – EcoPerformance Systems, EAWAG, CPM, IFU Institut für Umweltinformatik, Hamburg GmbH and ECOBILAN.

The survey was supported by NUTEK, the Swedish National Board for Industrial and Technical Development.

The research institutes involved are:

IVF, The Swedish Institute of Production Engineering Research  
IVL, Swedish Environmental Research Institute Ltd  
CPM, Centre for Environmental Assessment of Product and Material System  
SIK, The Swedish Institute for Food and Biotechnology

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## **Abstract**

The objective was to make a survey of LCA software tools on the market. The results from the survey are intended to be used by companies and organisations in their choice of an LCA software tool. As many LCA software suppliers as possible have been addressed to make a thorough survey of the existing LCA software tools on the market. The survey focuses on applicability, data availability and practical procedure when using the software. The survey was made by means of a questionnaire specially designed for this issue.

Results from the survey shows that there are several suppliers of LCA software tools on the market. The softwares are intended for different types of users and designed for different types of LCA. This survey can support all practitioners, organisations and companies, who would like to use an LCA software, in their choice of software.

## **Glossary**

Allocation	Partitioning the input and output flows of a unit process to the product system under study
EPD	Environmental Product Declaration
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
Metadata	Data about data
Practitioner	Individual or group that conducts a life cycle assessment
SPINE data format	Data documentation format developed by CPM among others
SPOLD data format	Data documentation format developed by the Society for Promotion of Life-cycle Assessment Development
Transparency	Open, comprehensive and understandable presentation of information
Unit process	Smallest portion of a product system for which data are collected when performing a life cycle assessment

## Introduction

Many companies in Sweden are beginning to evaluate the environmental impact of their products, processes and activities. One example is the companies' work with Design for Environment or Eco design. In order to do a proper evaluation of the environmental impact of their products a tool is needed, for example an LCA (Life Cycle Assessment) software tool. A lot of LCA software tools are available on the global market today and the companies might need some help in finding out which one is the best to use for their purpose. In this report the life cycle assessment as such is not dealt with but LCA references can be found on page 31 and Appendix 2.

A group of research institutes in Sweden, the LCA Network of the IRIS<sup>1</sup> association, have now carried out a survey of the LCA software tools presently available on the global market. The survey focuses on applicability, data availability and practical procedure when using the software.

Software suppliers were contacted by e-mail and by post. The survey, based on questionnaires, was made of all the software suppliers who answered the questionnaire, 24 software tools from 22 suppliers in all. The answers were collected and presented in a table. The softwares have not been tested in practice but the software descriptions have been compiled for evaluation.

The research institutes involved are:

IVF, The Swedish Institute of Production Engineering Research  
IVL, Swedish Environmental Research Institute Ltd  
CPM, Centre for Environmental Assessment of Product and Material System  
SIK, The Swedish Institute for Food and Biotechnology

The survey was supported by NUTEK, the Swedish National Board for Industrial and Technical Development.

## Objectives

The objective is to make a survey of software tools on the market. The results from the survey are intended to be used by companies and organisations in their

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<sup>1</sup> IRIS (Industrial Research Institutes of Sweden) is a joint organisation of about 30 industrial research organisations. Its objectives are to improve knowledge of industrial research, protect the common interests of the institutes, create good relations with decision-makers and serve as a link between industry and universities/ institutes of technology.

choice of an LCA software tool. As many LCA software suppliers as possible have been addressed to make a thorough survey of the existing LCA software tools on the market. The survey focuses on applicability, data availability and practical procedure when using the software. The main objective is to gather enough material to later make an evaluation of the tools with the aim to support the companies in their LCA work. The survey is presented together with the questionnaire and the results.

## Method

A questionnaire was elaborately prepared and sent out by e-mail and post. Addressees were selected from old survey references, own references and from the Internet. All answers to the questionnaire, at all possible to enter in a table, were sorted and entered.

The essence of the survey was formulated by the investigators based on field of application, data availability and practical procedure.

## Results and discussion

The answers received from 24 software suppliers were collected and are presented in a table, in which the answers are summarised to Yes/No or a very short comment. Facts about field of application, data and practical procedure for each software tool are presented more specifically in alphabetical order.

A summation based on the answers from the software suppliers shows that:

- Most of the answers of the questionnaire come from Europe, even though we sent the questionnaire to USA as well. There are probably more softwares on the market, but they were not found in this study. Anyhow this survey covers most of the common and well-known softwares in Europe.
- The range of prices of the softwares differs from free of charge to USD 20 000, which is quite a difference.
- 19 of the softwares are intended for LCA experts, 15 for design engineers and 18 for environmental engineers. 9 of the softwares are intended for all types of users.
- 17 of the softwares are designed for accounting LCA, 14 are designed for function-based LCA and 14 for screening LCA (explained in Appendix 2). Some of the softwares are designed for all types of LCA.



- Almost all of the softwares comply with the ISO 140 40 standards.

Almost every software communicates in English, some of them in another language as well. Two of the softwares only communicate in Japanese.

- The results are presented in many different ways by the different softwares and can in almost every case be exported to for example Excel.
- The softwares do include databases in most cases and are in some cases included in the price and in some sold separately. Data is sometimes general, and sometimes specific for a certain line of business or geographical area.
- Metadata, or data about data, can be documented in most of the softwares.
- New data can be added by the practitioner in almost all the softwares.
- Data format differs from software to software. Some of them use the same format, for example SPINE or SPOLD, and in these cases it is easy to communicate data from each other. There is a new standard regarding data format coming, ISO 14048, and many of the software suppliers intend to follow it.
- All of the softwares require quite a short time to learn how to use, sometimes less than a week.
- Valuation methods are used in different ways in the softwares. In most of them, the user can define a valuation method by her/himself. It requires quite a lot of work to do that. Most of the softwares do also include some valuation method.
- Almost all of the suppliers are interested in cooperating in an in-depth evaluation as a next step of this survey.

The answers have given quite a good picture of the tools on the market. Some of the questions in the questionnaire were difficult to understand or answer in a clear-cut way, and have therefore not always been answered.

The softwares have not been evaluated against certain criteria.

The answers in full from each software supplier are enclosed in Appendix 1.

## Conclusion

There are a lot of suppliers of LCA software tools on the market. The softwares are intended for different types of users and designed for different types of LCA. This survey can support all practitioners, organisations and companies, who would like to use an LCA software, in their choice of software.

As this survey is based solely on a questionnaire, there is a strong need for looking further into for example the quality aspects, the reliability, the availability, interface, communication issues of the softwares. A recommendation is to continue with this evaluation work in order to provide a fully adequate survey to support the people, organisations and companies, who would like to use an LCA software.

## Presentation in short of each software

### **Balance 3.0 (Institute of Energy Economics and the Rational Use of Energy (IER), University of Stuttgart)**

#### **Field of application**

Balance 3.0 is mainly designed for accounting LCAs and it is intended for LCA experts, design and environmental engineers.

#### **Data**

The database includes data covering materials, transport, waste disposal, electricity and heat supply, etc, direct and total energy consumption and environmental interventions of production sectors. New data can be documented by the user.

#### **Practical procedure**

First of all a “local database” for the new study is generated. Then the “local database” is connected to the “main database”. A name is documented as well as a description. After that a selection of inventory result parameters is chosen from the inventory list and then the product system is created by the user defining unit processes of his own and selecting LCI datasets from the “main database”. The calculations generate an LCI result and are also used to make some plausibility checks. When the LCI result is ready the Life Cycle Impact Assessment is performed using selected impact indicators. On a graphical display, which shows all parts of the product system and also what a certain part of the system can

contribute with to the value of a result inventory parameter, impact indicator, etc, the results are interpreted.

The relation between input and output of a process is defined by linear equations and calculations of loops are possible.

Each product system can be displayed and by doing this various different views of the product system can be generated. Each unit process can be analyzed. The software distinguishes between different types of unit processes. One type of unit processes describes a “real” production process with direct emissions, and other types of unit processes define LCI datasets, product mixes, etc.

## **The Boustead Model version 4.2 (Boustead Consulting Ltd)**

### **Field of application**

The Boustead Model version 4.2 is mainly designed for function-based and accounting LCAs and it is intended for LCA experts, design and environmental engineers.

### **Data**

The database contains data covering fuel production industries, material (iron, steel, a number of non-ferrous metals), glass, thermoplastics/polymers and intermediates, construction materials, acids and bases, packaging materials, retailing and transport.

Emissions are distinguished between where the various emissions occur, e.g. fuel production, transport operations or process operations. New data can be added by the user and can be documented by name, operation, units, year, company, etc.

### **Practical procedure**

Once installed the software can be started via the “Start” button or a desktop shortcut. The user can construct single stage processes as well as highly complex sequences of linked operations including open and closed loops. The software is mouse driven but a keyboard alternative is also possible. An online-help file is available which shows how options and controls are accessed. Calculations are made using an iterative procedure. Results are calculated to an accuracy of better than 0.5 %. The user cannot enter a formula. Sensitivity analyses can be performed. No sectors of the database are locked and all parameters are visible. The software includes a tool which helps the user to determine how each parameter was calculated by tracking a result back to its origins.

## **Cambridge Engineering Selector – Eco-selector (Granta Design Ltd)**

### **Field of application**

Cambridge Engineering Selector –Eco-selector is mainly designed for material selection to minimise environmental impact. The software is consequently not an LCA product and does not perform LCA calculations. It is intended for design engineers, environmental engineers and materials specialists.

### **Data**

The database contains data on material properties. New data can be added and documented by the user. Documentation of the LCA (metadata) is possible.

### **Practical Procedure**

A material is selected for a component, so as to maximise performance and minimise environmental impact. But the program is not an LCA product and does not perform LCA calculations. The user is able to compare materials for particular components, based on their environmental impact in manufacture and/or use.

It is possible to trace the result back to the origins; i e the result is transparent.

## **CUMPAN 1.44 (debis Systemhaus Industry GmbH)**

### **Field of application**

CUMPAN 1.44 is designed for screening and full LCAs. It is intended for LCA experts, design and environmental engineers, and for LCA beginners.

### **Data**

The CUMPAN database contains data concerning metals, plastics, energy, fuels and proprietaries and has the size of about 250 datasets. New data can be added by the practitioner.

### **Practical procedure**

The product is modeled on a graphical user interface using predefined material and process data from a database. The software manages linear equations, loops and allocation factors related to weight, heating values or monetary values. The result is fully transparent.

## **ECO-it 1.0 (Pré Consultants BV)**

### **Field of application**

ECO-it 1.0 is designed for screening LCAs. It is suitable for LCA experts or anyone who wants to make a quick product screening.

### **Data**

The database includes input and output data covering material production and processing, energy generation, transport, waste treatments, waste scenarios. It is possible to add new data.

### **Practical procedure**

In a project the life cycle of a product can be modeled using “Eco-indicator scores” from existing databases. Results can be obtained as a bar or pie graph, so that environmental hot spots can be identified. Other single score methods or extensions of current databases can be used if results are entered into an ECO-it database. Calculations are made by linear methods. Allocation is done by user-defined definition. The single score does not allow tracing the results back to individual substances. Various parts of the life cycle can be shown.

## **EcoLab version 5.1.2 (Nordic Port AB)**

### **Field of application**

EcoLab version 5.1.2 is designed for function-based and accounting LCAs. It is intended for LCA experts as well as for environmental engineers.

### **Data**

The database contains 271 activities (SPINE models of industrial processes). They cover production of metals, plastics, wood, cardboard, paper, glass, cement, chemicals, electricity and more. There are activities describing moulding, rolling, drilling, welding and other processing of metals. Other activities describe combustion of different fuels and waste treatment like scrap recovery, incineration and landfill. New data can be added by the user, who also can change everything. Ecolab provides an access control to stop different users from damaging data of each other.

## **Practical procedure**

By selecting or building activities an activity network is formed which describes how the involved processes cooperate to produce a certain function. The activities are reusable in the same LCA as well as in other LCAs. EcoLab follows all paths of the activity network in order to calculate the result and can use loops (if they are not stopped by a safety valve). Allocations can be done by the calculation.

EcoLab provides full transparency

## **EcoScan 3.0 (TNO Industrial Technology)**

### **Field of application**

EcoScan 3.0 is designed for screening LCAs and intended for engineers.

### **Data**

The software has a data format based on SPOLD. The database NOH Eco-indicator '95 is included in the software and it includes data covering materials, processes, usage, transportation, end of life, packaging, disposal and semi-manufactures. EcoScan 3.0 is also compatible with EcoScan '97 database, IdeMat '96, and forthcoming IdeMat 2000. In addition, you can make your own database with references to the origin of data.

### **Practical Procedure**

With EcoScan 3.0 it is possible to analyse the environmental impact and the cost of a product. All life cycle phases of a product can be taken into account. On a Product Life Cycle form (PLC form) all relevant aspects of the product concerning for example the production, usage or disposal phase are specified. This is done by filling in sheets, which are defined according to the phases. This way the stages wanted of the product life cycle are analysed. The software does not include documentation of the LCA (metadata), e.g. description of the conditions and choices.

Then the environmental points are assigned to the relevant aspects in order to express the environmental impact of the product in scores. This is merely a question of dragging and dropping data from ready-made databases onto the sheets of the PLC form. If the automatic disposal mode in EcoScan 3.0 is chosen, it is even easier. In that case the disposal sheet is automatically filled in. The calculations involve allocation methods and loops. Finally, the results can be displayed graphically and product improvements calculated. The results are not very transparent since the assessment is based on indicators.

## **EDIP PC-tool version 2.11 beta (Danish Environmental Protection Agency)**

### **Field of application**

EDIP PC-tool version 2.11 is designed for function-based and accounting LCAs. It is intended for LCA experts and design engineers.

### **Data**

Data included in the software is not specified for a certain branch of business, but the current version of the database primarily supports electromechanical processes. The database contains unit processes such as materials, energy systems, transport systems, products, sub-assemblies, disposal processes, production processes, substances and auxiliary materials. New data can be added and documented by the practitioner. Documentation of the LCA (metadata) is possible in the software.

### **Practical Procedure**

Modeling of the life cycle is started and progressively refined in synchronisation with the product development. Calculations, e.g. inventory or impact assessment, may be done at any level in the process.

It is possible to trace the result back to the origins; i.e. the result is transparent. It is also possible to get an inventory result, accounting for all the inputs and outputs to the system.

The systems can handle loops. The calculations may include uncertainty and sensitivity analysis (the figures must be associated with information about the uncertainty by the user).

## **EPS 4.0 Design System (Assess Ecostrategy Scandinavia AB)**

### **Field of application**

EPS 4.0 Design System is designed for screening accounting LCAs. The impact assessment is emphasised, and the valuation method EPS, Environmental Priority Strategies, is included in the software. The software is intended for LCA experts, design engineers, environmental engineers, purchase organisations and sales and management in corporations.

## **Data**

The data included in the software is not specified for a certain branch of business. The database, SPINE, included in the software contains data concerning materials, processes, transports and products. New data can be added and documented by the practitioner. The software contains means for documentation of the LCA (metadata).

## **Practical Procedure**

It is possible to trace the result back to its origin; i.e. the result is transparent. It is also possible to get an inventory result, accounting for all the inputs to and outputs from the system.

The software can perform error analysis and sensitivity analysis. The system works with analytical equations.

## **GaBi3 (PE Product EngineeringGmbH)**

### **Field of application**

GaBi3 is designed for function-based LCAs and it is intended for LCA experts and similar persons.

### **Data**

The software has extension databases, which are paid separately and can be used only in connection with the professional database. They include intermediates organic, intermediates inorganic, energy (power stations, country specific data, dynamic power plant model), steel (sheets, alloyed steel, alloying elements), aluminium (profiles, sheets, castings, alloying elements), non-ferrous metals (primary), plastics (high performance plastics, compounds), coatings (painting processes, paint, solvents, pigments fillers), end of life (disposal, recycling, dynamic process models), manufacturing (single processes, material specific processes, dynamic processes). The practitioner can add new data.

### **Practical procedure**

All kinds of mathematical functions can be used in the processes; different allocation methods can be chosen; recycling loops are easy to create. The result is very transparent because of the possibility to check consistency and the structure of the process tree in the balance.



## **GEMIS (Öko-Institut (Institute for applied ecology))**

### **Field of application**

GEMIS is designed for screening and accounting LCAs.

It is intended for LCA experts, environmental engineers, analysts in utilities, institutes, SMEs (small and medium enterprises). Only physical valuation methods (CO<sub>2</sub>-equivalents, etc) and external costs can be used.

### **Data**

The database includes data on approximately 500 products and 4000 processes in more than 20 countries. Industrial sectors, which companies using the software are involved in, are utilities (gas, electric), district heat, oil, building, agriculture, chemicals and transport. New data can be added and documented by the practitioner. Documentation of the LCA (metadata) is possible.

### **Practical Procedure**

The result is transparent; i.e. it is possible to do a total breakdown of the results including data quality and location of each source.

## **JEMAI-LCA (JEMAI, Japan Environmental Management Association for Industry)**

### **Field of application**

JEMAI-LCA is designed for function-based LCAs. It is intended for LCA experts and design engineers. It is only available in Japanese.

### **Data**

The data covers mainly processes (gathering resources, energy, manufacturing, transportation, use, disposal, etc.) The practitioner can add new data.

### **Practical procedure**

First of all the goal and scope of the study are established. Then an inventory analysis is performed under the pre-establishment of emitted area, transportation, scenarios of use and disposal. After that an impact assessment is done. The results of calculations are interpreted, further considerations such as data quality assessment, sensitivity analysis are performed to conclude the study.

Calculations are made in accordance with inputs and outputs of each process data. Cut-off rules are applied for endless loops. The user can choose various methods to allocate outputs from a unit process, i.e. mass-based, marked value based and other methods. There is no possibility to use mathematical formulas. Sensitivity analyses are somehow limited. The effect of the allocation method and the data variability on the LCI results can be assessed.

## **KCL Eco 3.01 (KCL, Finnish Pulp and Paper Research Institute)**

### **Field of application**

KCL Eco 3.01 is designed for all types of LCAs, i.e. function-based, screening and accounting LCAs. It is suited for all types of users, e.g. LCA experts, environmental and design engineers,

### **Data**

KCL Eco 3.01 has the data format Data Master (based on SPOLD) and is compatible with the EcoData database. The EcoData database involves data for pulp, paper and board production processes, chemicals, energy, transports, wood harvesting, deinking processes, and waste management. The practitioner can also add new data by himself, together with a note regarding the source.

### **Practical Procedure**

Modules for each life cycle stage are made inputs and outputs are inserted to the modules. The software does not include documentation of the LCA (metadata), e.g. description of the conditions and choices. Then the modules are connected to each other, including transports, and the flow is calculated using e.g. 1 kg final product as reference. The calculations in KCL Eco 3.01 are based on linear equations and involve closed loop functions, allocations, sensitivity analyses and assessments. Finally an impact assessment is made and the results displayed as tables and diagrams. The result from the valuation is transparent, i.e. it is possible to track the origin of the result.

## **LCA Support version 2 (NEC Support Kansai Ltd, NEC Corporation)**

### **Field of application**

LCA Support version 2 is designed mainly for screening and accounting LCAs. It is suited for all types of users, e.g. LCA experts, environmental and design engineers. The software only communicates in Japanese.

### **Data**

LCA Support version 2 is compatible with three databases: "LCA database series Japan", which contains general data covering material and energy production in Japan, "LCA database series 1995 Input Output Table", which contains about 4 000 data concerning production of overall Japanese sectors based on I/O tables, and "LCA database series BUWAL", which mainly contains packaging data in Europe. In addition, you can add new data with references to the sources.

### **Practical Procedure**

LCA Support version 2 provides a flow window to describe product life cycles. The flow window has two kinds of views: a tree view representing a product life cycle as process trees and a sheet view displaying a portion of the process trees. Users can change these views whenever required. Users can construct process trees intuitively to drag-and-drop and cut-and-paste process object icons.

LCA Support version 2 has a loop processing function, which is addition of process objects appearing repetitively on a process tree. The user can carry out sensitivity assessment by replacing an object icon with another by means of an easy interface. However, LCA Support version 2 treats only allocated data and has no special function for analytical equation calculation and mathematical formula use.

LCA Support version 2 provides a document attachment function, which enables document files, such as text files and Microsoft Word files, to be attached to individual process objects. This function may be used e.g. for descriptions of the conditions and choices made in the LCA.

## **LCAIT 4 (Chalmers Industriteknik, Ekologik)**

### **Field of application**

LCA-it 4 is not designed for any specific user, which means that LCA experts, design engineers, environmental engineers, LCA beginners and others can depending on LCA support, software user support and available data use the program. LCA-it 4 is appropriate for any type of LCA work (function-based LCA, screening LCA, accounting LCA and other).

### **Data**

The data included in the software is not specified for a certain branch of business. The software includes a basic software package with energy data and transport data, which includes production and combustion of fuels, production of electricity and different transport modes. Additional data modules are to be purchased separately. New data can be added and documented by the practitioner. Documentation of the LCA (metadata) is possible in the software. The software is based on the SPINE data documentation format.

### **Practical Procedure**

The software uses a relation database. The following section is quoted directly from the questionnaire (parts of question 15):

There are different types of working areas depending on what type of LCA procedure your are working with for the moment e g  
Defining a new LCA project and its different product systems in the Workspace working area  
Creating an LCA system (process tree) in the Flowchart working area.  
Defining a new substance, a unit etc. in the Nomenclature working area.  
Searching for a data set in the Query working area or  
Calculating the inventory and impact assessment results in the Output working area”

It is possible to trace the result back to its origin; i e the result is transparent. It is also possible to get an inventory result, accounting for all the inputs and outputs to the system.

The software can handle closed-loops. The user can define mathematical formulas for definition of units (e.g. kWh = 3,6 MJ).

## **PEMS v4.6 (Pira International)**

### **Field of application**

PEMS v4.6 is designed for function-based-, screening and accounting LCAs. It is intended for LCA experts.

### **Data**

The database which is transparent includes data covering energy consumption, waste management, transport and materials. It is possible to add new data.

### **Practical procedure**

Systems are constructed using a flow diagram. The user can use data from the database or add new data. Once data has been entered, systems can be compiled and results evaluated using a range of graph and reporting features. The calculations provide mass and energy balances. There are no formulaic links between flows in a given process except in distribution blocks, in which the mass and energy balance is maintained and the remainder exported or imported from another process. All impact assessment results can be traced back to individual flows through the use of analysis graphs and reports.

## **REGIS 2.1 (Sinum AG – EcoPerformance Systems)**

### **Field of application**

REGIS 2.1 is designed for screening and accounting LCAs. The tool can also be used in corporate ecobalances (ISO 14031). The software is intended for LCA experts, environmental engineers, technical staff and environmental managers.

### **Data**

The data included in the software is not specified for a certain branch of business. The database includes data covering energy systems, disposal systems, transportation, packaging materials, materials related to the printing industry and various auxiliary materials. New data can be added and documented by the practitioner. Documentation of the LCA (metadata) is not possible in the software. The user can, however, add comments.

## **Practical Procedure**

A short description of the practical procedure when using the software (from the questionnaire):

1<sup>st</sup> step: Modelling the organisational structure.

2<sup>nd</sup> step: Designing new measuring points related to specific inventories not contained in the database.

3<sup>rd</sup> step: Entering the measured quantities of a period.

4<sup>th</sup> step: Analysing the environmental impacts using different evaluation methods.

5<sup>th</sup> step: Documentation

It is possible to trace back the result to the origins; i.e. the result is transparent. It is also possible to get an inventory result, accounting for all the inputs and outputs to the system.

The software works with linear equations.

## **Sima Pro 4.0 Light with Scripts (PRé Consultants BV)**

### **Field of application**

The type of LCA work suitable for Sima Pro 4.0 Light with Scripts is function-based LCA, screening and accounting LCAs, and for cradle to gate, end of life studies and other partial LCA studies. The applicability for certain LCA work depends on the scripts and databases made to work with the software. The software is intended for design engineers, environmental engineers and for non LCA experts that wish to use LCA with predefined scripts.

### **Data**

Input/output data cover material production and processing, energy generation, transport, waste treatments and waste scenarios. New data can be added in projects only but cannot be used in the scripts themselves.

### **Practical procedure**

The software is made to use a predefined script and a database which is programmed with the SimaPro PLUS option. The script asks a variety of questions in order to build an LCA model in the background. It can be analysed in different predefined ways. The database can be a customized one or one of the

generic kind supplied by the proprietor of the software. Once the script is finished the results are saved in a project and the user can view/edit them or analyse them again. Calculations are made by linear methods. Allocation is done by user-defined definition (in processes). Avoided product allocation by subtraction of the avoided product. Loops can be simulated. The result is fully transparent and any result of any stage in the life cycle can be traced back. Each result can also be displayed as a process tree.

## **Sima Pro 4.0 single user/multi user commercial (Pré Consultants BV)**

### **Field of application**

Sima Pro 4.0 single user/multi user commercial is suitable for function-based LCA, screening and accounting LCAs, and for cradle to gate, end of life studies and other partial LCA. The tool is intended for LCA experts, design engineer and environmental engineer

### **Data**

The database includes input and output data concerning material production and processing, energy generation, transport, waste treatments and waste scenarios. It is possible to add new data in projects or to the database.

### **Practical procedure**

Input/output data are stored as processes in a database or in projects. Modelling of the life cycle is done in steps, as part of a project: the products are modelled as assembly. The functional unit is modelled in the life cycle, end of scenarios are modelled as disposal, reuse, disassembly scenarios. In the modelling links are made to processes. Analysis or comparisons with preselected impact assessment method can be performed in the modelling phase or on the processes. It can also be predefined in reports. The software uses linear calculations and allocation is done by user-defined definition. Avoided product allocation by subtraction of the avoided product. Loops can be simulated. Results of any stage in the life cycle can be traced back.

## **SIMBOX Version 2.6 (EAWAG)**

### **Field of application**

SIMBOX Version 2.6 is not specifically an LCA software, but a simulation tool for material and energy household analysis. Intended users are environmental engineers, university people, staff at governmental offices or other companies.

### **Practical Procedure**

See “Regionaler Stoffhaushalt” (Baccini P, Bader H-P, Spektrum Verlag, 1996) for information about the practical procedure when using the software. The calculations are based on serious and numerically accurate mathematical procedures as are used in real simulation programmes. Mathematical formulas, sensitivity analyses, and other important simulation techniques are available.

## **SPINE@CPM Data Tool 3.0 (CPM)**

### **Field of application**

SPINE@CPM Data Tool 3.0 is designed for function-based LCAs, screening and accounting LCAs. The software is intended for LCA experts and environmental engineers.

### **Data**

The software does not include any database. New data can be added and documented by the practitioner. Documentation of the LCA (metadata) is possible. SPINE@CPM Data Tool communicates with SPINE databases, which are based on Microsoft Access and the SPINE LCI data format. SPINE databases may be built up by anyone, using SPINE@CPM Data Tool.

LCI data may also be bought from the reviewed SPINE@CPM Database containing LCI data. In the SPINE@CPM Database you can find detailed information on all types of goods transportation, electricity, heat and fuel production, raw material production for e.g. polymers, metals, chemicals, building materials as well as some manufacturing processes such as metal processing, electronic components and waste management alternatives.

The SPINE@by-pass 1.0 containing 270 data sets is also available to buy from CPM and retailers in short. This database is not reviewed in regard of the CPM data quality requirements and is therefore recommended to be used e.g. for laboratory LCI and LCA work.



## **Practical Procedure**

It is not possible to do any calculations in SPINE@CPM Data Tool. The main scope of the tool is environmental information management; in other words the tool supports data acquisition, documentation and storage.

The activities (data sets) are added into the flowchart of the aggregated activity (LCA study). Documentation of metadata is possible next to the flow chart. The calculations can be made by exporting the numerical values to compatible calculation software.

## **Team™ 3.0 (ECOBILAN SA, Member of PriceWaterhouseCoopers)**

### **Field of application**

Team™ 3.0 can be used for all types of LCA work and is intended for LCA experts and environmental engineers.

### **Data**

Major kind of database which includes data covering pulp and paper, plastics and chemicals, glass, steel, non ferrous metals, energy, transport and end of life. New data can be added by the practitioner and information about data is stored in independent modules attached to the data set.

### **Practical procedure**

User's manuals and pedagogical case studies exercises are delivered with the software. An on line help as well as a full documentation describing the LCA terminology and methodology are included in the software.

In order to attribute a value to flow, one can enter: a numerical value (N<sub>2</sub>O=92g/1,000kg of coal burned) or a formula that can use "variables". A large range of built-in mathematical formulas is available (trigonometry, logarithms, exponentials, etc). This use of formulas and variables allows one to build a dynamic database, and to later identify key parameters with the help of sensitivity analyses. Variables can be defined for each module, and are used in the calculations of the value of flows and allocation rules (for sensitivity analyses on methodological choices).

## **Umberto 3.5 (IFU Institut für Umweltinformatik, Hamburg GmbH)**

### **Field of application**

Umberto 3.5 is designed for function-based and accounting LCAs. It can also be used for environmental business assessment in general, process planning and optimisation, economical and ecological improvement of processes, products and sites. There are branch solutions of Umberto provided by industrial associations available. The software is intended for all types of users.

### **Data**

The software contains data of material hierarchies, organized as material groups with technical, economic and ecological material properties, process-data, e.g. transportation processes with parameters for several truck types, distances, etc. New data can be added by the practitioner.

### **Practical procedure**

**Projects:** The user can create individual projects. Each project is characterized by a freely definable and expandable list of products, raw materials, pollutants, and forms of energy, etc --- all referred to as materials. They are administered in a hierarchically structured material list.

**Scenarios:** Several scenarios can be created within a project. A scenario is characterized by a graphical network structure. Processes are defined – either by the user or by recalling modules from the Umberto library which contains numerous standard processes.

**Periods:** To ensure the continuity of a material flow analysis, periods setting the time scope of the balance can be stated for each scenario, e.g. the fiscal year or a month. Thus also time-dependent calculations are possible.

Very flexible, mathematical formulas can be used to support parameter variations, scenario technique is supported, data qualities can be used. Recycling loops can be modelled, allocation rules can be freely adapted. Umberto also allows to model multi-product systems and calculate the LCI than for each single product. To specify processes also scripting languages (Python, Javascript, Vbscript and soon Perl) are supported. Methods are documented and provide full transparency on how the results are calculated.

## **WISARD version 3.7 (ECOBILAN)**

### **Field of application**

WISARD version 3.7 can be used for function-based and accounting LCAs. The software is intended for LCA experts, environmental engineers and technical staff from local authorities and waste managers.

The database contains data of processes (waste management) and ancillary materials/processes (e.g. lime production, diesel production). New data can be added by the practitioner.

### **Practical procedure**

Data collection using the electronic questionnaires provided+system description (graphical user interface)+data calculation with TEAM + result interpretation (either guided with pre-defined presentation formats or defined by the user)

Allocations are defined and explained, sensitivity analyses are available and Monte Carlo calculations can be made.

Results are presented for each sub-system defined by the user (incineration, landfill, etc.) and for each sub-system it is possible to differentiate between site emissions, supply of utilities, construction and demolition.

- X** = Yes  
 - = No  
 \* = Information in Comment  
 () = Reference to question No

### 1.1.1 LCA Software Tools – Results questionnaire

Q u e s t i o n	Country (4)	Number of licenses sold (approximately) (5)	Approximate price for one license (6)	Software support offered (8)
	Germany	3	\$250	X
	UK	confi- dential	\$15000	X
	UK	Not released	Not yet decided	X
	Germany	62	\$6000	X
	Germany	70	\$215	X
	Holland	150	\$5500 for 2 users	X
	Holland	100	\$475	X
	Holland	100	\$700	X
	Denmark	>200	\$3200	X
	Sweden	250	\$2500- 8000	X
	Germany	1000	Free	X
	Germany	Not released (*)	\$900	-
	Japan	50	Euro 3000	X
	Finland	50	Euro 3000	X
	Japan		\$2800	X
	Sweden	400- 500	£3930	X
	Sweden	90	£3000	X
	TRK	150	\$5900	X
	Switzerland	80	\$2900 per 5 lic	X
	Holland	>600	\$2540	X
	Holland	20+	\$1000- 5000	X
	Switzerland	450	Free	-
	Sweden	>200	\$3000	X
	France	>350	\$1000- 20000	X
	France	>80	\$1500- 3000	X

Question	Balance 3.0	The Boustead Model version	Cambridge Engineering Selector Eco Selector	GUMPAN 144	ECO-fit 1.0	EcoLab version 5.1.2	EcoScan 3.0	EDIP PC-tool	EPS 4.0 Design System	GaB3	GEMIS, TEMIS and EM	JEMAI-LCA	KCL Eco 3.0	LCA support, version 2	Leait 4	PEMS v4.6	REGIS 2.1	Sima Pro 4.0	Sima Pro 4.0 single user/	Simbox version 2.6	SPINE@CPM Data Tool 3.0	TEAM™	Umber to 3.5	WISARD version 3.7	
Demo version available (9)	-	X	Test	-	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	-	X	X	X	X	X
Intended user LCA Expert (10)	X	X	-	X	-	-	X	X	X	X	X	X	X	X	-	-	X	-	-	X	X	X	X	X	X
Intended user Design engineer (10)	X	X	X	X	-	X	X	X	X	-	X	X	X	X	X	-	-	X	X	X	X	X	X	X	-
Intended user Environmental engineer (10)	X	X	X	X	-	-	-	X	X	-	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X
Used for Function based LCA (13)	-	X	- (*)	-	X	-	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X
Used for Screening LCA (13)	-	-	-	X	X	X	-	-	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Used for Accounting LCA (13)	X	X	- (*)	-	X	-	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Comply with ISO 140 40 standards (14)	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Question	Balance 3.0	The Boustead Model version	Cambridge Engineering Selector Fee Selector	CUMSPAN 1.44	ECO-fit 1.0	EcoLab version 5.1.2	EcoScan 3.0	EDIP PC-tool	EPS 4.0 Design System	GaB3	GEMIS, TEMIS and EM	JEMAI-LCA	KCL Eco 3.0	LCA support, version 2	LcaIt 4	PEMS v4.6	REGIS 2.1	Sima Pro 4.0	Sima Pro 4.0 single user/	Simbox version 2.6	SPINE@CPM Data Tool 3.0	TEAM™	Umberto 3.5	WISARD version 3.7
English (17)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Other language (17)	-	(X)	-	X	-	X	-	X	-	X	X(*)	(X)	-	X(*)	(X)	-	X	X	X	X	(X)	X	X	X
Result in chemical substances (18)	X	X	-	-	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X
Result in Effect categories (18)	X	X	-	X	-	X	-	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X
Result in Environmental "Points" (18)	X	-	-	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X
Result in tables (18)	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Result in Comparison between different products (18)	*	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X
Result in Diagrams (18)	X	-	X	X	X	-	X	X	X	X	-	X	-	X	X	X	X	X	X	X	X	X	X	X
Possible to export results (18)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Question	Balance 3.0	The Boustead Model version	Cambridge Engineering Selector Fee Selector	CUMSPAN 1.44	ECO-fit 1.0	EcoLab version 5.1.2	EcoScan 3.0	EDIP PC-tool	EPS 4.0 Design System	GaB3	GEMIS, TEMIS and EM	JEMAI-LCA	KCL Eco 3.0	LCA support, version 2	LcaIt 4	PEMS v4.6	REGIS 2.1	Sima Pro 4.0	Sima Pro 4.0 single user/	Simbox version 2.6	SPINE@CPM Data Tool 3.0	TEAM™	Umberto 3.5	WISARD version 3.7	
The software supports total inventory with inputs and outputs (20)	X	X	-	X	X	X	-	X	X	X	X	X	X	-	X	X	X	X	X	-	X	X	X	X	X
Include databases (21)	X	X	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	-	X	X	X	X	X
Include documentation of LCA, "metadata" (25)	X	X	X	X	X	X	-	X	X	X	X	X	-	X	X	X	-	X	X	X	X	X	X	X	X
New data can be added and documented by practitioner (26)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Data format SPINE (27)	-	-	-	-	-	X	-	-	X	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-
Data format SPOLD (27)	-	-	-	-	-	-	(*)	X	-	-	-	-	-	-	-	-	-	-	-	-	X	X	(*)	(*)	
Time of learning (28)	<2h	<1d	<1d	1d	<2h	<1d	<1d	<1w	<1w	<1m	1d-1w	<1d	<1w	<1d	<1w	<1d	<1d	<2h	<1d	<1d	1d-1w	<1d	<1w	<1d	<1d
Taught by user manual (29)	-	X	X	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	X	X	X	X	X





Question	Balance 3.0	The Boustead Model version	Cambridge Engineering Selector Fee Selector	CUMPAN 1.44	ECO-fit 1.0	Ecolab version 5.1.2	EcoScan 3.0	EDIP PC-tool,	EPS 4.0 Design System	GaB3	GEMIS, TEMIS and EM	JEMAI-LCA	KCL Eco 3.0	LCA support, version 2	LcaIt 4	PEMS v4.6	REGIS 2.1	Sima Pro 4.0	Sima Pro 4.0 single user/	Simbox version 2.6	SPINE@CPM Data Tool 3.0	TEAM TM	Umberto 3.5	WISARD version 3.7	
(37)																									
Software is updated Annually (37)	-	X	-	X	-	-	-	-	X	-	X	-	-	-	-	X	X	-	-	X	-	-	-	-	
Software is updated Bianually (37)	X	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	X	-	-	-	-	-	X	
Software is updated other intervals (37)	-	X	-	-	X	X	X	X	-	X	-	-	-	X	X	X	-	-	-	X	-	X	X	-	
Interested in cooperation for the next step of the survey (38)	X	X	X	X	X	X	X	X	X	X	X	X(*)	X	X	X	X	X	X	X	X	X	X	X	X	X

<b>Q u e s t i o n</b>	<b>Comment</b>	Not immediately but can be done by defining a "meta product"	Balance 3.0
		The Boustead Model version	
		Material selection to minimize environmental impact	Cambridge Engineering selector Eco Selector
		Used for full LCA	CUMSPAN 1.44
			ECO-fit 1.0
			EcoLab version 5.1.2
		Data format based on SPOLD	EcoScan 3.0
			EDIP PC-tool,
			EPS 4.0 Design System
			GaBi3
			GEMIS, TEMIS and EM
		70 licenses sold in advance, only available in Japanese	JEMAI-LCA
			KCL Eco 3.0
		The software only communicates in Japanese	LCA support, version 2
			LcaIt 4
			PEMS v4.6
		Data format based on SPOLD	REGIS 2.1
			Sima Pro 4.0
			Sima Pro 4.0 single user/
		Not specifically LCA software, but simulation tool for material	Simbox version 2.6
	<a href="mailto:SPINE@CPM">SPINE@CPM</a> Data Tool 3.0		
	TEAM™		
	Umber to 3.5		
Very similar to SPOLD format	WISARD version 3.7		

## References

### Some literature on LCA methodology:

ISO 14040 Life cycle assessment – Principles and framework [ISO 14040, 1998]

ISO 14041 Life cycle assessment – Goal and scope definition and inventory analysis [ISO 14041, 1998]

ISO 14042 Life cycle assessment – Life cycle impact assessment [ISO 14042, 2000]

ISO 14043 Life cycle assessment – Life cycle interpretation [ISO 14043, 2000]

Livscykelanalyser LCA [Naturvårdsverket, 1996] (in Swedish)

The Hitchhiker's Guide to LCA [Baumann and Tillman, under preparation 2000]

Nordic Guidelines on Life-Cycle Assessment [The Nordic Council of Ministers, 1995]

### Internet address of the participating institutes:

IVF <http://www.ivf.se>

IVL <http://www.ivl.se>

CPM <http://www.cpm.chalmers.se>

SIK <http://www.sik.se>

## Appendix 1

### **Balance 3.0 (Institute of Energy Economics and the Rational Use of Energy (IER), University of Stuttgart) Organisation**

1. Name and Version of the LCA software tool  
BALANCE 3.0
2. Name of company/organisation who is proprietor of the tool  
Institut für Energiewirtschaft und rationelle Energieanwendung (IER),  
Universität Stuttgart  
*(Institute of Energy Economics and the Rational Use of Energy (IER), University of Stuttgart)*  
Heßbrühlstrasse 49a, D-70565 Stuttgart
3. History of the tool (who developed it, when and where it was launched on the market)  
Developped by IER since 1995 to support, combine and standardize LCA-projects within the Institute. The interest of other institutes caused us to offer the software to prospective buyers since 1999.
4. Contact for more information  
Name: Torsten Marheineke  
Adress: Institut für Energiewirtschaft und rationelle Energieanwendung (IER), Universität Stuttgart, Heßbrühlstrasse 49a, D-70565 Stuttgart  
Phone: ++49 711 78061-65  
E-mail: [torsten.marheineke@ier.uni-stuttgart.de](mailto:torsten.marheineke@ier.uni-stuttgart.de)  
Home page: [www.ier.uni-stuttgart.de](http://www.ier.uni-stuttgart.de) (Institute)  
[http://www.ier.uni-stuttgart.de/extern/balance/balance\\_data.htm](http://www.ier.uni-stuttgart.de/extern/balance/balance_data.htm) (still under construction, but shows a list of projects which were/are realized by using BALANCE)
5. Has the tool been reviewed in an unbiased report or evaluation ?  
Siegenthaler, Claude P. et al: „LCA software guide 1997“, öbu Schriftenreihe 13/1997  
  
How many licences of the software are sold ? 3  
Name of customer reference:

## Appendix 1

- Beate Arman, Institut für Pflanzenbau und Grünland, Universität Hohenheim, Deutschland
- Marc Weber, Institut für landwirtschaftliche Betriebslehre, Universität Hohenheim, Deutschland
- Edgar Hertwich PhD, Institute for Product Design, LCA Laboratory, Norwegian University of Science and Technology, Trondheim, Norway

### **Commercial specifications**

6. Price of the software:

500 DM = approx. 250 USD

licence for additional working place : 100 DM = approx. 50 USD

costs of Inventory Datasets on request

7. –

8. Any software support offered:

Yes. Free introduction to the software, by phone or as a short lesson at our Institute. In general, this introduction enables the user to perform his LCA studies.

9. Is there a demonstration version of the software ?

Not in general. But we offer a free version with a licence limiting the use of balance to a certain time period to persons which are seriously interest in the software.

### **Features**

10. Intended use of the software

LCA expert - yes, Design engineer - yes, Environmental engineer - yes.

11. Size of the companies for which the software is intended.

In general, the use of the software is not limited to a certain number of users. Our experience comes up to 20 users working at the same time with the software.

12. Which industrial sectors are the software user companies involved with ?

Scientists working in the fields of energy systems, sustainable agriculture, transportation sector

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13. The software is designed mainly for the following type of LCA work  
Accounting LCA
14. Does the software comply with the ISO 14040 standards?  
Yes
15. Please give a brief description of the practical procedure when using the software.
1. Generate a „Local Database“ for your new study.
  2. Connect your „Local Database“ to the „Main Database“  
*(The Main Database provides life cycle inventory datasets as well as the definition of impact indicators, characterisation factors, weighting factors for impact indicators etc.).*
  3. Enter the name of the study, a description (goal and scope definition).
  4. If you want to work with background inventory data, select the background inventory system (for explanation see Question 39)
  5. Select the inventory result parameters you want to consider in your LCA study from the complete list of inventory result parameters offered by the Main Database.
  6. Define your own unit processes and select LCI datasets from the Main Database to create your product system.
  7. Start the calculation procedure to generate LCI results.  
*(The calculation procedure carries out some plausibility checks. For example, loops should not result in a upstream demand which is higher as the final output of the product in question.)*
  8. Perform the Life Cycle Impact Assessment: Select impact indicators - and if desired the preferred sets of weighting factors for impact indicators - from the Main Database. Then, the values for the impact indicators, the aggregating evaluation quantity, and the contribution of each inventory result parameter to these values are calculated.
  9. Interpretation: A Graphical Display Module enables the user to display any part of the product system and the contribution of this part of the product system to the value of a result inventory parameter, impact indicator etc.
  10. If you finalized your study, you can import your data into the Main Database. By doing this you provide your results as LCI data sets to other users.
16. What units can be used ?  
SI (metric) – Yes. Other – Yes.

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Comment: The user is free to define any unit for the intermediate product flows. On the contrary, the units for LCI result parameters, impact indicators etc. are defined once in the Main Database.

17. Which languages does the software communicate in ?

English

18. What kind of results are produced ?

Chemical substances – Yes. Effect categories – Yes. Environmental „points“ – Yes. Tables – Yes. Comparisons between different products – Not immediately, but can be done by defining a „meta product system“ which has an input from two different product systems (The input from the second product system may e. g. have a negative value). Then, you can compare the two product systems resp. the two products provided by the two product systems by analyzing the „meta product system“). Diagrams – Yes.

Possibilities to export results to other software, e. g. Excel ? Yes (to Excel or any other software which understands the „Windows Clipboard“)

19. Please give special information on how calculations are made, i. e. analytical equations....

The relation between inputs and output of a unit process are defined by linear equations:  $\text{Input}_1 = \text{factor}_1 \times \text{output}$ ; calculation of loops is possible

20. Does the software support total inventory with inputs and outputs ? Yes

### Databases

21. Does the software include any databases ?

Yes: Ökoinventare für Energiesysteme, ETH Zürich and PSI 1996  
 Different LCI Datasets compiled by IER 2000  
 Input-Output-Table Germany 1993  
 Input-Output-Table World 1993, differing 11 world regions

22. What kind of data the databases contain ?

Materials, Transport, waste disposal, electricity and heat supply, etc.; energy consumption, direct and total (=direct + indirect) environmental interventions of production sectors

## Appendix 1

23. Is there a regular updating possibility of the software database contents ?

Yes. Import of additional data to the Main Database is possible at every time. In the Local Databases which contain your LCA studies, current LCI datasets can be replaced by other ones. Additionally, it is possible to replace a selected background inventory system by another one (see also questions 15 and 39)

24. What other databases are compatible with the software, if any ?

No

25. Does the software include documentation of the LCA, „metadata“, e. g. description of the condition and choices ?

Yes.

### **Documentation**

26. Can new data be added by practitioner and can be the origin of the new data be documented ?

Yes

27. Which data formats or documentatin tools are compatible with the software ?

SPINE – No. SPOLD – No.

### **Learning**

28. How long does it take to learn the software ?

< 2 h

29. How is the software taught ?

User manual – No. „Virtual course – No. Teachered course – Yes. Other: Introduction to the software by phone or as a short lesson at our Institute. In general, this introduction enables the user to perform his LCA studies.



## Appendix 1

### User reflections

30. Describe a case study in which this software was used.

List of projects: [http://www.ier.uni-stuttgart.de/extern/balance/balance\\_data.htm](http://www.ier.uni-stuttgart.de/extern/balance/balance_data.htm)

Advantages:

- Persons who have an idea about life cycle assessment can perform their own LCA after a short introduction to the software
- The use of a background inventory system enables the user to streamline life cycle inventory assessment. Firstly, a rough estimation of the total environmental interventions can be made. Then, the product system can be improved by replacing step by step parts of the background inventory system by own unit processes or LCI datasets.
- The Graphical Display Module allows the user to identify relevant process steps of the product system very quickly.

Disadvantages:

Perhaps you should question users which are not members of your institute. If one of our colleagues misses a software function, we add this item immediately. So, the software meets your demands perfectly today.

In future, there may be the request to perform site specific life cycle impact assessment. At the moment, this is only possible by defining appropriate inventory result parameters, which seems not to be the most preferable way. Consequently, we think about realizing a more attractive solution.

### Valuation methods

31. Which valuation methods can be used by the software ?

In terms of ISO 14040: „Weighting“ = aggregating the impact indicator results by using weighting factors. At the moment, the database contains damage oriented weighting factors derived from different external costs studies of the EC. But other sets of weighting factors, e. g. Ecopoints or EcoIndicator99, can be added very easily to the database.

32. How transparent is the result (possibilities to track the origin of a result) ?

Each product system can be displayed on the screen with the Graphical Display Module. Doing this different views to the product system can be generated. Each unit process of the product system can be analyzed by listing e. g. direct interventions, intermediate product flows, indirect interventions caused by the intermediate product flows of the unit process, the description of the unit process data etc.

## Appendix 1

Additionally, the software distinguishes between different types of unit processes. The type of the unit process stands for a certain functionality. On the one hand this helps the practitioner to avoid errors by entering data. On the other hand the type of a unit process often helps a viewer/analyst who is not the builder of an LCI to understand what the builder intended to do when defining a unit process in question. E. g. one type of unit processes describes a „real“ production process with direct emissions. Other types of unit processes define LCI datasets, product mixes etc.

33. Is it possible to use different valuation methods for the same LCA ?

Yes

### **Technical specifications**

34. What are hardware requirements for the software (memory, etc.) ?

Minimum 486 processor, 16 MB RAM, required harddisk space: software 10 MB,  
Database ca. 20 - 200 MB

35. Which is the memory size of the software itself ?

10 MB

36. Which operating system can be used ?

Win'95, Win'98, Windows NT, ...

37. How often is the software updated ?

Biannually (within the IER, the software is updated immediately, if there is any demand)

Is it included in the support ?

No

## Appendix 1

### Other

38. Would it be possible for you to cooperate in the depth evaluation for example by lending us the software for some time ?

Yes

39. Additional information

The software BALANCE offers the possibility to use a background inventory system to estimate the environmental interventions of up- and downstream processes which are not covered by an investigated product system.

The background inventory data used by BALANCE is derived from official national statistics presenting both economic and environmental data for production sectors of an economy.

A detailed description of the procedure is given in:

Marheineke, T., Friedrich, R., Krewitt, W.:

Application of a Hybrid-Approach to the Life Cycle Inventory Analysis of a Freight Transport Task. In: SAE 1998 Transactions - Journal of Passenger Cars. Society of Automotive Engineers (SAE), Warrendale PA, U.S.A., 1999

If you are interested in this literature, I will gladly send a copy by Mail or Fax to you.

## Appendix 1

### The Boustead Model version 4.2 (Boustead Consulting Ltd)

#### Organisation

- 1 Name and version of the LCA software tool  
The Boustead Model version 4.2
- 2 Name of company/organisation who is the proprietor of the tool  
Boustead Consulting Ltd.
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
The Boustead Model has been developed continuously by Dr I Boustead and Dr W T Dove since version 1 was launched in 1990.
- 4 Contact for more information  
Name Dr William Dove  
Address Black Cottage, West Grinstead, HORSHAM, West Sussex, RH13 7BD, UK  
Phone +44 1403 864561  
E-mail wtdove@boustead-consulting.co.uk  
Home page <http://www.boustead-consulting.co.uk>
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details Previous versions of the Boustead Model have been reviewed over the years, but we are not aware of any review of version 4.x.  
No   
  
How many licenses of the software are sold?  
This is confidential information.  
Name of customer reference

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
\$15,000.00 (USD) / year for a single terminal licence.  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
\$27,000.00 / year for a dual terminal licence. \$37,500.00 / year for a 3+ terminal licence. We also offer, by arrangement, special rates for educational establishments, government departments and trade associations.

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Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

7 Any special purchasing conditions?

We can, if desired, invoice in a local currency equivalent.

8 Any software support offered?

Yes  Please give details (annual fee, etc) Because the user pays an annual fee, they receive unlimited telephone support or can elect to have queries answered by facsimile or e-mail, should they so wish. Licensees receive two free days of on-site training in the first year of use. Any extra days outside this period are paid for separately, as are any travel expenses. All upgrades are supplied free.

No

9 Is there a demonstration version of the software?

Yes  Where is it available? A demonstration CD-ROM can be ordered free of charge from our website: it is sent by air mail as soon as possible after the request has been received.

No

## Features

10 Intended use of software

Type of user (LCA practitioner classification)

LCA expert

Design engineer

Environmental engineer

Other

11 Size of the companies for which the software is intended

< 250 employees

250-1000 employees

> 1000 employees

Other

12 Which industrial sectors are the software user companies involved with?

Our users cover all industrial sectors, including automotive, building, ferrous and non-ferrous metals, chemicals and petrochemicals (including plastics), construction

## Appendix 1

materials and packaging materials. Our users also include research laboratories and governmental departments.

- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)

Function-based LCA	<input checked="" type="checkbox"/>
Screening LCA	<input type="checkbox"/>
Accounting LCA	<input checked="" type="checkbox"/>
Other	<input type="checkbox"/>

- 14 Does the software comply with the ISO 14040 standards?

Yes

No

Comment Our software is fully ISO 14040/14041 compliant

- 15 Please give a brief description of the practical procedure when using the software.

Once installed, the Boustead Model can be accessed via the Start button or a desktop shortcut. The software enables the user to construct highly complex and long sequences of linked operations, including recycling (both open and closed loop) just as easily as if they were analysing a single stage process. The software is mouse driven, but for every option a keyboard alternative is provided enabling the user to run the software even if a mouse is not present. An on-line help file is always available and this provides screen images that show exactly how the various options and controls are accessed. Users can combine the information contained within the database in conjunction with their own data. If the user's own data are used then there are options to assist in the data gathering process, as well as worked examples of how any data should be prepared before it can be used in the software and database.

- 16 What units can be used?

SI (Metric)

Other  Although most of the data in the database is set up using the SI system of units the user can easily construct and use other units systems.

- 17 Which languages does the software communicate in?

English

German

French

Spanish

Swedish

Other  Data acquisition questionnaires, which are printed out using the Boustead Model, are supplied in English, French, German and Italian. We plan to add Spanish in the next few months. The language used in the software, help files and supporting documentation is English.

## Appendix 1

- 18 What kind of output results are produced?
- |   |   |                                    |
|---|---|------------------------------------|
| Chemical substances   | <input checked="" type="checkbox"/>     |                                    |
| Effect categories   | <input checked="" type="checkbox"/>     |                                    |
| Environmental “points”  | <input type="checkbox"/>                |                                    |
| Tables  | <input checked="" type="checkbox"/>     |                                    |
| Comparisons between different products                        | <input checked="" type="checkbox"/>     |                                    |
| Diagrams  | <input type="checkbox"/>                |                                    |
| Other   | <input checked="" type="checkbox"/>     | Graphical output is also supported |
| Possibilities to export result to other softwares, e.g. Excel | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>        |

- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?

Calculations are made using an iterative procedure, which ensures that the results are calculated, on the first pass, to an accuracy of better than 0.5% (which is better than the accuracy of most data). I.e., the calculation procedure does not itself introduce any errors due to rounding or data truncation. There is no direct facility in which the user can enter a formula for use at present. Sensitivity analyses are easy to perform using the software.

- 20 Does the software support total inventory with inputs and outputs?
- Yes
- No
- Comment

## 1.2 Databases

- 21 Does the software include any databases?
- Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?
- The Boustead Model database. Boustead Consulting provides much of the data that other practitioners and databases use. For example, the PWMI series of polymer ecoprofile data sets was generated using the Boustead Model.
- No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?
- The database contains information on the fuel production industries for the USA and Canada (including the 14 generation sub-regions), as well as for all of the EU countries and Japan, China, Australia, India, Taiwan and Korea. This takes up about 2700 operations. Primary production data (i.e. data obtained directly from plant) on a further 2000+ materials production and processing operations is also provided. Materials for which production data are supplied include iron, steel, non-ferrous metals (copper, zinc, tin, lead, gold, silver, aluminium, alloys), glass, a large number of commodity thermoplastics/polymers and intermediates (37 at the last count and rising), construction materials (bricks, clays, concretes, pipes and roofing tiles of various specifications) many acids and bases, packaging materials (construction, filling), retailing (distribution, vending), road, rail, sea and air

## Appendix 1

transport (various vehicles, ships and aircraft). We currently list over 85 different raw materials, 85+ air emissions, 70+ water emissions and 30+ solid waste categories. We also distinguish between where the various emissions occur, e.g. fuel production, fuel use, transport operations or whether they are produced by the process itself (e.g. the release of carbon dioxide when calcium carbonate (limestone) is heated). The demonstration CD-ROM contains a full listing of the operations for which data are provided.

- 23 Is there a regular updating possibility of the software database contents?  
 Updating of data and software occurs at least once a year (when new fuel producing industry data is released), however we update more frequently than this to include new data on processes and materials, when such information becomes available, as well as improvements and new features to the software (many of which are suggested by our users).
- 24 What other databases are compatible with the software, if any?  
 Our database structure is unique and so there are no other compatible databases that can be directly used with our software. However, if similarly formatted and detailed data exist in other databases then there is no reason why this cannot be manually inputted (subject to licence/copyright agreements).

## Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment We supply a series of information sheets that describe the origins of many of the data sets. The number of these sheets is continuously increasing.
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment Whenever a user adds their own data there are a number of data fields that they may use to document the data set, e.g. name of the operation that the data relates to, the units for the operation, the year in which the data were acquired, the annual production total, the company and site to which the data relate etc.
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other  Broadly speaking the data satisfy many of the requirements of both the SPINE and SPOLD formats, however there are several parameters required by these formats for which the information is routinely unavailable.



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### Learning

28 How long does it take to learn the software?

- < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other

29 How is the software taught?

- User manual   
 “Virtual” course   
 Teachered course   
 Other

Two days of on-site instruction are

provided in the first year to every user, however it is very rare for the second day to be used.

### User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)

We use our software and database for our consultancy activities (e.g. the PWMI series of ecoprofile reports). The whole APME and CEFIC ecoprofile data sets were generated using the Boustead Model: these data sets are widely used by other commercially available databases such as those produced by Buwal, Ecobilan and PRé Consultants.

### Valuation methods

31 Which valuation methods can be used by the software?

We do not support valuation. We stop at classification/characterisation.

32 How transparent is the result (possibilities to track the origin of a result)?

There are no locked sectors of the database and all parameters are visible. The software also includes analysis tools that let the user determine how each and every parametar has been calculated by tracking back any result to its origins.

33 Is it possible to use different valuation methods for the same LCA?

- Yes   
 No

## Appendix 1

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
The database and software can be run on a computer with 16 Mbyte RAM and a minimum of 60 Mbyte hard disc space. We recommend a Pentium processor running at 100 MHz as the absolute minimum requirement for the cpu.
- 35 Which is the memory size of the software itself?  
The software is about 2.6 Mbytes, but a further 5-6 Mbytes of DLL and OCX files are also used when the software is running (these are automatically added when the Boustead Model is installed).
- 36 Which operating system can be used?  
Windows 95/98/NT
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other  The database is updated at least once a year as new national fuel production statistics are published every year, however, we also update whenever new data become available to us (e.g. as the result of work undertaken by us, such as PWMI) or whenever we improve or add new features to the software. Version 4.0 was released in June 1999, version 4.1 followed in August 1999 and version 4.2 appeared in February 2000.
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No
- 39 Additional information  
We would be happy to provide a copy of our database and software for in-depth evaluation provided that any such evaluation was conducted under our supervision.

## Appendix 1

### Cambridge Engineering Selector – Eco-selector (Granta Design Ltd)

#### Organisation

- 1 Name and version of the LCA software tool  
Cambridge Engineering Selector - Eco-selector
- 2 Name of company/organisation who is the proprietor of the tool  
Granta Design Limited
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
CES/Eco is part of the Cambridge Engineering Selector set of products, which is sold world-wide. CES/Eco is planned for release in Spring 2001. A test version should be available in Q4 2000.
- 4 Contact for more information  
Name Dr David Cebon  
Address Granta Design Limited, 40B High St, Trumpington, Cambridge, CB2 2LS, UK  
Phone +44-1223-332665  
E-mail david.cebon@grantadesign.com  
Home page <http://www.grantadesign.com>
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
No

How many licenses of the software are sold?

Not released yet

Name of customer reference

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
Not yet decided. The price list for CES with the standard materials and process database can be made available on request.  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)

Price range, if above is not answered (USD)

- |               |                          |
|---------------|--------------------------|
| <1.000        | <input type="checkbox"/> |
| 1.000-5.000   | <input type="checkbox"/> |
| 5.000-10.000  | <input type="checkbox"/> |
| 10.000-20.000 | <input type="checkbox"/> |
| >20.000       | <input type="checkbox"/> |

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- 7 Any special purchasing conditions?
- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc) Part of the annual license fee  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available? A test version can be made available in  
 Q4 2000  
 No

## Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)  
 LCA expert   
 Design engineer   
 Environmental engineer   
 Other  Materials specialist
- 11 Size of the companies for which the software is intended  
 < 250 employees   
 250-1000 employees   
 > 1000 employees   
 Other
- 12 Which industrial sectors are the software user companies involved with?  
 Aerospace, Automotive, Materials supply, Education
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
 Function-based LCA   
 Screening LCA   
 Accounting LCA   
 Other  Material selection to minimise environmental impact
- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment Not known
- 15 Please give a brief description of the practical procedure when using the software.  
 Select a material for a component, so as to maximise performance and minimise environmental impact

## Appendix 1

- 16 What units can be used?  
 SI (Metric)   
 Other  Imperial, cgs, any user-defined system
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other  Material  
 selection charts  
 Possibilities to export result to other softwares, e g Excel Yes  No
- 19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 The software is not strictly a LCA product, and does not perform LCA calculations. Rather, the user is able to compare materials for a particular components, based on their environmental impact in manufacture and/or in use.
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
 A database of the environmental properties of materials, developed by MF Ashby and co-workers in Cambridge University Engineering Department.  
 No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Material properties
- 23 Is there a regular updating possibility of the software database contents?  
 Yes - a team of database engineers continually updates Granta Design's databases

## Appendix 1

- 24 What other databases are compatible with the software, if any?  
All databases which run within the CES system. These can be generated by Granta Design Limited or created by customers, or customer-edited versions of Granta's databases.

### Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g. description of the conditions and choices?  
Yes   
No   
Comment The database is accompanied by an extensive multi-media CD-ROM called Eco-view, which contains a large amount of supporting information, as well as an extensive set of links to web-sites, world-wide.
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
Yes   
No   
Comment
- 27 Which data formats or documentation tools are compatible with the software?  
SPINE   
SPOLD   
Other  The data can be exported to any suitable word processor or spreadsheet

### Learning

- 28 How long does it take to learn the software?  
< 2 hours   
< 1 day   
< 1 week   
< 1 month   
Other
- 29 How is the software taught?  
User manual   
"Virtual" course   
Teachered course   
Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
Not available at present

## Appendix 1

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Various Eco indices are available, as well as calculation of relative energy content, emissions, etc for a given component
- 32 How transparent is the result (possibilities to track the origin of a result)?  
Totally transparent
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
PC with 100MB free hard disk space, or network
- 35 Which is the memory size of the software itself?  
32MB RAM is needed
- 36 Which operating system can be used?  
Windows 95+, NT4+
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No

Additional information

Evaluation software not available until Q4, 2000

## Appendix 1

### CUMPAN 1.44 (debis Systemhaus Industry GmbH)

#### Organisation

- 1 Name and version of the LCA software tool  
CUMPAN 1.44
- 2 Name of company/organisation who is the proprietor of the tool  
debis Systemhaus Industry GmbH
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
debis Systemhaus 1998 Germany
- 4 Contact for more information  
Name debis Systemhaus Industry GmbH  
Address Erich-Herion-Straße 13 D 70736 Fellbach  
Phone +49 711 17 40011  
E-mail lce@debis.com  
Home page www.debis.com/lce
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
No   
  
How many licenses of the software are sold?  
62  
Name of customer reference  
Umweltbundesamt, Adam Opel AG, Mercedes-Benz Brasil, Fraunhofer Gesellschaft IPA und IAO, diverse Universitäten

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
6 000  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
60 % for a package of 10 licences  
Price range, if above is not answered (USD)  
<1.000   
1.000-5.000   
5.000-10.000   
10.000-20.000   
>20.000



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- 7 Any special purchasing conditions?
- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc) 15 % from licece fee p. a.  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available? PowerPoint Presentation via email  
 No

### Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)  
 LCA expert   
 Design engineer   
 Environmental engineer   
 Other  LCA beginner
- 11 Size of the companies for which the software is intended  
 < 250 employees   
 250-1000 employees   
 > 1000 employees   
 Other
- 12 Which industrial sectors are the software user companies involved with?  
 Automobile industry and suppliers and capital goods industry
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
 Function-based LCA   
 Screening LCA   
 Accounting LCA   
 Other  full LCA
- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment

## Appendix 1

- 15 Please give a brief description of the practical procedure when using the software.  
modelling of the product on a graphical user interface using predefined material and process data from a database
- 16 What units can be used?  
SI (Metric)   
Other  piece
- 17 Which languages does the software communicate in?  
English   
German   
French   
Spanish   
Swedish   
Other
- 18 What kind of output results are produced?  
Chemical substances   
Effect categories   
Environmental “points”   
Tables   
Comparisons between different products   
Diagrams   
Other  files with csv structure  
Possibilities to export result to other softwares, e g Excel Yes  No
- 19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
linear equations, loops, allocation factors related on weight, heating values or monetary values
- 20 Does the software support total inventory with inputs and outputs?  
Yes   
No   
Comment

## Appendix 1

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as  
 PWMI, Buwal, etc)?  
 PWMI, Buwal, GEMIS  
 No
- 22 What kind of data do the databases contain (group of materials, products,  
 processes, etc)?  
 see attached textfile
- 23 Is there a regular updating possibility of the software database contents?  
 yes, distribution via email and update by import procedures
- 24 What other databases are compatible with the software, if any?  
 GEMIS

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e g  
 description of the conditions and choices?  
 Yes   
 No   
 Comment detailed documentation and comments to whole data sets and LCA  
 goal and scope
- 26 Can new data be added by the practitioner and can the origin of the new data  
 be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the  
 software?  
 SPINE   
 SPOLD   
 Other  transparent CUMPAN data format that can be processed with  
 Excel

## Appendix 1

### Learning

28 How long does it take to learn the software?

< 2 hours

< 1 day

< 1 week

< 1 month

Other

29 How is the software taught?

User manual

“Virtual” course

Teachered course

Other

### User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
Ecodesign Softwarestudie

Softwarerecherche und Leistungstest

Gruppe angepaßte Technologien

Technische Universität Wien

Wiedner Hauptstraße 8 - 10

A 1040 Wien

### Valuation methods

31 Which valuation methods can be used by the software?  
impact assessment values can be used for several valuation methods

32 How transparent is the result (possibilities to track the origin of a result)?  
fully transparent

33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

## Appendix 1

### Technical specifications

34 What are the hardware requirements for the software (memory, etc)?  
PC with Pentium, 32 MB RAM, 50 MB Disk

35 Which is the memory size of the software itself?  
10 MB

36 Which operating system can be used?  
Windows NT or UNIX

37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other

Is it included in the support?

Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes   
No

39 Additional information

Oracle database licence is needed

## Appendix 1

### ECO-it 1.0 (Pré Consultants BV)

#### Organisation

- 1 Name and version of the LCA software tool  
ECO-it 1.0
- 2 Name of company/organisation who is the proprietor of the tool  
PRé Consultants BV
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
ECO-it was launched in 1997
- 4 Contact for more information  
Name Ms. Nanda van der Vliet/ Mr Michiel Oele  
Address PRé Consultants BV, Plotterweg 12, 3812 BB Amersfoort, The Netherlands  
Phone + 31 33 4555022  
E-mail info@pre.nl  
Home page www.pre.nl
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
  
No   
  
How many licenses of the software are sold?  
approx. 70  
Name of customer reference  
NedCar, Volvo, various universities and innovation centres

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
240 Euro (approx 215 USD as of 9/8/2000)  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
On request  
Price range, if above is not answered (USD)  

<1.000	<input checked="" type="checkbox"/>
1.000-5.000	<input type="checkbox"/>
5.000-10.000	<input type="checkbox"/>
10.000-20.000	<input type="checkbox"/>
>20.000	<input type="checkbox"/>

## Appendix 1

- 7 Any special purchasing conditions?  
License conditions apply and can be found in the software and on the order form
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) Limited technical support included  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? web site <http://www.pre.nl> or CD-ROM/ diskettes from PRé or dealers. No demo of the Plus option is available.  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)  
LCA expert   
Design engineer   
Environmental engineer   
Other  Everyone who wants to make quick product screenings
- 11 Size of the companies for which the software is intended  
< 250 employees   
250-1000 employees   
> 1000 employees   
Other
- 12 Which industrial sectors are the software user companies involved with?  
Car manufacturing, universities, innovation centres, Applicable to all industry sectors.
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
Function-based LCA   
Screening LCA   
Accounting LCA   
Other

## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment
- 15 Please give a brief description of the practical procedure when using the software.  
 In a project the life cycle of a product can simply be modelled using "Eco-indicator scores" from existing databases. Results can be obtained as bar or pie graph, so that environmental hot spots can be identified. Other single scores methods or extensions of current databases can be used if results entered in an ECO-it database using ECO-edit (price on request). The results can be calculated with SimaPro.
- 16 What units can be used?  
 SI (Metric)   
 Other
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other   
 Possibilities to export result to other softwares, e.g. Excel Yes  No
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 SimaPro uses linear calculations. Allocation is done by user defined definition (in processes).



## Appendix 1

- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as  
 PWMI, Buwal, etc)?  
 Eco-indicator 95 and 99 , mainly based on BUWAL 250  
 No
- 22 What kind of data do the databases contain (group of materials, products,  
 processes, etc)?  
 Input/output data for material production and processing, energy generation,  
 transport, waste treatments, waste scenarios. See demo for more details.
- 23 Is there a regular updating possibility of the software database contents?  
 No
- 24 What other databases are compatible with the software, if any?

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e g  
 description of the conditions and choices?  
 Yes   
 No   
 Comment Small documentation field available
- 26 Can new data be added by the practitioner and can the origin of the new data  
 be documented?  
 Yes   
 No   
 Comment Data can be changed or added with ECO-edit. Small  
 documentation field available

## Appendix 1

- 27 Which data formats or documentation tools are compatible with the software?
- SPINE
- SPOLD
- Other  N.A.

### Learning

- 28 How long does it take to learn the software?
- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other
- 29 How is the software taught?
- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
N.A.

### Valuation methods

- 31 Which valuation methods can be used by the software?  
All single score methods can be used.
- 32 How transparent is the result (possibilities to track the origin of a result)?  
The single score does not allow tracing back the results to individual substances.  
Various parts (contributions) of the life cycle can be shown.
- 33 Is it possible to use different valuation methods for the same LCA?
- Yes
- No

## Appendix 1

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Windows 95/98 16 MB memory, Win NT /2000 32 MB memory or better recommended with Pentium processor.
- 35 Which is the memory size of the software itself?  
About 2 MB
- 36 Which operating system can be used?  
Windows 95, 98, NT , 2000
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other  Irregular
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No
- 39 Additional information  
A new version of ECO-it with new pricing be available later this year.

## Appendix 1

### EcoLab version 5.1.2 (Nordic Port AB)

#### Organisation

##### 1: Name and version...

EcoLab version 5.1.2

##### 2: Name of company...

Nordic Port AB  
Varbergsgatan 2c  
S-412 65 GÖTEBORG, Sweden  
Phone: +46 (0)31 773 99 20  
Fax: +46 (0)31 703 46 60  
E-mail: [info@port.se](mailto:info@port.se)  
[www.port.se](http://www.port.se)

##### 3: History...

The SPINE data format was defined by the nordic NEP project and published in late 1995. ABB, one of the member companies, asked Göran Löfgren to create a software tool to support LCA work in the new SPINE data format. Göran was one of the three official constructors of the SPINE model. He was a skillful software developer and database modeller and actually also a biologist. The first versions were called "ABB LCA tool", aimed for ABB only, but in 1996 the first version of EcoLab was released on the market by Göran in the newly founded company Nordic Port. Many of the companies that had been participating in the NEP project now turned into EcoLab customers. The ESA group (EcoLab Support Association) was formed to allow the users to discuss practical LCA and EcoLab questions and to give us feedback on further development.

##### 4: Contact for more information

Benny Fredin  
Nordic Port AB  
Varbergsgatan 2c  
S-412 65 GÖTEBORG, Sweden  
Phone: +46 (0)31 773 99 20  
Mobile-phone +46 (0)706 29 90 60  
Fax: +46 (0)31 703 46 60  
E-mail: [benny.fredin@port.se](mailto:benny.fredin@port.se)

##### 5: Reviewed...

Yes IVL (Ulrik Axelsson and Marin Erlandsson) compared EcoLab, SimaPro, LCAiT, KCL-Eco and Team in september 1999.

There are 150 licenses in 20 Countries using EcoLab. The following industries are using EcoLab today:

## Appendix 1

### Manufacturing

- **ABB** *Switzerland, Sweden, Finland, Italy, USA, India...*
- **ADtranz** *Germany, Switzerland, Sweden, UK, ...*
- **Electrolux** *Sweden, ...*
- **SKF** *Sweden, ...*
- **Ericsson** *Sweden, ...*
- **Perstorp** *Sweden, ...*
- **SAAB Automobile** *Sweden, ...*

### Chemical industry

- **Akzo Nobel** *Netherlands, Sweden, ...*

### Forestry, pulp, paper and hygiene

- **StoraEnso** *Finland, Sweden, Germany, ...*
- **Mo&Domsjö** *Sweden*
- **SCA** *Sweden*
- **AssiDomän** *Sweden*

### Energy producers

- **Sydkraft** *Sweden*
- **Vattenfall** *Sweden*

## 6: Price...

EcoLab multi user prices:

EcoLab 5.0 multi user (2 users)	USD 5 500
EcoLab 5.0 each extra user	USD 1 400
CPM's database <a href="mailto:SPINE@by-pass">SPINE@by-pass</a>	USD 2 200 / customer

## 7: Conditions...

No

## 8: Support...

Yes

### **About EcoLab Support**

All EcoLab license holders will be members of the EcoLab Support Association. Our EcoLab helpdesk gives support to the customers in questions concerning the program / product and its use. All new versions of EcoLab are included in the support cost.

Prices for support contract USD 1000 per year

## 9: Demo...

Yes Just let us know. Our home page promotes order via e-mail.

## Appendix 1

### Features

#### 10: Intended use...

- LCA expert
- Environmental engineer

#### 11: User company size...

- <250 employees
- 250-1000 employees
- 1000 employees

#### 12: Sectors...

- Manufacturing
- Chemical industry
- Forestry, pulp, paper and hygiene
- Energy producers

#### 13: Type of LCA work...

- Function-based LCA
- Accounting LCA

#### 14: ISO 14040...

- Yes

#### 15: How to use...

### Background

In LCA, you study the environmental impact caused by the production of a specified "function". In order to produce a function, we normally have to use a lot of technological processes that extract natural resources and produce, use and dispose of products. Each process is modelled as an "Activity" according to SPINE. An activity has flows for input and output of matter, energy and services. Some flows describe natural resource depletions and emissions, specifying the direct environmental impact of the activity. Other flows describe needs of refined resources or output of products for further use. Such flows can be viewed as requests for cooperation with other activities.

### Normal work

You create a study by selecting the activities that you need and connecting output flows of some of these activities to input flows of others. This way you form an activity network that describes how the involved processes cooperate to produce your function. The flow that constitutes the function of your study is marked out. Then you can order a calculation. When the calculation is done, you can view the resulting environmental impact in a lot of different reports.

## Appendix 1

### Reusable activities

Activities are reusable. The same activity can simultaneously be used in many studies, and also in many phases of one study. The activity is scaled to adapt to the quantitative needs at each place. The scaling is done temporarily during calculation only. The original flow quantities are retained in the activity definition. Reuse would not be possible without the automatic scaling.

### Data import

If you need activities or other data that is currently not in your database, you can enter new data directly in the software. But there are also different possibilities to import data from other sources, see further paragraph 23 in section "Databases".

### 16: Units...

- SI (Metric)
- Other

### 17: Languages...

- English

### 18: Output results...

- for ALL options!

Export to other software, e.g. Excel:

- Yes Data can be stored as excel files. But we have also a command that puts data from a report (table or graph) to the clipboard in spreadsheet format. This is more flexible as you can directly paste it into any open spreadsheet or word document and control exactly where (to which page/sheet and position) to paste the data. When copying a graph, you choose between copying the graph image or the spreadsheet data that the graph is based on.

### 19: Calculations...

You specify the quantity of the function for which you want to calculate the study. EcoLab follows all paths of the activity network. Activities are (temporary) scaled to match the quantity you have specified for the function and to make the quantities match in all flow connections. Unit conversions are performed if necessary in each flow connection. This allows for instance connection of a flow measured in MJ to a flow measured in kWh and even to a flow measured in another unit type, e.g. kg, if there is conversion information between energy and mass available for the flowing substance.

Loops can be calculated if they do not over-determine the flow quantities in the activity network. This means that you can't just force a flow quantity into an activity that in its present context might ask for another quantity. A loop always

## Appendix 1

needs some kind of "safety-valve" for flow quantity mismatch. If you provide an activity to cover any shortage or to take care of any surplus, the loop will be realistic and possible to calculate. The calculation will use the safety-valve if it turns out necessary.

Allocations can be done by the calculation. Allocation is used for multiple product activities where only one of the products is used. You must specify conversion factors for each of the products in an activity to allow EcoLab to calculate the value of each product in a common unit (mass, economic value or similar). You can specify factors for all these units at the same time if you want many allocation options. At calculation time, you select which unit should be used for allocation (if any), and then leave the rest to EcoLab.

### 20: Total inventory...

Yes

## Databases

### 21: Database included...

For a one-pay cost of 2 200 USD the Customer will get the database Spine@by-pass. It is a large LCA-database from CPM, Centre of Environmental Assessment of Product and Material Systems at Chalmers University Of Technology in Göteborg, Sweden.

### 22: Kind of data

The database contains 271 activities (SPINE models of industrial processes). They cover production of metals, plastics, wood, cardboard, paper, glass, cement, chemicals, electricity and more. There are activities describing moulding, rolling, drilling, welding and other processing of metals. Other activities describe combustion of different fuels and waste treatment like scrap recovery, incineration and landfill.

### 23: Database update...

#### Two aspects

EcoLab is not bound to a specific data module, although we can deliver the Spine@by-pass database published by CPM. Questions about database updates in that particular database must be directed to CPM. But there is another very important aspect of database updating, and that is the technical facilities available in the software to introduce changes in activities and other data into a database. This is a complex subject where EcoLab is coming up with very powerful features. Our technical facilities are there for all users. A user may use them to create and publish own databases and to publish regular updates. Some of our customers already do that.



## Appendix 1

### Technical update facilities

Activities can be imported from files of the XFR communication format. XFR is a common format for communication between SPINE software. If you want to change your study to use a new version of an activity, you will also have to disconnect your old activity and connect the new one instead. You may have multiple studies in your database and it is not obvious that all studies should use the new version.

A possibility to transfer activities and activity systems (scenarios) of any complexity from one EcoLab database to another has been developed and is now under testing. This feature allows you for instance to move your study from one database to another where the "stock" activities that you are using have been updated. You can control activity replacement during transfer in a very efficient way. An inofficial transfer feature is currently available in EcoLab. Please contact our support if you want to use it before it has been officially released.

Impact categories and valuation methods can be imported from XFR files. EcoLab can actually now also import such data directly from Excel, but this function is at the moment also not officially released, so please contact our support if you want to do that before it has been released.

Substance data can be imported as a side effect of the import of activities, impact categories or valuation methods. For each substance, you have the choice of keeping your own substance definition or take over the imported data.

In some other software, much of the data is kept in locked modules that users can't change. This is convenient only as long as the user entirely accepts the data modules supplied by the software company. But sooner or later you will need to change parts of the data, maybe because of new research results or customer demands. A locked module does not allow that or may overwrite your changes in its next update. You may also need to keep old and new versions of some data simultaneously in your database because some studies are finished and must not be changed while new projects need new versions of the data. The problem is accentuated when the finished, old project is used as a component in the new project. EcoLab is open to data changes and also to accomodate multiple versions of the same data.

### 24: Compatible databases...

At least three of our most important customers have created extensive databases for distribution within their own groups of companies. However, none of them have so far made their databases publicly available.

Activities can be purchased in XFR format from CPM or CIT and be imported to EcoLab. Impact categories and valuation methods can be purchased from CIT and be imported to EcoLab via XFR files or the new, not yet official, direct import function from an Excel sheet.

## Appendix 1

### Documentation

#### 25: Metadata...

Yes

Comment: Metadata fields are provided according to the SPINE specification.

#### 26: Add new data...

Yes

Comment: The user can create and change anything. There is only one restriction: When many users work in the same server database, there is a need of controlling the access to activities so users can not damage data of other users. Some activities may even be classified. EcoLab provides an access control, allowing a user to restrict access to his activities, giving other users write access, read access or no access at all.

#### 27: Data format...

SPINE

SPINE databases of other software can not be opened directly by EcoLab. This is because EcoLab is dependent on some additional data and obeys some rules that others might not do. But most SPINE software support the XFR communication format. EcoLab can both import as well as export XFR files.

### Learning

#### 28: Learn time...

<1 day

Our teached course takes almost one day. This is quite sufficient for normal usage. But of course it takes much longer to fully master all of the advanced features in EcoLab

#### 29: How taught...

User manual

Recommended primarily for deeper studies of advanced features.

Teached course

The best way to learn the normal usage.

### User reflections on the software

#### 30: Describe a case study...

ABB Corporate Research in Västerås describes one of their case studies as follows:

## Appendix 1

### Introduction

EcoLab was used to calculate life cycle inventory data for a number of different cables. The inventory data will be used for LCA of systems. The created scenarios contained production of a number of materials, different production steps at the cable factory, some transports and disposal scenarios of production waste. Inventory data were also gathered for some of the materials used, such as copper, plasticizer and plastic compounds. ABB have their own database. Here are some aspects of the use of the tool.

### Complexity

The tool is easy to understand and use. The search function for the database is powerful and it is easy to find data if a sensible naming is used. It is good that it is possible to have a view of the scenario, while looking at the content of different activities which it contains. When going into a scenario inside a scenario, one can however get lost in the structure. Still, the possibility of having a number of windows open at the same time helps. It is important to understand the concept of how the database is structured and how the connections work, otherwise for instance copying of scenarios can bring unpleasant surprises.

### Time consumption

The complexity of the work lays in the choice of right data. This requires quite a lot of "clicking around" to get the information needed. Opening the technical system documentation window takes too long. Building the scenarios on the other hand feels fast and easy.

### Presentation of results from analysis

The presentation format is continually improving and nice presentations can be made and be copied right into other documents. The results from valuation methods can, however, not yet be divided into impact categories. Import and export of data from/to Excel is very helpful.

### Valuation methods

#### 31: Which...

All methods that can be expressed as factors transforming emission and natural resource quantities into valuation scores can be used in EcoLab. Each factor transforms the natural resource need or emission of one substance from/to a specific impact medium (environment type) into a contribution to the total valuation score. Many of our users use the factors, also called "indices" compiled and published by CIT. They include EPS, Tellus and a variety of Environmental Theme and EcoScarcity methods for different countries.

You can easily define your own methods in the same way.

## Appendix 1

### 32: Transparency...

EcoLab provides full transparency. Besides the possibility to aggregate the scores in different ways, you may also get a detailed report where each flow that contributes to the score is reported separately. The report also shows where in the structure of activities and subactivities this flow is found.

### 33: Multiple valuation...

Yes

## Technical specifications

### 34: Hardware...

- Pentium
- 32 MB of RAM or more
- 800x600 pixel screen

### 35: Software size...

A complete installation including a demo database takes less than 20 MB.

### 36: OS...

Windows 95, 98 or NT4.

### 37: Software updates...

Monthly      There is no pre-defined time schedule, and some of the releases are only sent to customers that need special help. We try not to disturb all our customers every time a new version is created, but after a few months, we recommend all users to download the latest upgrade from our home page.

Yes

## Other

### 38: Lending software...

Yes

39: Additional information

## Appendix 1

### EcoScan 3.0 (TNO Industrial Technology)

#### Organisation

- 1 Name and version of the LCA software tool  
EcoScan 3.0
- 2 Name of company/organisation who is the proprietor of the tool  
TNO Industrial Technology
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
Turtle Bay developed it and it was launched in 1993. We bought it from Turtle Bay in 1999.
- 4 Contact for more information  
Name Mrs. ir. A.L.E. Alferts  
Address P.O. Box 5073  
Phone +31 15 2608868  
E-mail a.alferts@ind.tno.nl  
Home page www.ecoscan.nl
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
No

How many licenses of the software are sold?

total about 100.

Name of customer reference

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
stand alone \$ 475 (quantity 1 to 5); network version & 420 (quantity 6 to 10); and you can buy different databases. These prices vary from &110 to \$290.  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
see above

## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

- 7 Any special purchasing conditions?  
No
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) For questions you can always contact us. We not only answer question about the software tool itselfes but we can also help you in doing a LCA.  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? on our website [www.ecoscan.nl](http://www.ecoscan.nl)  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)  
LCA expert   
Design engineer   
Environmental engineer   
Other
- 11 Size of the companies for which the software is intended  
< 250 employees   
250-1000 employees   
> 1000 employees   
Other  all kinds off companies
- 12 Which industrial sectors are the software user companies involved with?  
All kinds of industrie and to universities.
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
Function-based LCA   
Screening LCA   
Accounting LCA   
Other

## Appendix 1

14 Does the software comply with the ISO 14040 standards?

Yes

No

Comment

15 Please give a brief description of the practical procedure when using the software.

With EcoScan 3.0 you can analyse the environmental impact and cost of a product. All life cycle phases of a product can be taken into account. On a Product life cycle form (PLC form) you specify all relevant aspects of the product concerning for example the production, usage or disposal phase. You are doing this by filling in sheets, which are defined according to the phases. In this way you analyse the stages of a product life cycle you want. Then you assign environmental points to the relevant aspects to express the environmental impact of the product in scores. This is merely a question of dragging and dropping data from ready-made databases onto the sheets of the PLC form. And if you choose the automatic disposal mode in EcoScan, it is even more easier. In that case the disposal sheet is automatically filled in. Finally, you can display the results graphically and calculate product improvements.

16 What units can be used?

SI (Metric)

Other

17 Which languages does the software communicate in?

English

German

French

Spanish

Swedish

Other  Dutch

18 What kind of output results are produced?

Chemical substances

Effect categories

Environmental "points"

Tables

Comparisons between different products

Diagrams

Other

Possibilities to export result to other softwares, e g Excel Yes  No

## Appendix 1

- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?

Allocation methods and loops already exist in EcoScan 3.0.

- 20 Does the software support total inventory with inputs and outputs?

Yes

No

Comment

### 1.3 Databases

- 21 Does the software include any databases?

Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?

NOH Eco-indicator '95

No

- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?

materials, processes, usage, transportation, end of life, packaging, disposal, semi-manufactures

- 23 Is there a regular updating possibility of the software database contents?

Yes, in september there will be a new version of EcoScan and some databases are also updated. EcoScan 3.0 will be compatible with IdeMat 2000.

- 24 What other databases are compatible with the software, if any?

We can deliver EcoScan '97 database, IdeMat '96 database and soon 2000, other databases that we at the moment not deliver and you can even make your own database.

### Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g. description of the conditions and choices?

Yes

No

Comment

- 26 Can new data be added by the practitioner and can the origin of the new data be documented?

Yes

No

Comment



## Appendix 1

- 27 Which data formats or documentation tools are compatible with the software?
- SPINE
- SPOLD
- Other  SPOLD format used as basis for the indicators used in the tool.

### Learning

- 28 How long does it take to learn the software?
- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other
- 29 How is the software taught?
- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)

### Valuation methods

- 31 Which valuation methods can be used by the software?  
You can use any method you like. You can even create your own method.
- 32 How transparent is the result (possibilities to track the origin of a result)?  
The results are not very tranparant because you use indicators.
- 33 Is it possible to use different valuation methods for the same LCA?
- Yes
- No

## Appendix 1

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
System requirements

You can install EcoScan 3.0 on a Pentium 100 Mhz compatible or higher with a minimum of 8 Mb memory, 8 Mb free space on the hard disk and an SVGA (minimal resolution of 800 \* 600) monitor.

- 35 Which is the memory size of the software itself?  
4,24 MB

- 36 Which operating system can be used?  
windows 95, 98 and N.T. 4.0

- 37 How often is the software updated?  
 Monthly   
 Annually   
 Biannually   
 Other  It depends on the developments of the software  
 and the changes and the oppertunities in the market. s

Is it included in the support?

- Yes   
 No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

- Yes   
 No

- 39 Additional information

you can find a demo version on our website to evaluate our software tool.

## Appendix 1

### EDIP PC-tool version 2.11 beta (Danish Environmental Protection Agency)

#### Organisation

- 1 Name and version of the LCA software tool  
EDIP PC-tool, version 2.11 beta
- 2 Name of company/organisation who is the proprietor of the tool  
Danish Environmental Protection Agency
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
Developed by the Institute for Product Development at the Technical University of Denmark to support the industry's use of the EDIP LCA methodology (Wenzel et al., 1997: Environmental assessment of products. Vol. 1 - Methodology, tools, techniques and case studies, Kluwer Academic Publishers, Hingham, MA. USA. ISBN 0 412 80800 5). It was launched on the Danish market 1998 and is the predominant LCA tool among Danish industries and consultants.
- 4 Contact for more information  
Name Morten Als Pedersen  
Address Institute for Product Development  
Phone +45 45 25 46 61  
E-mail map@ipt.dtu.dk  
Home page <http://www.mst.dk/activi/08030000.htm>
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details J.G.S.Robertson, Journal of Industrial Ecology vol. 3 (2&3), 177-180  
No   
How many licenses of the software are sold?  
appx. 100  
Name of customer reference  
See user group at <http://www.mst.dk/activi/08030000.htm>

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
700+vat incl. a one day hands-on course  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
500+vat without course for license 2 and later

## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

- 7 Any special purchasing conditions?  
No
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc)  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available?  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)  
LCA expert   
Design engineer   
Environmental engineer   
Other
- 11 Size of the companies for which the software is intended  
< 250 employees   
250-1000 employees   
> 1000 employees   
Other
- 12 Which industrial sectors are the software user companies involved with?  
All sectors but the current version of the underlying database primarily supports electro-mechanic processes
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
Function-based LCA   
Screening LCA   
Accounting LCA   
Other

## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment Impact assessment of human toxicity involves aggregation of impacts with different effect mechanisms which can be seen as conflicting with the ISO recommendations)
- 15 Please give a brief description of the practical procedure when using the software.  
 Follows the progressive nature of the development process. I.e. modelling of the Life Cycle is started and progressively refined in sync with the product development. Calculations e.g. inventory or impact assessment may be done at any level in this process.
- 16 What units can be used?  
 SI (Metric)   
 Other
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other  Danish
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other   
 Possibilities to export result to other softwares, e.g. Excel Yes  No
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 The system is analytically calculating hierarchical models that may contain loops. Cutting off these loops is done on the basis of a system parameter that specifies the allowed error. No possibility for including formulas other than the existing linear relations e.g. for specifying relations between input and output. All

## Appendix 1

figures may be associated with information about uncertainty and all calculations may include uncertainty and sensitivity analysis on that basis.

- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
 EDIP database including commonly available international LCI databases and a lot of process data from the EDIP programme (Environmental Design of Industrial Products - see Wenzel et al., 1997 for more details)  
 No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Unit processes: Products, sub-assemblies, materials, energy systems, transport systems, disposal processes, production processes, substances, auxillary materials.
- 23 Is there a regular updating possibility of the software database contents?  
 The Danish EPA owns and updates the underlying database
- 24 What other databases are compatible with the software, if any?  
 The EDIP database applies the SPOLD data format

## Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment

## Appendix 1

- 27 Which data formats or documentation tools are compatible with the software?
- SPINE
- SPOLD
- Other

### Learning

- 28 How long does it take to learn the software?
- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other
- 29 How is the software taught?
- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc) see. <http://www.mst.dk/activi/08030000.htm>

### Valuation methods

- 31 Which valuation methods can be used by the software?  
EDIP life cycle impact assessment method (environmental theme method with optional normalisation expressing results as "person equivalents" (PE) and weighting using distance to political targets expressing results as "targeted person equivalents" (PET). The tool is prepared for up to three optional sets of weighting factors
- 32 How transparent is the result (possibilities to track the origin of a result)?  
Full transparency with possibility of reporting inventory, characterised results, normalised results or weighted results
- 33 Is it possible to use different valuation methods for the same LCA?
- Yes
- No

## Appendix 1

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Pentium, win3.1 or later, 32 Mb RAM, 50 Mh Harddisk, XGA monitor resolution 1024x768
- 35 Which is the memory size of the software itself?  
Fluctuates with the functions that are active
- 36 Which operating system can be used?  
Windows 3.1x, 95 , 98, NT
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No

39 Additional information

The software supports uncertainty analysis based on statistical information on in- and output data. A Monte Carlo analysis is performed providing an estimate of the uncertainty of the overall results of the LCA . More information may be found at the homepage of the Danish EPA at <http://www.mst.dk/activi/08030000.htm> .



## Appendix 1

### EPS 4.0 Design System (Assess Ecostrategy Scandinavia AB)

#### Organisation

- 1 Name and version of the LCA software tool  
EPS 4.0 Design System
- 2 Name of company/organisation who is the proprietor of the tool  
Assess Ecostrategy Scandinavia AB
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
Earlier versions of the software was developed by Volvo, The system was launched in early 1997 when Assess Ecostrategy Scandinavia AB took over the responsibilities to market and further develop the software from Volvo.
- 4 Contact for more information  
Name Carl-Otto Nevén or Luis Blanco, Assess  
Address Box 31024 400 32 Göteborg Sweden  
Phone +46 31 422810  
E-mail assess@assess.se  
Home page WWW.ASSESS.SE
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details The system has been reviewed by published Scientific papers and also reviewed by media through magazines and newspapers.  
No   
  
How many licenses of the software are sold?  
Aproximaly over 200 license  
Name of customer reference  
To mention a few. Volvo Car Corp., Volvo Penta, ITT Flygt AB, Partek, HTU, Höskolan i Dalarna, Höskola i Halmstad, Espoo Vaanta i Finland.

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
3200  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
By offer only

## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

- 7 Any special purchasing conditions?  
There is a yearly License fee of 300 USD
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) Included in the license fee  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? By request to Assess Ecostrategy Scandinavia AB  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)  
LCA expert   
Design engineer   
Environmental engineer   
Other  Purchase organization, Sales and Management in Corporations.
- 11 Size of the companies for which the software is intended  
< 250 employees   
250-1000 employees   
> 1000 employees   
Other  1 - many thousands
- 12 Which industrial sectors are the software user companies involved with?  
In all branches of business
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
Function-based LCA   
Screening LCA   
Accounting LCA   
Other  Impact assessment

## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment
- 15 Please give a brief description of the practical procedure when using the software.  
 The system is self instructing
- 16 What units can be used?  
 SI (Metric)   
 Other
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other  Results from Impact  
 assessment  
 Possibilities to export result to other Yes  No   
 softwares, e g Excel
- 19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 The system works with analytical equations and can perform error analysis and sensitivity analysis.

## Appendix 1

- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as  
 PWMI, Buwal, etc)?  
 SPINE  
 No
- 22 What kind of data do the databases contain (group of materials, products,  
 processes, etc)?  
 Materials, Process, Transport and products.
- 23 Is there a regular updating possibility of the software database contents?  
 A module is included in the system for update possibilities of the Database.
- 24 What other databases are compatible with the software, if any?

### Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g  
 description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data  
 be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the  
 software?  
 SPINE   
 SPOLD   
 Other

## Appendix 1

### Learning

28 How long does it take to learn the software?

- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other

29 How is the software taught?

- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)

### Valuation methods

31 Which valuation methods can be used by the software?

EPS

32 How transparent is the result (possibilities to track the origin of a result)?

The results can be traced to the origins

33 Is it possible to use different valuation methods for the same LCA?

- Yes
- No

### Technical specifications

34 What are the hardware requirements for the software (memory, etc)?

80486 or higher 40MB hard disk available space 16MB RAM capacity VGA or higher resolution Mouse or other suitable pointing device.

35 Which is the memory size of the software itself?

20 MB

**Appendix 1**

36 Which operating system can be used?  
Windows 95/98/2000/NT

37 How often is the software updated?

- Monthly   
Annually   
Biannually   
Other

Is it included in the support?

- Yes   
No

**Other**

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

- Yes   
No

39 Additional information

## Appendix 1

### GaBi3 (PE Product Engineering GmbH)

#### Organisation

- 1 Name and version of the LCA software tool  
GaBi3
  
- 2 Name of company/organisation who is the proprietor of the tool  
PE Product Engineering GmbH
  
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
First installation 1993; developed together with the IKP Stuttgart (University of Stuttgart; Institute for Polymere testing)
  
- 4 Contact for more information  
Name PE PRoduct Engineering Stichling  
Address Kirchheimerstr.76 73265 Dettingen/Teck Germany  
Phone 07021 / 98001-12  
E-mail j.stichling@pe-product.de  
Home page <http://www.gabi-software.com>
  
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details "Gruppe angepasste Technologien" TU  
Wien  
No
  
- How many licenses of the software are sold?  
250  
Name of customer reference  
DaimlerChrysler; BMW; Volkswagen; OPEL; FORD; Renault; BAYER; BASF; Alu  
Suisse; DuPont; MIT Boston; MITI Japan; etc.

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
2500 LEAN /8000 PROF  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)

## Appendix 1

Price range, if above is not answered (USD)

- <1.000   
 1.000-5.000   
 5.000-10.000   
 10.000-20.000   
 >20.000

- 7 Any special purchasing conditions?  
 any additional license: 1250 USD
- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc) HOTLINE for the  
 Professional-Version 0 USD  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available? <http://www.gabi-software.com>  
 No

## Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)  
 LCA expert   
 Design engineer   
 Environmental engineer   
 Other
- 11 Size of the companies for which the software is intended  
 < 250 employees   
 250-1000 employees   
 > 1000 employees   
 Other
- 12 Which industrial sectors are the software user companies involved with?  
 Automotive sector; Chemical sector; metall and non-metall industry; Universities
- 13 The software is designed mainly for the following type of LCA work (for  
 more details, see enclosure)  
 Function-based LCA   
 Screening LCA   
 Accounting LCA   
 Other



## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment
- 15 Please give a brief description of the practical procedure when using the software.
- 16 What units can be used?  
 SI (Metric)   
 Other
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other   
 Possibilities to export result to other softwares, e g Excel Yes  No
- 19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 all kind of mathematical functions can be used in processes; different allocation methods can be choined; recycling loops are easy to create
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Appendix 1

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as  
 PWMI, Buwal, etc)?  
 BUWAL; APME; PWMI; SRI; CS  
 No
- 22 What kind of data do the databases contain (group of materials, products,  
 processes, etc)?  
 see enclosure
- 23 Is there a regular updating possibility of the software database contents?  
 Yes
- 24 What other databases are compatible with the software, if any?

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e g  
 description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data  
 be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the  
 software?  
 SPINE   
 SPOLD   
 Other

## Appendix 1

### Learning

28 How long does it take to learn the software?

- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other

29 How is the software taught?

- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
a lot of case studies were made, mainly on the field of automotive engineering

### Valuation methods

31 Which valuation methods can be used by the software?  
ECO INDICATOR 95 ; you can create your own valuation method

32 How transparent is the result (possibilities to track the origin of a result)?  
It is very transparent because of the possibility of consistency check and the process tree structure in the balance.

33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

34 What are the hardware requirements for the software (memory, etc)?  
PC with pentium processor and 32MB RAM; CD-ROM

35 Which is the memory size of the software itself?  
10MB

**Appendix 1**

- 36 Which operating system can be used?  
Windows 95;98; 2000 or Windows NT

- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other  2-3 years

Is it included in the support?

- Yes   
No

**Other**

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No

- 39 Additional information  
there are a lot of extension databases available right now; you will find them enclosed

## Appendix 1

### GEMIS (Öko-Institut (Institute for applied ecology))

#### Organisation

- 1 Name and version of the LCA software tool  
Global Emission Model for Integrated Systems (GEMIS), included previous English Version TEMIS, and EM (Environmental Manual)
  
- 2 Name of company/organisation who is the proprietor of the tool  
Öko-Institut (Institute for applied ecology)
  
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
Öko-Institut, release of Version 1.0 in 1989, 2.0 in 1992, 2.1 in 1994, 3.0 in 1995, 3.08 in 1997, 3.1 in 1998, 4.0 in 2000
  
- 4 Contact for more information  
Name Uwe R. Fritsche  
Address Öko-Institut, Darmstadt Office, Elisabethenstr. 55-57, D-64283 Darmstadt, Germany  
Phone +49-6151-8191-24  
E-mail fritsche@oeko.de  
Home page <http://www.oeko.de/service/gemis/>
  
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details several reviewers since 1990  
No
  
- How many licenses of the software are sold?  
none, because it is in the public domain since 1995. Previous versions were licensed for DM 500/license, and about 400 licenses were given  
Name of customer reference  
approx. 1,000 world-wide, approx. 500 in Germany

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
-  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
-

## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

7 Any special purchasing conditions?

8 Any software support offered?

- Yes  Please give details (annual fee, etc) email support upon request, training seminars on an annual bases
- No

9 Is there a demonstration version of the software?

- Yes  Where is it available? full version on the website
- No

## Features

10 Intended use of software

Type of user (LCA practitioner classification)

- LCA expert
- Design engineer
- Environmental engineer
- Other  analysts in utilities, institutes, SMEs

11 Size of the companies for which the software is intended

- < 250 employees
- 250-1000 employees
- > 1000 employees
- Other  any size

12 Which industrial sectors are the software user companies involved with?

utilities (gas, electric), district heat, oil, building, agriculture, chemicals, transport

13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)

- Function-based LCA
- Screening LCA
- Accounting LCA
- Other

## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment only partially
- 15 Please give a brief description of the practical procedure when using the software.  
 "Tours" available on the web
- 16 What units can be used?  
 SI (Metric)   
 Other  several from menu
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other  French and Spanish planned for 2001
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other  costs (internal, external)  
 Possibilities to export result to other softwares, e.g. Excel Yes  No
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 see model documentation (included in online help)
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Appendix 1

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as  
 PWMI, Buwal, etc)?  
 partially Ecolnvent, APME, PWMI, BUWAL  
 No
- 22 What kind of data do the databases contain (group of materials, products,  
 processes, etc)?  
 approx. 500 products, 4000 processes in more than 20 countries
- 23 Is there a regular updating possibility of the software database contents?  
 yes
- 24 What other databases are compatible with the software, if any?  
 none

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e g  
 description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data  
 be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the  
 software?  
 SPINE   
 SPOLD   
 Other  preliminary ISO



## Appendix 1

### Learning

- 28 How long does it take to learn the software?
- |           |                                     |   |
|-----------|-------------------------------------|---|
| < 2 hours | <input type="checkbox"/>            |   |
| < 1 day   | <input checked="" type="checkbox"/> |   |
| < 1 week  | <input checked="" type="checkbox"/> |   |
| < 1 month | <input type="checkbox"/>            |   |
| Other     | <input type="checkbox"/>            | depends on level of analysis , and database adjustments |
- 29 How is the software taught?
- |                  |                                     |                       |
|------------------|-------------------------------------|-----------------------|
| User manual      | <input checked="" type="checkbox"/> |                       |
| “Virtual” course | <input checked="" type="checkbox"/> |                       |
| Teachered course | <input type="checkbox"/>            |                       |
| Other            | <input checked="" type="checkbox"/> | seminars upon request |

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
see EM website (<http://www.oeko.de/service/em>) were reports from 20 case studies are given, incl. full reports in PDF.

### Valuation methods

- 31 Which valuation methods can be used by the software?  
only physical (CO<sub>2</sub>, OPP, SO<sub>2</sub> equivalents), and external costs
- 32 How transparent is the result (possibilities to track the origin of a result)?  
total break-down, incl. data quality + location of each source
- 33 Is it possible to use different valuation methods for the same LCA?
- |     |                                     |
|-----|-------------------------------------|
| Yes | <input type="checkbox"/>            |
| No  | <input checked="" type="checkbox"/> |

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
486 PC, 16 MB RAM, 20 MB hard space

## Appendix 1

35 Which is the memory size of the software itself?  
approx. 2 MB + DLL

36 Which operating system can be used?  
Win 9x, 2000, NT 4.0

37 How often is the software updated?

Monthly   
 Annually   
 Biannually   
 Other

Is it included in the support?

Yes   
 No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes   
 No

39 Additional information

The software is public domain, i.e. freely available via our website. The software is also multi-lingual.

## Appendix 1

### JEMAI-LCA (JEMAI, Japan Environmental Management Association for Industry)

Question

1 Name and version of the LCA software tool

JEMAI-LCA

2 Name of company/organisation who is the proprietor of the tool  
JEMAI, Japan Environmental Management Association for Industry

3 History of the tool (who developed it, when and where was it launched on the market?)

NIRE, National Institute for Resources and Environment developed the software originally. JEMAI will launch it on the market from September this year.

4 Contact for more information

Name Kazuo Nomura  
Address 1-17-6, Ueno, Taito-ku, Tokyo, Japan  
E-mail [nomura@jemai.or.jp](mailto:nomura@jemai.or.jp)  
Home Page <http://www.jemai.or.jp>

5 Has the tool been reviewed in an unbiased report or evaluation?

Yes [ ] Please give details ....

No [V]

How many licenses of the software are sold?

Currently our software has not been in market. But we have already sold 70 licenses in advance for whom wants as soon as possible.

Name of customer reference

Sony, Hitachi, Panasonic, Canon, and so on.

Commercial specifications

6 Price of software (purchase of license)(USD)

about 900 USD (95.000 Japanese Yen)

Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)

Not established at present

## Appendix 1

Price range, if above is not answered (USD)

- <1.000  [V]  
 1.000-5.000  []  
 5.000-10.000  []  
 10.000-20.000  []  
 >20.000  []

7 Any special purchasing conditions?

90.000 Japanese Yen for official member of JEMAI

8 Any software support offered?

- Yes  [] Please give details (annual fee, etc)  
 No  [V]

9 Is there a demonstration version of the software?

- Yes  [] Where is it available?  
 No  [V]

But we demonstrate the procedure to use it regularly. (every one month)

Features

10 Intended use of software

Type of user (LCA practitioner classification)

- LCA expert  [V]  
 Design engineer  [V]  
 Environmental engineer  []  
 Other  []

11 Size of companies for which the software is intended

- <250 employees  []  
 250-1 000 employees  []  
 >1000 employees  []  
 Other  [V]

There is no intention concerning the size of companies.

12 Which industrial sectors are the software user companies involved with?

electric appliances, automobile, business machine

13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)

- Function-based LCA  [V]  
 Screening LCA  []  
 Accounting LCA  []  
 Other  []

## Appendix 1

14 Does the software comply with the ISO 14040 standards?

Yes

No

Comment

The major characteristics of this software is to support making report of LCA study. Through the operation of this software, we can make it complying with the ISO 14040 standards automatically.

15 Please give a brief description of the practical procedure when using the software.

As mentioned before, this software fully comply with the ISO 14040 Standards. Firstly goal and scope of the study are established. Secondary, inventory analysis is performed under the pre-establishment of emitted area, transportation, scenario of use and disposal. Thirdly, impact assessment would be put into practice. The last phase in interpretation, we can see the results of calculations, and perform further considerations such as data quality assessment, sensitivity analysis to conclude the study.

16 What units can be used?

SI (Metric)

Other

17 Which languages does the software communicate in?

English

German

French

Spanish

Swedish

Other  only Japanese

18 What kind of output results are produced?

Chemical substances

Effect categories

Environmental ``points"

Tables

Comparisons between different products

Diagrams

Other

Possibilities to export result to other Softwares, e.g. Excel

Yes  No

19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?

Calculations are made according with inputs and outputs of each process data, which is basically same with other LCA software. Cut-off rules are applied for endless loops. Users can choose various methods to allocate outputs from a unit process,

## Appendix 1

i.e. mass-based, marked value based, other methods.

There is no possibility to use mathematical formula.  
Sensitivity analyses are somehow limited. Effect of allocation method and data variability on the LCI results can be assessed.

20 Does the software support total inventory with inputs and outputs?

Yes

No

Comment

### Databases

21 Does the software include any databases?

Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?

- Several data are recalculated based on BUWAL 132.
  - Database by Input-Output Analysis researched in Japan.
  - Database originally collected.

22 What kind of data do the databases contain (group of materials, products, processes, etc)?

Process data mainly (gathering resources, energy, manufacturing, transportation, use, disposal, etc.)

23 Is there a regular updating possibility of the software database contents?

Yes, there is.

24 What other databases are compatible with the software, if any?

Nothing at present.

### Documentation

25 Does the software include documentation of the LCA, ``metadata'',

e.g. description of the conditions and choices?

Yes

No

Comment

Most of these type of information such as the choice of allocation, category indicators and limitations can be described in report.

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26 Can new data be added by the practitioner and can the origin of the new data be documented?

Yes

No

Comment

The details of new data can be written in data sheet.

27 Which data formats or documentation tools are compatible with the software?

SPINE

SPOLD

Other  Our original format

Learning

28 How long does it take to learn the software?

<2 hours

<1 day

<1 week

<1 month

Other

29 How is the software taught?

User manual

``Virtual" course

Teachered course

Other

We organized a training course for practitioners.

30 Describe a case study in which this software was used.  
(experience with advantages and disadvantages regarding complexity, time consumption, etc)

JEMAI-LCA describes a case study for refrigerator to explain the operation.

In the phase of goal and scope definition, we can select the impact categories and life cycle stages from the default list. This selection would be reflected in report of the case study automatically.

In inventory analysis part, you can choose the area such as Kanto-region in every process. This will be the basic information to estimate the distance of transportation. The data for electricity has been prepared for every region in

Japan. This means that the selection of area enable us to apply several data for electricity in one case study easily. In impact assessment, you can try several methods to compare

## Appendix 1

the results. Not only proposed in LCA community but your original method can be available.

In interpretation phase, you can obtain the representative value, the upper and lower limit value. Foreground data and background data are classified clearly in database. The information concerning data quality such as year collected is described in every data, then you can see the distribution of data quality in total life cycle. The difference of result by allocation principles can be calculated in sensitivity analysis.

All of these characteristics can be seen in case study for refrigerator.

### Valuation methods

31 Which valuation methods can be used by the software?

Ecoindicator '95, Eco-scarcity '97, EPS, NIRE-DtT method.

32 How transparent is the result (possibilities to track the origin of a result)?

33 Is it possible to use different valuation methods for the same LCA?

Yes

No

### Technical specifications

34 What are the hardware requirements for the software (memory, etc)?

CPU: over Pentium II 400MHz  
Memory: over 64Mbytes (hopefully 128 Mbytes)

35 Which is the memory size of the software itself?

About 3 Mbytes

36 Which operating system can be used?

Microsoft Windows 95/98/NT

37 How often is the software updated?

Monthly   
Annually   
Biannually   
Other

Is it include in the support?

Yes   
No



## Appendix 1

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes [ ]

No [?] It's up to you. Our software supports only Japanese. (see Q17)

39 Additional information

## Appendix 1

### KCL Eco 3.01 (KCL, Finnish Pulp and Paper Research Institute)

#### Organisation

- 1 Name and version of the LCA software tool  
KCL Eco 3.01
- 2 Name of company/organisation who is the proprietor of the tool  
KCL ( Finnish Pulp and Paper Research Institute)
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
Developed by Timo Kutinlahti, KCL Eco Macintosh version 1993 and Windows version 1995, KCL Espoo
- 4 Contact for more information  
Name Catharina Hohenthal (Helena Wessman)  
Address PO Box 70, 02151 Espoo, Finland  
Phone +358-9-43711  
E-mail catharina.hohenthal@kcl.fi  
Home page www.kcl.fi/eco
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
University of Surrey, England 1996, University of Tennessee, Knoxville, USA 1997  
No   
  
How many licenses of the software are sold?  
See attachment  
Name of customer reference  
See attachment

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
3000 euro  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
First lic. 3000 euros, second lic. 500 euros, all additional lic. 340 euros.

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Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

7 Any special purchasing conditions?

-

8 Any software support offered?

- Yes  Please give details (annual fee, etc) Support by email/  
telephone, no extra fee.
- No

9 Is there a demonstration version of the software?

- Yes  Where is it available? It can be downloaded at [www.kcl.fi/eco](http://www.kcl.fi/eco)  
or sent on CDROM by mail.
- No

## Features

10 Intended use of software

Type of user (LCA practitioner classification)

- LCA expert
- Design engineer
- Environmental engineer
- Other

11 Size of the companies for which the software is intended

- < 250 employees
- 250-1000 employees
- > 1000 employees
- Other

12 Which industrial sectors are the software user companies involved with?  
All industries, Consulting companies and educational purposes. (see ref list.)

13 The software is designed mainly for the following type of LCA work (for  
more details, see enclosure)

- Function-based LCA
- Screening LCA
- Accounting LCA
- Other

## Appendix 1

14 Does the software comply with the ISO 14040 standards?

Yes

No

Comment

15 Please give a brief description of the practical procedure when using the software.

Open the program and start making modules for each life cycle stage. Insert inputs and outputs to the modules. Connect the modules to each other, include transports, and calculate the flow using e.g 1 kg final product as reference. Make an assessment and display results as tables and diagrams.

16 What units can be used?

SI (Metric)

Other  User chooses units.

17 Which languages does the software communicate in?

English

German

French

Spanish

Swedish

Other

18 What kind of output results are produced?

Chemical substances

Effect categories

Environmental "points"

Tables

Comparisons between different products

Diagrams

Other

With the "Hotspot" function the most significant sources of emissions can easily be found and displayed. Sensitivity analysis (Monte Carlo).

Possibilities to export result to other softwares, e.g Excel Yes  No

19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?

The software is based on linear equations. Closed loop function possible.

Allocations, Sensitivity analysis and assessments possible.

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- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
 No data is included, but KCL ECO includes Data Master data format, which is based on SPOLD formats. Data is separately in EcoData database.  
 No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Pulp, paper and board production processes. Chemicals, Energy, Transports, Wood harvesting, Deinking processes, Waste management.
- 23 Is there a regular updating possibility of the software database contents?  
 Yes
- 24 What other databases are compatible with the software, if any?  
 -

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e g description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other

## Appendix 1

### Learning

28 How long does it take to learn the software?

- < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other

29 How is the software taught?

- User manual   
 "Virtual" course   
 Teachered course   
 Other  Short demonstration in the Helsinki area.

### User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
 Life cycle of paper for example. The life cycle can with KCL Eco be divided into life cycle stages as: Groving (wood harvesting), Pulping, Paper making, Chemicals, Electricity, Transports among others. This way the stage of the inventory with the most significant emissions can be detected. Also the emissions of all transports during the life cycle can be calculated separately. When calculation errors occur they are were easy to find thanks to the flowsheet check. The assessment part is also very easy and fast to do. The two assessment methods can be used for the inventory and the results of the methods can therefor easily be compared. The closed loop function is used to include the recycling of paper in the inventory. The results are listed in tables and diagrams. The graphic layout is very good. Also sensitivity analysis can be made to get the accuracy of the data.

### Valuation methods

31 Which valuation methods can be used by the software?

DAIA 98 and EcoIndicator 95

32 How transparent is the result (possibilities to track the origin of a result)?

Complete transparency

33 Is it possible to use different valuation methods for the same LCA?

- Yes   
 No

## Appendix 1

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Runs on any PC-Model with Microsoft Windows 95 (or later) Windows NT 4.0 (or later) and 30 MB of free hard disk space
- 35 Which is the memory size of the software itself?  
5428KB
- 36 Which operating system can be used?  
Microsoft Windows 95 (or later) Windows NT 4.0 (or later)
- 37 How often is the software updated?  
 Monthly   
 Annually   
 Biannually   
 Other
- Is it included in the support?  
 Yes   
 No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
 Yes   
 No
- 39 Additional information

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### LCA Support version 2 (NEC Support Kansai Ltd, NEC Corporation)

#### Organisation

- 1 Name and version of the LCA software tool  
LCA Support version 2
- 2 Name of company/organisation who is the proprietor of the tool  
NEC Software Kansai, Ltd.  
NEC corporation
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
In October 1994, NEC developed the first LCA software and JEMAI put this software on the market as JEMAI-LCA in March 1995, which was the first LCA software to be marketed in Japan. NEC continued LCA software research and NEC Software Kansai released LCA Support in December 1997. The latest version of LCA Support is version 2 and has been sold since September 1999.
- 4 Contact for more information  
Name Shigeyuki Miyamoto  
Address 1-1, Miyazaki 4-chome, Miyamae-ku, Kawasaki, Kanagawa 216-8555, Japan  
Phone +81 44 856 2377  
E-mail s-miyamoto@ax.jp.nec.com  
Home page <http://www.labs.nec.co.jp/rel>
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
No

How many licenses of the software are sold?

Name of customer reference

Motoko Tokimoto  
NEC Software Kansai, Ltd.

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
About 2,800 USD (300,000 yen)  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
Network license 1 client about 1,400 USD (150,000 yen)



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10 clients about 13,000 USD (1,400,000 yen)  
 Price range, if above is not answered (USD)

<1.000	<input type="checkbox"/>
1.000-5.000	<input type="checkbox"/>
5.000-10.000	<input type="checkbox"/>
10.000-20.000	<input type="checkbox"/>
>20.000	<input type="checkbox"/>

7 Any special purchasing conditions?

8 Any software support offered?

Yes  Please give details (annual fee, etc) 1-year support and instruction 100,000 yen  
 No

9 Is there a demonstration version of the software?

Yes  Where is it available?  
 No

**Features**

10 Intended use of software

Type of user (LCA practitioner classification)

LCA expert	<input checked="" type="checkbox"/>
Design engineer	<input checked="" type="checkbox"/>
Environmental engineer	<input checked="" type="checkbox"/>
Other	<input type="checkbox"/>

11 Size of the companies for which the software is intended

< 250 employees	<input checked="" type="checkbox"/>
250-1000 employees	<input checked="" type="checkbox"/>
> 1000 employees	<input checked="" type="checkbox"/>
Other	<input type="checkbox"/>

12 Which industrial sectors are the software user companies involved with?

LCA Support is a general purpose and covers almost all of the sectors. It is especially suitable for electronic products.

## Appendix 1

- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)
- |                    |                                     |
|--------------------|-------------------------------------|
| Function-based LCA | <input type="checkbox"/>            |
| Screening LCA      | <input checked="" type="checkbox"/> |
| Accounting LCA     | <input checked="" type="checkbox"/> |
| Other              | <input type="checkbox"/>            |
- 14 Does the software comply with the ISO 14040 standards?
- |     |                                     |
|-----|-------------------------------------|
| Yes | <input checked="" type="checkbox"/> |
| No  | <input type="checkbox"/>            |
- Comment
- 15 Please give a brief description of the practical procedure when using the software.
- LCA Support provides a flow window to describe product life cycles. The flow window has two kinds of views: a tree view representing a product life cycle as process trees and a sheet view displaying a portion of the process trees. Users can change these views whenever required. Users can construct process trees intuitively to drag-and-drop and cut-and paste process object icons.
- 16 What units can be used?
- |             |   |
|-------------|---|
| SI (Metric) | <input checked="" type="checkbox"/>                         |
| Other       | <input checked="" type="checkbox"/> Every unit can be used. |
- 17 Which languages does the software communicate in?
- |         |  |
|---------|--|
| English | <input type="checkbox"/>                     |
| German  | <input type="checkbox"/>                     |
| French  | <input type="checkbox"/>                     |
| Spanish | <input type="checkbox"/>                     |
| Swedish | <input type="checkbox"/>                     |
| Other   | <input checked="" type="checkbox"/> Japanese |
- 18 What kind of output results are produced?
- |  |   |
|--|---|
| Chemical substances  | <input checked="" type="checkbox"/>                                 |
| Effect categories  | <input checked="" type="checkbox"/>                                 |
| Environmental "points"                                       | <input checked="" type="checkbox"/>                                 |
| Tables   | <input checked="" type="checkbox"/>                                 |
| Comparisons between different products                       | <input checked="" type="checkbox"/>                                 |
| Diagrams   | <input type="checkbox"/>  |
| Other  | <input type="checkbox"/>  |
| Possibilities to export result to other softwares, e g Excel | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |

## Appendix 1

- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?

LCA Support has a loop processing function, which is addition of process objects appearing repetitively on a process tree. Users can carry out sensitivity assessment by replacing an object icon with the other one through an easy interface such as drag-and-drop and cut-and-paste. LCA Support treats only allocated data and has no special function for analytical equation calculation and mathematical formula use.

- 20 Does the software support total inventory with inputs and outputs?

Yes

No

Comment

## Databases

- 21 Does the software include any databases?

Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?

Three database products for LCA support are put on the market: "LCA database series Japan" from the Japan Environmental Management Association for Industry (JEMAI), "LCA database series BUWAL" and "LCA database series 1995 Input Output Table".

No

- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?

"LCA database series Japan" contains general data for material and energy production in Japan. "LCA database series 1995 Input Output Table" contains about 4,000 data for production of overall Japanese sectors based on I/O tables. "LCA database series BUWAL" mainly contains packaging data in Europe.

- 23 Is there a regular updating possibility of the software database contents?

Yes. We are planning.

- 24 What other databases are compatible with the software, if any?

## Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g. description of the conditions and choices?

Yes

No

Comment LCA support provides document attachment function, which enables document files to be attached to an individual process object. Users can attach document files, such as text files and Microsoft Word files, to include an LCA document.

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26 Can new data be added by the practitioner and can the origin of the new data be documented?

Yes

No

Comment

27 Which data formats or documentation tools are compatible with the software?

SPINE

SPOLD

Other

## Learning

28 How long does it take to learn the software?

< 2 hours

< 1 day

< 1 week

< 1 month

Other

29 How is the software taught?

User manual

“Virtual” course

Teached course

Other

## User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)

LCA Support has hundreds of customers now and the exact number of LCA studies is uncertain. In the case of NEC Corporation, LCA studies of the following product has been completed:

- PCs (Desktop and Laptop Models)
- Cellular Telephones and Pagers
- ISDN Terminals
- Fax Machines and Telephones
- Engineering Workstations
- Optical Network Terminals
- Switching Systems
- Semiconductor Memories
- Liquid Crystal Projectors
- Transmission Systems
- Printers
- Cathode Ray Tubes (CRTs), LCDs

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- Liquid Crystal Modules
- Relays
- Connectors
- Education System Equipment
- Lighting Tools.

Please refer web pages for more detail: <http://www.nec.co.jp/english/profile/kan/>

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Although LCA support equips valuation function, we offer no specific weighting factors. This is because we have not found objective valuation methods and cannot recommend specific method to our customers.
- 32 How transparent is the result (possibilities to track the origin of a result)?
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Processor : i486DX4 or higher processor recommended.  
Memory : 16MB RAM  
Hard disk : 15MB of available hard-disk space  
Display : VGA or higher-resolution monitor. Super VGA recommended.
- 35 Which is the memory size of the software itself?
- 36 Which operating system can be used?  
Microsoft(R)Windows(R)95 operating system  
Microsoft(R)Windows(R)98 operating system  
Microsoft(R)Windows NT(R) Workstation Version 4.0 operating system  
Microsoft(R)Windows NT(R) Server Version 4.0 operating system
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other

Is it included in the support?

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Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes   
No

39 Additional information

## Appendix 1

### LCAiT 4 (Chalmers Industriteknik, Ekologik)

#### Organisation

- 1 Name and version of the LCA software tool  
LCAiT 4  
Current version 2000-08-25 = 4.0.15.
- 2 Name of company/organisation who is the proprietor of the tool  
Chalmers Industriteknik, Ekologik
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
The first generation of the LCAiT software (version 1, 2 & 3) was developed by CIT Ekologik in 1991 and launched on the market in 1992 as being one of the first Windows based LCA software using a graphical interface and other user friendly features.

The new generation of the LCAiT software, LCAiT 4, was mainly developed during 1999. It has been on the market since January 2000 and it is still being further developed.

- 4 Contact for more information  
Name  
Lil Falkensson for ordering the free software edition "LCAiT 4 Light", or for general questions concerning software and data packages, prices etc.  
Lisa Person for overall questions as well as user support and technical support.  
Robert Svensson for user support.  
Karin Strömberg for technical support.

Address Chalmers Teknikpark, 412 88 Göteborg, Sweden

#### Phone

Operator: +46 31 772 40 00  
Lil Falkensson: +46 31 772 3696  
Lisa Person: +46 31 772 4237  
Robert Svensson: +46 31 772 4339  
Karin Strömberg: +46 31 772 4338

#### E-mail

lil.falkensson@cit.chalmers.se  
lisa.person@cit.chalmers.se  
robert.svensson@cit.chalmers.se  
karin.stromberg@cit.chalmers.se

#### Home page

www.lcait.com and www.ekologik.cit.chalmers.se

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5 Has the tool been reviewed in an unbiased report or evaluation?

Yes  Please give details

Yes a huge number of times (for the old generation (LCAiT 1-3)). Here are some examples:

1995:

- ÖBU, Schweiz Vereinigung für Ökologisch bewusste Uniternehmungsführung, Herisau, Switzerland, "Software Guide: Ökobilanz-Software 1995".

- Faversham House Group Limited, London, UK, "The Environmental Software Guide".

1996:

- Centre for Clean products and Clean Technologies, University of Tennessee, Knoxville, USA, "Evaluation of LCA design tools".

1997:

- ÖBU, Schweiz Vereinigung für Ökologisch bewusste Uniternehmungsführung, Herisau, Switzerland, "The LCA Software Guide 1997".

- GrAT, Wien, Austria, "Ecodesign software studie".

- Trischler und Partner GmbH, Freiburg, Germany, "Marktüberblick Umweltmanagement-Software".

1998:

- Faversham House Group Limited, London, UK, "The Environmental Software Guide".

1999:

- Faversham House Group Limited, London, UK, "The Environmental Software Guide".

The new software (LCAiT 4) will be included in the following evaluation:

2000:

- WRI, World Resource Institute, USA, "Survey of LCA Software Tools".

No

How many licenses of the software are sold?

Between 400-500 licenses.

Name of customer reference

Here are some examples of our LCAiT users:

Ajou University (Korea), Astra Zeneca, BP Chemicals, Borealis Polymers OY (Finland). Cementa AB, Chalmers University of Technology, Duni, ESAB, Electrolux, Göteborg Energi, Höganäs AB, Jotun (Norway), KTH Royal Technical University, Korea Accreditation Board, Mitthögskolan, Neste, Norske Mejerier (Norway), Packforsk, SIK, Samsung Electronics (Korea), Stiftelsen Østvoldsforskning (Norway), Stora Enso, Telia, Tetra Pak, Umeå Energi, VITO (Belgium), Volvo TU, VTT (Finland).

## Commercial specifications

6 Price of software (purchase of license) (USD)

Prices when the software is commercially used:

License no 1: 35 000 SEK ≈ 3930 U\$ (\*)

License no 2: 30 000 SEK ≈ 3370 U\$ (\*)

License no 3: 30 000 SEK ≈ 3370 U\$ (\*)

License no 4: 25 000 SEK ≈ 2800 U\$ (\*)



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(\*) According to the rate in July 2000: 1 U\$ = 8,9 SEK.

There is a reduced price for our old LCAiT customers (i.e. users of the LCAiT 3 version).

There is a substantially reduced price for Universities when the software is used in education and non-commercial research. We also offer packages where Universities can rent licenses for students etc. (2000 SEK per license and year).

Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
See above!

Price range, if above is not answered (USD)

- |               |                          |
|---------------|--------------------------|
| <1.000        | <input type="checkbox"/> |
| 1.000-5.000   | <input type="checkbox"/> |
| 5.000-10.000  | <input type="checkbox"/> |
| 10.000-20.000 | <input type="checkbox"/> |
| >20.000       | <input type="checkbox"/> |

### 7 Any special purchasing conditions?

No, not for the software.

For the use of the data the customer must agree upon the following conditions:

1. You are now responsible for the consequences of applying the data; CIT Ekologik has no responsibility for the consequences of using the data.
2. You must not pass on the data, neither electronically nor as printouts, to a third party (i.e. outside your organisation) without an agreement from CIT Ekologik.
3. You are free to use the data internally. However, before You publish complete sets of data, You should first contact CIT Ekologik.
4. You must not use CIT Ekologik's name for marketing purposes without permission from CIT Ekologik. However, when using the data, You should refer to CIT Ekologik as the source of the data.

### 8 Any software support offered?

Yes  Please give details (annual fee, etc)

Initial technical support, such as how to install etc. is included in the software package i.e. free of charge.

User support (telephone or e-mail) can be purchased additionally (15 000 SEK per year).

Training courses on different levels in how to handle the LCAiT software are held continuously. They can as well be intergrated with pure LCA methodology if desired. The prices may differ some depending on the number of participants, but a typical example is 6000 SEK per person and day. Custom-made courses are purchased separately and are adapted for the individual needs.

We also perform LCA-studies, everything from simple material profiles to complex product LCAs. We offer expert support and guidance in the construction of your own LCA activity within your organisation. This kind of "on-line" training programmes becomes more and more common.

## Appendix 1

No

9 Is there a demonstration version of the software?

Yes  Where is it available?

There is a free light edition of the LCAiT 4 software. The LCAiT 4 Light edition has the following limitations:

- No printouts can be obtained.
- There are no import or export features.
- The number of activities are limited to 5 Process activities and 5 Transport activities.

Even though there are limitations, you can use the Light edition in order to insert your own data, create your own small LCA systems (see limitation above), document the data according to the SPINE data documentation format, calculate both the inventory and impact assessment results and the most important; Your work is automatically saved in the relation database, which means that you can use the Light edition for starting to work with the software, not only to get a quick guided tour. When purchasing the full edition, it is just to continue working in the same database. In the full edition you will be able to create printouts, import and export data, convert LCA systems from the former LCAiT version (LCAiT 3) and to create large systems.

The LCAiT 4 Light edition can be downloaded from [www.lcait.com](http://www.lcait.com) or ordered from Lil Falkensson (see contact details under question no 4 above).

No

## Features

10 Intended use of software

Type of user (LCA practitioner classification)

- |                        |                                     |
|------------------------|-------------------------------------|
| LCA expert             | <input checked="" type="checkbox"/> |
| Design engineer        | <input checked="" type="checkbox"/> |
| Environmental engineer | <input checked="" type="checkbox"/> |
| Other                  | <input checked="" type="checkbox"/> |

The software is NOT adapted for any specific user.

Because of the huge number of flexible features it is very suitable for the LCA expert, but it is also appropriate for an LCA practitioner that performs less complex LCAs, like for instance an Environmental engineer or even an LCA beginner. An LCA beginner might however need more LCA support, Software user support and Data, which are services that we offer separately.

The Design engineer might use the software for simple evaluations, but this requires that a huge number of data sets are included since a desing engineer does not have the time to perform LCIs for materials etc. A combination between a desing engineer and an LCA practioner within the company may be the best solution.

## Appendix 1

11 Size of the companies for which the software is intended

- < 250 employees
- 250-1000 employees
- > 1000 employees
- Other

The software is NOT designed for any specific company size. As mentioned above, CIT Ekologik can offer small and medium sized companies extra LCA support, data etc. if needed (see also question no 39 below).

12 Which industrial sectors are the software user companies involved with?

As mentioned above, the software is NOT designed for any specific industrial sector.

The LCAiT software (involving all versions i.e. 1-4) are used within the following industrial sectors:

- Forestry, pulp and paper (e.g. Paper board)
- Packaging (e.g. Food packaging)
- Plastics industry (e.g. Polyethylene)
- Chemical industry (e.g. Cleaning agents, Painting systems)
- Mining and metallurgical industry (e.g. The steel work industry)
- Building materials
- Telecom services
- Electronics
- Engineering industry
- Transport and car components
- Electricity and energy sector
- Food industry
- Waste management
- Home appliance products (e.g. Furniture)

In addition, the software is used by LCA consultants and for research and education by Universities etc.

13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)

- Function-based LCA
- Screening LCA
- Accounting LCA
- Other

As indicated above, the LCAiT software is appropriate for any type of LCA work.

14 Does the software comply with the ISO 14040 standards?

- Yes
- No

Comment

LCAiT supports the practitioner to perform an LCA according to the ISO 14040 series. CIT Ekologik is participating in the development of the ISO 14048 document and we are planning to implement it in LCAiT when the standard is finalised.

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- 15 Please give a brief description of the practical procedure when using the software.

The software is very user friendly and intuitive. There are different types of working areas depending on what type of LCA procedure your are working with for the moment e.g.

- Defining a new LCA project and its different product systems in the Workspace working area
- Creating an LCA system (process tree) in the Flowchart working area.
- Defining a new substance, a unit etc. in the Nomenclature working area.
- Searching for a data set in the Query working area or
- Calculating the inventory and impact assessment results in the Output working area.

A working area is easily hidden and activated making it easy to just view the part that is interesting for the moment. Most of the working areas are structured in a way similar to the Explorer (File Manager) in Windows, i.e. they are based on hierarchic tree structures. Drag and drop, Cut, Copy and Paste are functions that are used a lot. The "magic word" is RIGHT-CLICKING! Try this and the desired features will appear. Text files for export of data (for instance the inventory result matrix) are easily generated. A SPINE specific text file (called XFR) is used for exchanging a SPINE data set between different SPINE based software. The XFR file is also used for exchanging LCA systems (i.e. not only a single data set) between LCAiT 4 users. Input and output flows can easily be imported to an activity (process etc.) via an import text file. There is also an import feature for indexes in the impact assessment module. An activity (a single process or an LCA system) can be copied within the database (when different scenarios are desired) or between databases.

Unlike our old generation (LCAiT 1-3), the LCAiT 4 software uses a relation database, which makes it easy to handle and organise the data sets and therefore easy to reuse them in another study. This saves time and minimises the risk for creating duplicate data sets. A data set is easily found thanks to the search function (in the Query module). The large documentation possibilities (of the SPINE model) is a help for describing the functional unit, assumptions, system boundaries, data sources and other pieces of information necessary for communicating a data set. This makes the LCA work less dependent on certain individuals, which also saves time. The documentation module in the software makes it possible for the user to define the goal and scope definition according to the ISO standards. However, if the purpose of the LCA work is not that ambitious, please consider all the documentation fields as "possibilities" rather than "a must". In this case it is a good idea to choose those documentation fields that fulfils the requirements according to your own purpose and to skip the rest.

- 16 What units can be used?
- SI (Metric)
- Other

There is no limitation at all when it comes to defining different units.

## Appendix 1

17 Which languages does the software communicate in?

- English   
 German   
 French   
 Spanish   
 Swedish   
 Other

All the menus and LCAiT specific messages are in English. The Windows related dialogues (e.g. Print Setup etc.) are following the actual language of the Windows version used.

18 What kind of output results are produced?

- Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other

Comment to the "Comparison between different products":

It is quite easy to compare the results for different LCA systems (products) already in the current version (thanks to a feature called "Workbook mode"), but in the near future it will be possible to compare different LCA systems in the same diagram as well.

Further comments:

The inventory results are presented in a matrix showing the contribution for each sub process. The input and output flows are sorted into different categories, such as Natural resources, Emissions to air and Products.

In a future version, it will be possible to present both the inventory and impact assessment results divided into user defined life cycle phases.

Possibilities to export result to other softwares, e g Excel                      Yes  No

19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?

The LCAiT software can handle closed-loops, which makes it possible to calculate systems involving recycling loops.

In a future version we are planning to introduce an allocation function and some kind of sensitivity analysis (based on the Quantity Min, Max and Standard deviation fields in the SPINE model). We can at present however not give any specifications concerning the mathematical methods that will be used in these cases.

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In the current version, the only user defined mathematical formula is the equation used in the definition of units e.g.  $\text{kg} = 1000 \times \text{g}$  or  $\text{kWh} = 3.6 \text{ MJ}$ . In a future version, it will be possible to convert between units like MJ and kg, kg and m<sup>3</sup> etc. using a conversion factor like heat value, density etc.

- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?

The basic software package comes with an Energy- and transport database which includes production and combustion of fuels, production of electricity, and different transport modes. The data sources differ, but to mention the most important we have used the Swiss ETH reports and the transportation data are based on the NTM (the Network for Transport and the Environment).

Additional well documented data modules can be purchased separately. Examples are:

- Plastics & chemicals: mainly according to the APME Eco-profile report series, but could as well include data from the Swiss ETH reports or other sources.
- Metals: Data based on different data sources, mainly cradle-to-gate data compiled and published by branch organisations, but could as well include data from the Swiss ETH reports.
- Forestry, pulp and paper: Data based on different data sources, mainly cradle-to-gate data compiled and published by branch organisations.
- Manufacturing processes: Mainly from our own public LCA studies.
- Waste management and recycling: From a variety of data sources e.g. our own public LCA studies, reports from Swedish waste research council (nowadays a department within the Swedish Environmental Protection Agency).
- Impact assessment indexes for all commonly used characterisation and weighting methods (based on a several different data sources).

Single data sets, included in a data module, can be purchased separately as well.

No

- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Se question no 21 above.

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- 23 Is there a regular updating possibility of the software database contents?  
Yes. As LCA consultants, we are using the databases in our own work and we update the data sets/databases when considered necessary.
- 24 What other databases are compatible with the software, if any?  
If we start with the Swedish LCA related software, we have been participating in a SPINE data communication project at CPM (Centre for Environmental Assessment of Product and Material Systems). The SPINE model is further described in the answer to question no 25 below. The first phase of this project aimed to facilitate the communication of a data set (both technically and in ways of understanding) between different SPINE users, which in reality involved both software developers and software users. The software involved were: SPINE@CPMDataTool (CPM), EcoLab (Nordic Port) and LCAiT 4 (CIT Ekologik). The more comprehensive purpose of the project was to give recommendations outside the "SPINE sphere" concerning LCA data communication e.g. concerning nomenclature issues. As a result from this project we have experienced that we are more or less compatible with each other, which means that the LCAiT database can exchange (import/export) data with SPINE@CPMDataTool and EcoLab. We will work further with minor technical details that are not yet fully compatible.

Provided that other LCA software (e.g. SimaPro, TEAM etc) have import and export facilities (e.g. on some kind of text format) we would be able to electronically exchange data sets with them as well, for instance input and output flows and maybe some of the major documentation fields as well. At present this would be performed on a basic level, which would need some "manual" fixing in the text file. We are planning to investigate this further (see also question no 27 - The comment on the compatibility with SPOLD).

Other databases (not arising from an LCA software) are often stored in tables on for instance Excel format or similar. Provided that the data set has been interpreted (understood) such a data set is quite easy to import to the LCAiT 4 software. Only a little bit of editing is needed since the import requires that the "data table" is made according to the LCAiT import template. This editing is performed in Excel or similar software.

## Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g. description of the conditions and choices?

Yes

No

Comment

The LCAiT 4 software is based on the SPINE LCA data documentation format.

SPINE (Sustainable Product Information Network for the Environment) is a large scale operative data format for transparent storage, administration and retrieval of inventory data. The model is administrated by CPM (Centre for Environmental Assessment of Product and Material Systems - a Swedish competence centre at Chalmers University of Technology). SPINE allows for a transparent documentation of every life cycle inventory conducted since each data set can be described in terms of sources of information, data quality and method related choices such as system boundaries and principles of allocation. To facilitate the documentation of data, there are defined nomenclatures and an address register

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for contact persons and individual plants.

26 Can new data be added by the practitioner and can the origin of the new data be documented?

- Yes   
 No

Comment

There are no limitations what so ever when it comes to inserting your own data, nor concerning input and output flows associated with a process or new impact assessment methods neither the documentation of these "data".

27 Which data formats or documentation tools are compatible with the software?

- SPINE   
 SPOLD   
 Other

Comment:

Concerning compatibility with SPOLD: LCAiT 4 has not (at least not yet) any electrical exchange template for data exchange with software based on the SPOLD format (see question no 24). CPM has however published a report called "An Assessment of the SPOLD format, CPM report 1998:5", in which a mapping of how the information is moved between the formats have been performed. We however believe that when the ISO standard 14048, LCA data documentation format, has been finalised, the question about different formats might (hopefully) be redundant.

Today we are more or less compatible with the software based on the SPINE format (see question no 24).

## Learning

28 How long does it take to learn the software?

- < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other

Provided that the user is familiar with working in normal Windows software, a feeling for the "basics features" is obtained in about one week. To understand the significance of working in a relation database may take some more time depending on earlier experince.

29 How is the software taught?

- User manual   
 "Virtual" course



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Teached course   
 Other

As a supplement to the User manual we will provide a simple Exercise.  
 The DemoDatabase also includes some examples that will be further developed in time.

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)

Since the software was introduced on the market quite recently there are not so many public projects or case studies to refer to yet. In the answer to question no 5 (Name of customer reference), we have listed companies using the LCAiT software. Several of them are using the new version (no 4). It is however easier to find "case study examples" within the university and research sector. Here are some examples:

- The LCA group at SIK (The Swedish Institute for Food and Biotechnology) in Gothenburg.
- The LCA group at Volvo (Technological Development Corporation) in Gothenburg.
- Chalmers University of Technology, The department of Chemical Environmental Science, Morgan Fröling is using LCAiT 4 in a research project on Distribution of District heating.
- Chalmers University of Technology, The department of Chemical Environmental Science, Robert Svensson has used LCAiT 4 in his thesis for Arla, "Life cycle assessment of a table drink - a comparison between a C-vitamin effervescent tablet and a soft drink".
- Umeå Energi have been using the LCAiT 4 software in several thesis performed by students from Umeå University.

For updated information about such "case studies" or reference customers, please contact CIT Ekologik or visit [www.lcait.com](http://www.lcait.com).

### Valuation methods

- 31 Which valuation methods can be used by the software?  
 Any impact assessment method can be userdefined.

In the impact assessment database package (mentioned above) the following methods are included:

- Characterisation:  
 Resource depletion (reserve-base method and reserve-to-use method), Global warming, Ozone depletion, Photochemical oxidant creation, Acidification, Eutrophication, Human toxicity (air, water and soil), Eco-toxicity (aquatic ecosystems and terrestrial ecosystems).

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- Weighting:

Environmental Priority Strategies in product design (EPS), The Environmental Theme method, The Eco-scarcity method (ECO), The Eco-Indicator method, The EDIP method, The EcoIndicator method, Tellus method.

- 32 How transparent is the result (possibilities to track the origin of a result)?  
In the present version, the results can be viewed in a matrix showing the contribution for each sub process of the system. The impact assessment results can be viewed in a diagram as well.

Some examples of result presentation features that we are planning to include in a future version are: Diagrams in which it will be possible to easily trace the "hot spots" so that double clicking on a bar shows the diagram of the underlying system. Another feature we plan to include is a diagram, in which the bars are divided into different sections corresponding to the most important parameter contributions. As mentioned above, we will make it possible to present both the inventory and impact assessment results divided into user defined life cycle phases. Another thing also mentioned above, is the possibility to compare two LCAs in the same diagram.

We would very much like our users and potential customers to influence us in the development of different result presentation features.

- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
- Processor: 166 MHz.  
- RAM: 64 MB.  
- Harddisc space: software + database require about 15 MB.
- 35 Which is the memory size of the software itself?  
About 10 MB.
- 36 Which operating system can be used?  
Windows (95/98/2000 and NT).
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other

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The LCAiT 4 software is quite new and therefore we continuously develop new versions, which are distributed to our customers. Some versions only include minor "make-up" programming and these are free of charge.

Other versions will include major upgrades such as comprehensive functions and modules e.g. for performing allocation and sensitivity analysis, for generating complex user defined reports or for grouping the results into user defined life cycle phases.

Therefore we have answered both Yes and No on the question below.

Is it included in the support?

Yes

No

## Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes

No

## Additional information

CIT Ekologik has preformed environmental consultancy within industry since 1989. The unit has long experience in performing life cycle assessments of products and services and is well known for its expertise within the area. A large international network and close co-operation with the scientific activities at Chalmers University of Technology contribute to the high competence within the area. Over more than a decade, CIT Ekologik has carried out numerous assessments for customers in a wide range of industries all over the world. LCAiT is a product of CIT Ekologik's experience.

LCAiT is a modern, flexible and user friendly LCA software. Training programmes in using the software and in LCA methodology are held regularly. User support and quality assured data are offered as additional packages. We are also offering LCA consultancy and expertise support from the fields of activities within CIT Ekologik e.g. assistance when establishing your own LCA department, LCA studies or accomplishing an Environmental Product Declaration (EPD).

## Appendix 1

### PEMS v4.6 (Pira International)

#### Organisation

- 1 Name and version of the LCA software tool  
PEMS v4.6
- 2 Name of company/organisation who is the proprietor of the tool  
Pira International
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
The original software was developed as a result of a UK Government and industry funded research project approximately 10years ago. Since then the software has been upgraded several times to make it more user friendly and to keep it up to date with international consensus on LCA methodology
- 4 Contact for more information  
Name Michael Sturges  
Address Pira International, Randalls Road, Leatherhead, Surrey, UK  
Phone + 44 (0) 1372 802195  
E-mail michael@pira.co.uk  
Home page <http://www.lcauser.com> (PEMS website) <http://www.pira.co.uk> (Pira International website)
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details LCA Software Buyer's Guide, November 1994, Atlantic Consulting; LCA Software Review, Gareth Rice, Centre for Environmental Strategy, University of Surrey, May 1996; Evaluation of Life Cycle Assessment Tools, Dean Menke and Gary Davies, The University of Tennessee, Center for Clean Products and Clean Technologies, August 1996  
No   
  
How many licenses of the software are sold?  
Approx 90  
Name of customer reference  
SmithKline Beecham (Gary Parker), Smith & Nephew Europe (George Howarth), Tetra Pak Carton Packaging Division (David Cockburn). Please contact Pira International for full contact details.

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
Site licence £6000 sterling, single user licence £3000 sterling. Discounts available for academic institutions. There are also discounts available for multiple licences. NB VAT is charged where applicable  
Differentiated prices, for example if many licenses are sold to a single

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company the percentage reduction per license (USD)

Negotiable

Price range, if above is not answered (USD)

<1.000

1.000-5.000

5.000-10.000

10.000-20.000

>20.000

- 7 Any special purchasing conditions?  
Users must sign a user agreement. Licences sold to academic institutions are for teaching and research purposes only. Special consultancy licences are available on request
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) Helpline support offered as part of licence fee; help screens within the software itself; User Manual; Training and Installation included as part of the licence fee; PEMS User Club (free in first year) £1750 pa thereafter (note membership is voluntary). Some of the benefits of the PEMS User Club include, allowing life cycle practitioners to meet and exchange data / knowledge, keep up to date with the latest international developments in LCA, participate in workshop sessions and contribute to the development of practical and applicable best practice documents for life cycle approaches  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? By post, on request  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)  
LCA expert   
Design engineer   
Environmental engineer   
Other
- 11 Size of the companies for which the software is intended  
< 250 employees   
250-1000 employees   
> 1000 employees   
Other  Any

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- 12 Which industrial sectors are the software user companies involved with?  
Packaging, Food, Pharmaceuticals/healthcare, utilities
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)
- |                    |                                     |  |
|--------------------|-------------------------------------|--|
| Function-based LCA | <input checked="" type="checkbox"/> |  |
| Screening LCA      | <input checked="" type="checkbox"/> |  |
| Accounting LCA     | <input checked="" type="checkbox"/> |  |
| Other              | <input type="checkbox"/>            |  |
- 14 Does the software comply with the ISO 14040 standards?
- |     |                                     |  |
|-----|-------------------------------------|--|
| Yes | <input checked="" type="checkbox"/> |  |
| No  | <input type="checkbox"/>            |  |
- Comment      The software allows the user to conduct an LCA study in compliance with ISO requirements. However the user can go beyond the requirements if they wish
- 15 Please give a brief description of the practical procedure when using the software.
- Systems are constructed using a flow diagram. The user has the option to use data from the database within the software or add in new data either directly into the user database through the database manager or by entering data into the process blocks. Once data has been entered, systems can be compiled and results evaluated using a range of graph and reporting features.
- 16 What units can be used?
- |             |                                     |                                      |
|-------------|-------------------------------------|--------------------------------------|
| SI (Metric) | <input checked="" type="checkbox"/> |                                      |
| Other       | <input checked="" type="checkbox"/> | Any units can be defined by the user |
- 17 Which languages does the software communicate in?
- |         |                                     |
|---------|-------------------------------------|
| English | <input checked="" type="checkbox"/> |
| German  | <input type="checkbox"/>            |
| French  | <input type="checkbox"/>            |
| Spanish | <input type="checkbox"/>            |
| Swedish | <input type="checkbox"/>            |
| Other   | <input type="checkbox"/>            |

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- 18 What kind of output results are produced?
- |  |                                     |                                     |    |                          |
|--|-------------------------------------|-------------------------------------|----|--------------------------|
| Chemical substances  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Effect categories  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Environmental “points”                                       | <input checked="" type="checkbox"/> |                                     |    |                          |
| Tables   | <input checked="" type="checkbox"/> |                                     |    |                          |
| Comparisons between different products                       | <input checked="" type="checkbox"/> |                                     |    |                          |
| Diagrams   | <input type="checkbox"/>            |                                     |    |                          |
| Other  | <input type="checkbox"/>            |                                     |    |                          |
| Possibilities to export result to other softwares, e g Excel | Yes                                 | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
- 19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?
- Mass and energy balances are made - a calculation module allows users to use formulae to enter data. There are no formulaic links between flows in a given process except in distribution blocks, in which the mass or energy balance is maintained and the remainder exported or imported from another process.
- 20 Does the software support total inventory with inputs and outputs?
- Yes
- No
- Comment

## Databases

- 21 Does the software include any databases?
- Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?
- Many publicly available databases such as APME, Tenside surfactant data. BUWAL and ETH databases in PEMS format can be provided with proof of purchase of the original
- No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?
- Energy, Waste management, transport and materials
- 23 Is there a regular updating possibility of the software database contents?
- Databases are updated as new/updated publicly available data is published
- 24 What other databases are compatible with the software, if any?
- Data from other sources can be easily imported into the software

## Appendix 1

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?
- Yes
- No
- Comment Where available
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?
- Yes
- No
- Comment The databases are very flexible and very transparent
- 27 Which data formats or documentation tools are compatible with the software?
- SPINE
- SPOLD
- Other  Will be compatible with ISO 14048 when available

### Learning

- 28 How long does it take to learn the software?
- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other
- 29 How is the software taught?
- User manual
- “Virtual” course
- Teachered course
- Other  Demonstration systems

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)
- Anglian water - Options for Sewage Sludge Treatment and Disposal. Objectives of the study were to identify environmental impact associated with sludge utilisation and to provide information which might be used, in conjunction with other considerations, in determining future sludge strategy. The PEMS software was selected to model the systems due to its flexibility and user-friendly approach to life cycle modelling. The study was complex in nature but common areas and those deemed unimportant to the conclusions of the study were excluded. 11 scenarios



## Appendix 1

were studied in detail. Many of the environmental problem areas considered were standard however some areas specific to the company and study being carried out were also included, for example, soil conditioning and pathogens. Information relating to these areas was easily added to the list of burdens for inclusion at the scenario construction stage (flow sheeting). The information was also easily incorporated into the graphs used to assess the results. The detailed study took six months to complete in 1996 and was updated to include new scenarios and data during a three month period in 1998. A full report of this case study is available on request.

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Ecoindicator 95, Ecoscarcity, Effect category method, EPS2.0-, MPM, Tellus,
- 32 How transparent is the result (possibilities to track the origin of a result)?  
All impact assessment results can be traced back to individual flows through the use of analysis graphs and reports
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
486 + 16MB Ram
- 35 Which is the memory size of the software itself?  
~30MB
- 36 Which operating system can be used?  
Windows 95, 98, NT4 (sp3+), Windows 2000
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other  The software is updated to include suggestions from users and because of changes in international methodology
- Is it included in the support?  
Yes   
No

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### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?
- Yes
- No

#### Additional information

The software always scores favourably in independent reviews. The software forms the platform for Pira International's LCA and cost benefit analysis consultancy.

## Appendix 1

### REGIS 2.1 (Sinum AG – EcoPerformance Systems)

#### Organisation

- 1 Name and version of the LCA software tool  
REGIS 2.1
  - 2 Name of company/organisation who is the proprietor of the tool  
Sinum AG - EcoPerformance Systems
  - 3 History of the tool (who developed it, when and where was it launched on the market?)  
Sinum AG; launched in 1993
  - 4 Contact for more information  
Name Sinum AG  
Address Lerchenfeldstr. 5, 9000 St. Gallen, Switzerland  
Phone +41 71 274 71 72  
E-mail sinum@sinum.com  
Home page www.sinum.com
  - 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details ÖBU LCA Software Guide 1995/1997;  
UMSIS; Winner Project Switzerland Technology Award 2000  
No
- How many licenses of the software are sold?  
150
- Name of customer reference  
on demand

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
approx. 5900  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
on demand  
Price range, if above is not answered (USD)  
<1.000   
1.000-5.000   
5.000-10.000   
10.000-20.000   
>20.000
- 7 Any special purchasing conditions?  
For educational institutions, we offer special prices

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- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc)  
 Technical Service (updates included) USD approx. 530  
 Total Care Service (technical service + peer reviewing and consulting, special discounts, etc.) USD approx. 1000  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available? See Contact Adress or Homepage  
 No

## Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)  
 LCA expert   
 Design engineer   
 Environmental engineer   
 Other  Technical Staff; Environmental Manager
- 11 Size of the companies for which the software is intended  
 < 250 employees   
 250-1000 employees   
 > 1000 employees   
 Other
- 12 Which industrial sectors are the software user companies involved with?  
 Independet from industrial sectors; REGIS user community covers various sectors and companies of all sizes
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
 Function-based LCA   
 Screening LCA   
 Accounting LCA   
 Other  Corporate Ecobalance / EPE ISO14031
- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment
- 15 Please give a brief description of the practical procedure when using the software.  
 1<sup>st</sup> step: Modelling the organizational structure, 2<sup>nd</sup> step: Designing new measuring points related to specific inventories not contained in the database of Regis, 3<sup>rd</sup> step: Entering the measured quantities of a period, 4<sup>th</sup> step: Analysing the environmental impacts using different evaluation methods, 5<sup>th</sup> step: Documentation, e.g. System Modelling, Environmental Performance Indicators.

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- 16 What units can be used?  
 SI (Metric)   
 Other  open database
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other  Japanese; using multilanguage  
 capabilities translation in a new language is easy
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other  Environmental Costs  
 Possibilities to export result to other Yes  No   
 softwares, e g Excel
- 19 Please give special information on how calculations are made, i e analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 Linear Equations
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
 ETH/ESU, EMPA, BUWAL, INFRAS, CML, PRE  
 No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Energy Systems, Disposal Systems, Transportation, Packaging Materials,  
 Materials related to the printing industry, Various Auxiliary Materials
- 23 Is there a regular updating possibility of the software database contents?  
 Along with the software update
- 24 What other databases are compatible with the software, if any?

## Appendix 1

### Documentation

- 25 Does the software include documentation of the LCA, "metadata", e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment Possibility to add comments by the user
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other  REGIS data format is based on SPOLD, but enhanced by sinum

### Learning

- 28 How long does it take to learn the software?  
 < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other
- 29 How is the software taught?  
 User manual   
 "Virtual" course   
 Teachered course   
 Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
 A printing company uses Regis to support their EMS according to ISO 14000. The company derived their environmental aspects and set up a quantitative controlling system. They answer for example questions like "Which company's activities should be improved to get the maximum possible reduction of the environmental burden dependent on investment?".

## Appendix 1

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Swiss Ecoscarcity Method (UBP-Method), Eco-indicator, CML, user-defined methods
- 32 How transparent is the result (possibilities to track the origin of a result)?  
Full transparency
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Pentium II, 32 MB RAM, 200 MB Harddisk
- 35 Which is the memory size of the software itself?  
Basic Installation: 40 MB
- 36 Which operating system can be used?  
Windows NT / 2000, Windows 95 / 98
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No
- 39 Additional information

## Appendix 1

### Sima Pro 4.0 Light with Scripts (PRé Consultants BV)

#### Organisation

- 1 Name and version of the LCA software tool  
SimaPro 4.0 Light with Scripts
  - 2 Name of company/organisation who is the proprietor of the tool  
PRé Consultants BV
  - 3 History of the tool (who developed it, when and where was it launched on the market?)  
SimaPro 4.0 Light and SimaPro Plus option to create scripts were launched 1998
  - 4 Contact for more information  
Name Ms. Nanda van der Vliet/ Mr Michiel Oele  
Address PRé Consultants BV, Plotterweg 12, 3812 BB Amersfoort, The Netherlands  
Phone + 31 33 4555022  
E-mail info@pre.nl  
Home page www.pre.nl
  - 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details  
No
- How many licenses of the software are sold?  
approx. 80
- Name of customer reference  
Dutch concrete industry , FEFCO (European Corrugated Board Producers Association)

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
Light version: 3200 Euro per 5 licenses, approx. 2900 USD as of 9/8/2000.  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
On request



## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

- 7 Any special purchasing conditions?  
License conditions apply and can be found in the software and on the order form
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) Support through a service contract which is included the first year. Afterwards 1000 Euro/5 licenses per year. Includes support, membership of internet user group, software updates. Major upgrades (4 to 4.1, 5 etc) included in the price.  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? web site <http://www.pre.nl> (FEFCO demo or (in Dutch only) the Dutch Concrete demo), or CD-ROM/ diskettes from PRé or dealers.  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)
- LCA expert
- Design engineer
- Environmental engineer
- Other  Non lca experts that wish to use LCA with predefined scripts to obtain quick and reliable results.
- 11 Size of the companies for which the software is intended
- < 250 employees
- 250-1000 employees
- > 1000 employees
- Other
- 12 Which industrial sectors are the software user companies involved with?  
Concrete production and corrugated board. Applicable to all industry sectors.

## Appendix 1

- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)
- |                    |                                     |   |
|--------------------|-------------------------------------|---|
| Function-based LCA | <input checked="" type="checkbox"/> |   |
| Screening LCA      | <input checked="" type="checkbox"/> |   |
| Accounting LCA     | <input checked="" type="checkbox"/> |   |
| Other              | <input checked="" type="checkbox"/> | cradle to gate, end of life studies and other partial LCA studies. The applicability for certain LCA work depends on the scripts and databases made to work with SimaPro Light. |
- 14 Does the software comply with the ISO 14040 standards?
- |         |                                     |  |
|---------|-------------------------------------|--|
| Yes     | <input type="checkbox"/>            |  |
| No      | <input checked="" type="checkbox"/> |  |
| Comment |                                     | Users can work conform ISO 14040 series standards. SimaPro 5 terminology will comply with ISO 14040 series |
- 16 Please give a brief description of the practical procedure when using the software.
- SimaPro Light is made to use a predefined script and database which is programmed with the SimaPro PLUS option. The script asks a variety questions in order to build an LCA model in the background. It can be analyzed in different predefined ways. The database can be a customized database or one of the generic ones supplied by PRé. Once the script is finished the results are saved in a project and the user can view/edit them or analyze them again in the same way as in a normal SimaPro.
- 17
- 18
- 19
- 16 What units can be used?
- |             |                                     |   |
|-------------|-------------------------------------|---|
| SI (Metric) | <input checked="" type="checkbox"/> |   |
| Other       | <input checked="" type="checkbox"/> | Open system in which units and quantities can be defined. Build in consistency checks on import/export. |
- 17 Which languages does the software communicate in?
- |         |                                     |                                |
|---------|-------------------------------------|--------------------------------|
| English | <input checked="" type="checkbox"/> |                                |
| German  | <input type="checkbox"/>            |                                |
| French  | <input type="checkbox"/>            |                                |
| Spanish | <input type="checkbox"/>            |                                |
| Swedish | <input type="checkbox"/>            |                                |
| Other   | <input checked="" type="checkbox"/> | Version 5 will be multilingual |

## Appendix 1

- 18 What kind of output results are produced?
- |   |                                     |                                     |    |                          |
|---|-------------------------------------|-------------------------------------|----|--------------------------|
| Chemical substances   | <input checked="" type="checkbox"/> |                                     |    |                          |
| Effect categories   | <input checked="" type="checkbox"/> |                                     |    |                          |
| Environmental “points”  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Tables  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Comparisons between different products                        | <input checked="" type="checkbox"/> |                                     |    |                          |
| Diagrams  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Other   | <input checked="" type="checkbox"/> |                                     |    | process tree with        |
| selectable result types                                       |                                     |                                     |    |                          |
| Possibilities to export result to other softwares, e.g. Excel | Yes                                 | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 SimaPro uses linear calculations. Allocation is done by user defined definition (in processes). Avoided product allocation by subtraction of the avoided product. Loops can be simulated.
- 20 Does the software support total inventory with inputs and outputs?
- |         |                                     |
|---------|-------------------------------------|
| Yes     | <input checked="" type="checkbox"/> |
| No      | <input type="checkbox"/>            |
| Comment |                                     |

## Databases

- 21 Does the software include any databases?
- |  |                                     |   |
|--|-------------------------------------|---|
| Yes  | <input checked="" type="checkbox"/> | Which ones (referring to external source such as PWMI, Buwal, etc)? |
| Databases can include PWMI/APME, BUWAL 132, BUWAL 250, BUWAL 300, ETH, IDEMAT, PRE database, Dutch concrete database. It is designed to work with its own custom made database with material/process specific data.. |                                     |   |
| No   | <input type="checkbox"/>            |   |
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Input/output data for material production and processing, energy generation, transport, waste treatments, waste scenarios. See demo for more details.
- 23 Is there a regular updating possibility of the software database contents?  
 yes, through service contract, if no custom database is used.
- 24 What other databases are compatible with the software, if any?  
 IVAM database (see <http://www.ivambv.uva.nl>)

## Appendix 1

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment Data can be added in projects only but cannot be used in the scripts themselves.
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other

### Learning

- 28 How long does it take to learn the software?  
 < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other
- 29 How is the software taught?  
 User manual   
 “Virtual” course   
 Teachered course   
 Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
 N.A.

## Appendix 1

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Eco-indicator 95, Eco-indicator 99, Ecopoints 97, CML. Soon: EDIP, EPS, CML2. User defined methods possible.
- 32 How transparent is the result (possibilities to track the origin of a result)?  
Fully transparent. Any results of any stage in the life cycle can simply (right mouse click) be traced back. Each result can also be displayed as a process tree (For example show mercury to air, or characterisation of heavy metals, or Eco-indicator score of the full life cycle .
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 35 What are the hardware requirements for the software (memory, etc)?  
Depending on size of database and operating system. Windows 95/98 16 MB memory, Win NT /2000 32 MB memory or better recommended with Pentium processor. Complex calculations and/or large databases require more memory and a faster processor.
- 35 Which is the memory size of the software itself?  
About 5 MB
- 36 Which operating system can be used?  
Windows 95, 98, NT , 2000
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

## Appendix 1

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes

No

39 Additional information

Note: not for publication: SimaPro 5 is expected by the end of the year. The specifications above were for SimaPro 4. You might consider testing a Betaversion, on request I can send specs for SimaPro 5. The Plus option to create scripts will be improved in the near future.

## Appendix 1

### Sima Pro 4.0 single user/multi user commercial (Pré Consultants BV)

#### Organisation

- 1 Name and version of the LCA software tool  
SimaPro 4.0 single user / multi user commercial
  
  - 2 Name of company/organisation who is the proprietor of the tool  
PRé Consultants BV
  
  - 3 History of the tool (who developed it, when and where was it launched on the market?)  
SimaPro 1.0 was first launched in 1990 in the Netherlands, SimaPro 4.0 was launched 1998. All development was done in house by programmers of PRé Consultants.
  
  - 4 Contact for more information  
Name Ms. Nanda van der Vliet/ Mr Michiel Oele  
Address PRé Consultants BV, Plotterweg 12, 3812 BB Amersfoort, The Netherlands  
Phone + 31 33 4555022  
E-mail info@pre.nl  
Home page www.pre.nl
  
  - 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details No recent versions, all apply to SimaPro 3  
No
- How many licenses of the software are sold?  
Over 600
- Name of customer reference  
a selection of license holders: IVF, IKEA, TRATEK, Kemira, Nokia, Swedish EPA, Svensk Industridesign, Kemira, Fortum (Neste), Mitsubishi, Philips, Danish Railways, NK Cables, NedCar (Volvo/Mitsubishi), General Motors, 3M, LG Electronics, Akzo Nobel, ABB, Coloplast, DNV, TNO, VITO, ELF Atochem, Procter and Gamble, Norsk Hydro, Pirelli, Swisscom, Johnson & Johnson

## Appendix 1

### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
 2800 Euro/ approx 2540 USD as of 9/8/2000, 5600 Euro for network version (2 users) plus 1200 Euro for each extra user. Educational discount available.  
 Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
 On request  
 Price range, if above is not answered (USD)
- |               |                                     |
|---------------|-------------------------------------|
| <1.000        | <input type="checkbox"/>            |
| 1.000-5.000   | <input checked="" type="checkbox"/> |
| 5.000-10.000  | <input type="checkbox"/>            |
| 10.000-20.000 | <input type="checkbox"/>            |
| >20.000       | <input type="checkbox"/>            |
- 7 Any special purchasing conditions?  
 License conditions apply and can be found in the software and on the order form
- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc) Support through a service contract which is included the first year. Afterwards 1000 Euro per year. Includes support, membership of internet user group, software and database updates. Major upgrades (4 to 4.1, 5 etc) included in the price.  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available? web site <http://www.pre.nl>, or CD-ROM/ diskettes from PRé or dealers.  
 No

### Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)
- |                        |                                     |
|------------------------|-------------------------------------|
| LCA expert             | <input checked="" type="checkbox"/> |
| Design engineer        | <input checked="" type="checkbox"/> |
| Environmental engineer | <input checked="" type="checkbox"/> |
| Other                  | <input type="checkbox"/>            |
- 11 Size of the companies for which the software is intended
- |                    |                                     |
|--------------------|-------------------------------------|
| < 250 employees    | <input checked="" type="checkbox"/> |
| 250-1000 employees | <input checked="" type="checkbox"/> |
| > 1000 employees   | <input checked="" type="checkbox"/> |
| Other              | <input type="checkbox"/>            |



## Appendix 1

- 12 Which industrial sectors are the software user companies involved with?  
Almost all .
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)
- |                    |                                     |   |
|--------------------|-------------------------------------|---|
| Function-based LCA | <input checked="" type="checkbox"/> |   |
| Screening LCA      | <input checked="" type="checkbox"/> |   |
| Accounting LCA     | <input checked="" type="checkbox"/> |   |
| Other              | <input checked="" type="checkbox"/> | cradle to gate, end of life studies and other partial LCA studies |
- 14 Does the software comply with the ISO 14040 standards?
- |     |                                     |  |
|-----|-------------------------------------|--|
| Yes | <input checked="" type="checkbox"/> |  |
| No  | <input type="checkbox"/>            |  |
- Comment           Users can work conform ISO 14040 series standards.  
SimaPro 5 terminology will comply with ISO 14040 series
- 20 Please give a brief description of the practical procedure when using the software.
- Input /output data are stored as processes in a database or in projects. Modelling of the life cycle is done in steps, as part of a project: the product (or parts of products) are modelled as assembly. The functional unit is modelled in the life cycle, end of life scenarios are modelled as disposal, reuse, disassembly scenarios. In the modelling links are made to processes. Analysis or comparisons with preselected impact assessment method can be performed anywhere in the modelling phase or on the processes. It can also be predefined in reports. Analysis or comparison results can be fully traced back to the origin of the result in various ways. A process tree with results can also be shown in any stage. Results (tables, graphs) can be copied and pasted to Word and Excel or exported.
- 21
- 16 What units can be used?
- |             |                                     |   |
|-------------|-------------------------------------|---|
| SI (Metric) | <input checked="" type="checkbox"/> |   |
| Other       | <input checked="" type="checkbox"/> | Open system in which units and quantities can be defined. Build in consistency checks on import/export. |
- 17 Which languages does the software communicate in?
- |         |                                     |                                |
|---------|-------------------------------------|--------------------------------|
| English | <input checked="" type="checkbox"/> |                                |
| German  | <input type="checkbox"/>            |                                |
| French  | <input type="checkbox"/>            |                                |
| Spanish | <input type="checkbox"/>            |                                |
| Swedish | <input type="checkbox"/>            |                                |
| Other   | <input checked="" type="checkbox"/> | Version 5 will be multilingual |

## Appendix 1

- 18 What kind of output results are produced?
- Chemical substances
- Effect categories
- Environmental “points”
- Tables
- Comparisons between different products
- Diagrams
- Other  process tree with  
selectable result types
- Possibilities to export result to other  
softwares, e.g. Excel Yes  No
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?
- Simapro uses linear calculations. Allocation is done by user defined definition (in processes). Avoided product allocation by subtraction of the avoided product. Loops can be simulated.
- 20 Does the software support total inventory with inputs and outputs?
- Yes
- No
- Comment

## Databases

- 21 Does the software include any databases?
- Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?
- PWMI/APME, BUWAL 132, BUWAL 250, BUWAL 300, ETH, IDEMAT, PRE database, Franklin US LCI database, Dutch concrete database.
- No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?
- Input/output data for material production and processing, energy generation, transport, waste treatments, waste scenarios. See demo for more details.
- 23 Is there a regular updating possibility of the software database contents?  
yes, through service contract
- 24 What other databases are compatible with the software, if any?
- IVAM database (see <http://www.ivambv.uva.nl>)

## Appendix 1

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment Data can be added in projects or to the database.
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other

### Learning

- 28 How long does it take to learn the software?  
 < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other
- 29 How is the software taught?  
 User manual   
 “Virtual” course   
 Teachered course   
 Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)

## Appendix 1

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Eco-indicator 95, Eco-indicator 99, Ecopoints 97, CML. Soon: EDIP, EPS, CML2. User defined method possible.
- 32 How transparent is the result (possibilities to track the origin of a result)?  
Fully transparent. Any results of any stage in the life cycle can simply (right mouse click) be traced back. Each result can also be displayed as a process tree (For example, show mercury to air, or characterisation of heavy metals, or Eco-indicator score of the full life cycle).
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 36 What are the hardware requirements for the software (memory, etc)?  
Depending on size of database and operating system. Windows 95/98 16 MB memory, Win NT /2000 32 MB memory or better recommended with Pentium processor. Complex calculations and large databases require more memory and a faster processor.
- 35 Which is the memory size of the software itself?  
About 5 MB.
- 36 Which operating system can be used?  
Windows 95, 98, NT , 2000
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

## Appendix 1

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes

No

39 Additional information

Note: not for publication: SimaPro 5 is expected by the end of the year. The specifications above were for SimaPro 4. You might consider testing a Betaversion, on request I can send specs for SimaPro 5.

## Appendix 1

### SIMBOX Version 2.6 (EAWAG)

#### Organisation

- 1 Name and version of the LCA software tool  
SIMBOX Version 2.6
  
- 2 Name of company/organisation who is the proprietor of the tool  
EAWAG
  
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
H.-P. Bader and R.Scheidegger, Department of Ressources and Waste Management EAWAG, 1995 in Switzerland
  
- 4 Contact for more information  
Name H.-P. Bader or R.Scheidegger  
Address Postfach 611, Ueberlandstrasse 133, CH-8600 Dübendorf  
Phone +41 1 823 5502  
E-mail bader@eawag.ch, scheideg@eawag.ch  
Home page [www.eawag.ch/services/software/d\\_simbox.html](http://www.eawag.ch/services/software/d_simbox.html)
  
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details USIS/ISIS-Report since 1997, LCA Software Guide 1997,  
No
  
- How many licenses of the software are sold?  
20+  
Name of customer reference  
on request

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)

## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

- 7 Any special purchasing conditions?
- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc) individual support, costs depending on intensity of support  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available? No

## Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)  
 LCA expert   
 Design engineer   
 Environmental engineer   
 Other  universities, government offices, companies, engineering companies,...
- 11 Size of the companies for which the software is intended  
 < 250 employees   
 250-1000 employees   
 > 1000 employees   
 Other  size of companies is no argument, since not specifically LCA-software
- 12 Which industrial sectors are the software user companies involved with?  
 various
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
 Function-based LCA   
 Screening LCA   
 Accounting LCA   
 Other  not specifically LCA-software, but simulation tool for material and energy household analysis

## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment see question 13
- 15 Please give a brief description of the practical procedure when using the software.  
 See P. Baccini and H.-P. Bader, Regionaler Stoffhaushalt, Spektrum Verlag, 1996
- 16 What units can be used?  
 SI (Metric)   
 Other  the units have to be consistent
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other  There are a lot of  
 different possibilities in presenting the results, beginning from standard graphics to  
 user-designed  
 Possibilities to export result to other softwares, e.g. Excel Yes  No
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 The calculations are based on serious and numerically accurate mathematical procedures as are used in real simulation programs. Mathematical formulas, sensitivity analyses, and other important simulation techniques are available.
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment



## Appendix 1

### Databases

- 21 Does the software include any databases?  
Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?
- 23 Is there a regular updating possibility of the software database contents?
- 24 What other databases are compatible with the software, if any?

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
Yes   
No   
Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
Yes   
No   
Comment
- 27 Which data formats or documentation tools are compatible with the software?  
SPINE   
SPOLD   
Other

## Appendix 1

### Learning

- 28 How long does it take to learn the software?
- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other  To start with SIMBOX 1 day is enough, to become an expert in using all the possibilities requires more experience
- 29 How is the software taught?
- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc) see publications, book reference above, C.Zeltner et al:”Sustainable metal management exemplified by cooper in the USA”, Regional Environmental Change 1, 31-46, 1999 and ongoing work.

### Valuation methods

- 31 Which valuation methods can be used by the software?
- 32 How transparent is the result (possibilities to track the origin of a result)?
- 33 Is it possible to use different valuation methods for the same LCA?
- Yes
- No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Pentium I PC with 32 MB Memory or higher
- 35 Which is the memory size of the software itself?  
1-2 MB

**Appendix 1**

36 Which operating system can be used?  
WINDOWS NT, WINDOWS 95,98,2000, UNIX Sun Sparc

37 How often is the software updated?

- Monthly   
Annually   
Biannually   
Other

Is it included in the support?

- Yes   
No

**Other**

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

- Yes   
No

39 Additional information

## Appendix 1

### SPINE@CPM Data Tool 3.0 (CPM)

#### Organisation

- 1 Name and version of the LCA software tool  
SPINE@CPM Data Tool 3.0

The main scope of SPINE@CPM Data Tool is environmental information management. The tool supports data acquisition, documentation, storage, communication etc. and it can generate transparent LCI and LCA-reports.

The SPINE@CPM Data Tool is independent of the mathematical handling of data, e.g. balance calculations in a LCA. In order to make any mathematical analyses, the tool supports communication with Microsoft Excel. For balance calculations in LCA, the tool also communicates with LCA calculation software (see further question 19).

- 2 Name of company/organisation who is the proprietor of the tool  
CPM, Centre for environmental assessment of Product and Material system, a competence centre at Chalmers University of Technology in Sweden

- 3 History of the tool (who developed it, when and where was it launched on the market?)  
SPINE@CPM Data Tool was published in 1999 and it is a part of the environmental information management system SPINE (Sustainable Product Information Network for the Environment).

SPINE originates from the Nordic NEP-project (Nordic project on Environmentally sound Product development) and is the result of several interdisciplinary projects involving industry and academic organisations between 1993 and 1995. The NEP-project result was based on work made at Chalmers University of Technology and Chalmers Industriteknik (CIT). Among the participants were Östfold Research Foundation, Swedish Environmental Research Institute, and over twenty large Nordic companies.

SPINE has been further developed within the CPM collaboration, in order to enable an effective and efficient handling of environmental information.

- 4 Contact for more information
 

Name	Ann-Christin Pålsson
Address	412 96 Göteborg, Sweden
Phone	+46-(0)31-772 56 46
E-mail	info@globalspine.com
Home page	www.globalspine.com

## Appendix 1

- 5 Has the tool been reviewed in an unbiased report or evaluation?  
 Yes  Please give details

SPINE@CPM Data Tool has not been reviewed in regard of total LCA performance.

However, SPINE@CPM Data Tool has been compared with the LCA data communication tool SPOLD regarding the handling of LCA data documentation and communication quality in the report "An Assessment of the SPOLD format"; Erixon M, Ågren S; CPM report 1998:5. Due to the bias of the assessment, due to the CPM experiences working with SPINE, the SPOLD-group found reasons to respond to the result from the assessment. The response has been prepared by Bo P. Weidema in Brussels, January 1999 "Response to the CPM assessment of the SPOLD format". Both the assessment report and the reponse should be regarded as a whole and they may be downloaded from the globalspine web site.

No

How many licenses of the software are sold?

The tool is free to down load from the globalspine web site and it is frequently used by several CPM companies and LCA practitioners connected to CPM. About 450 persons has down loaded the tool from the web site.

Name of customer reference

Please contact CPM for further information.

## Commercial specifications

- 6 Price of software (purchase of license) (USD)  
 SPINE@CPM Data Tool is free to down load at [www.globalspine.com](http://www.globalspine.com).  
 Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)

-

Price range, if above is not answered (USD)

- <1.000   
 1.000-5.000   
 5.000-10.000   
 10.000-20.000   
 >20.000

- 7 Any special purchasing conditions?

-

- 8 Any software support offered?

Yes  Please give details (annual fee, etc) CPM offers courses in efficient handling of environmental data, i.e. in LCA, involving the use of SPINE@CPM Data Tool. Visit our web site "Education" for further information.

No

## Appendix 1

9 Is there a demonstration version of the software?

Yes  Where is it available?

SPINE@CPM Data Tool original software is free to download at  
www.globalspine.com.

No

### Features

10 Intended use of software

Type of user (LCA practitioner classification)

LCA expert

Design engineer

Environmental engineer

Other

11 Size of the companies for which the software is intended

< 250 employees

250-1000 employees

> 1000 employees

Other  Any size.

12 Which industrial sectors are the software user companies involved with?

Transport, Energy, Chemical and Metal processing, Technology, Construction, Forestry etc.

13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)

Function-based LCA

Screening LCA

Accounting LCA

Other

14 Does the software comply with the ISO 14040 standards?

Yes

No

Comment SPINE@CPM Data Tool is a base for the upcoming standard for life cycle assessment data documentation format, ISO 14048. In addition, the SPINE LCI data format supports the data quality requirements in ISO 14041 regarding the goal and scope definition and the inventory analysis.

## Appendix 1

- 15 Please give a brief description of the practical procedure when using the software.
- A LCI is performed by using SPINE formatted data sets. These can be bought from commercial SPINE-databases e.g. at CPM, communicated with other SPINE-based software or databases, or self-made i.e. documented/re-formatted manually into SPINE-format.
- The relevant activities (data sets) are added in to the flow chart of the aggregated activity (LCA study) and the information regarding system boundaries, allocation procedures, and other methodological choices for the aggregated system is documented next to the flow chart.
- The calculations can be made by exporting the numerical values in the inventory tables to Excel or a compatible calculation software (see question 19). When the balance calculation (and impact assessment) has been performed, the result table can be imported into the aggregated activity in SPINE@CPM Data Tool. The calculation and documentation may also, of course, be made manually.
- Now all the documentation regarding the LCI/LCA is collected, including a flow chart and result table. The result can be communicated by html or paper reports, which can be generated automatically. In addition, all the documentation can be reused.
- 16 What units can be used?
- SI (Metric)
- Other
- 17 Which languages does the software communicate in?
- English
- German
- French
- Spanish
- Swedish
- Other  The tool uses english in the help file etc., but any language can be used to document data in the open text fields.
- 18 What kind of output results are produced?
- Chemical substances
- Effect categories
- Environmental "points"
- Tables
- Comparisons between different products
- Diagrams
- Other  It depends on the data
- input practitioner what the tables present.
- Possibilities to export result to other softwares, e g Excel Yes  No

## Appendix 1

- 16 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
The SPINE@CPM Data Tool is independent of the mathematical handling of data, e.g. balance calculations in a LCA. In order to make any mathematical analyses, the tool supports communication with Microsoft Excel. For balance calculations in LCA, the tool also communicates with the LCA calculation software EcoLab (Nordic Port), LCAiT 4.0 (CIT), and EPS Design System 4.0 (Assess), i.e. they are all compatible with SPINE@CPM Data Tool. CPM regard this free choice of suitable mathematical analyse as an important part of a flexible information management system.
- 20 Does the software support total inventory with inputs and outputs?  
Yes   
No   
Comment

## Databases

- 21 Does the software include any databases?  
Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
-
- 23 Is there a regular updating possibility of the software database contents?  
-
- 24 What other databases are compatible with the software, if any?  
SPINE@CPM Data Tool communicates with SPINE databases, which are based on Microsoft Access and the SPINE LCI data format. SPINE databases may be built up by anyone, using SPINE@CPM Data Tool.
- LCI data may also be bought from the reviewed SPINE@CPM Database containing LCI data. In the SPINE@CPM Database you can find detailed information on all types of goods transportation, electricity, heat, and fuel production, raw material production for e.g. polymers, metals, chemicals, building materials as well as some manufacturing processes such as metal processing, electronic components and waste management alternatives. In addition, more data sets on polymers, chemicals etceteras will be published shortly.
- The SPINE@by-pass 1.0 containing 270 data sets is also available to buy from CPM and retailers in short. This database is not reviewed in regard of the CPM data quality requirements and is therefore recommended to be used e.g. for laboratory LCI and LCA work.



## Appendix 1

Further, SPINE@CPM Data Tool can exchange databases with the LCA calculation software EcoLab (Nordic Port), LCAiT 4.0 (CIT), and EPS Design System 4.0 (Assess).

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other

### Learning

- 28 How long does it take to learn the software?  
 < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other  The learning time depends on the previous knowledge and training in LCA.
- 29 How is the software taught?  
 User manual   
 “Virtual” course   
 Teachered course   
 Other  There is a help-file in the software and on the global spine web site. CPM also arranges standard courses and education adjusted to a specific organisation or situation.

## Appendix 1

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
An example of an aggregated activity, put together from SPINE-formatted data sets are Silviculture. The purpose of the study is to supply with LCA-data for forestry, to be used in further studies of wood products.

The system describes the cultivation cycle for softwood delivered at road side in Sweden. The following subsystems are included: tree plant nursing, soil preparation, planting softwood plants, clearing of young forest, fertilising in silviculture, thinning of forest area, final felling and forwarding of harvested wood. See the flowchart to see how they are linked. See also the documentation of each of these included subsystems for a further description.'

Go to [www.globalspine.com](http://www.globalspine.com), click on Data Store and further Public Data Store in order to register and view the details regarding this study in SPINE@CPM Database. It is free of charge to search the database.

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Any valuation method can be used.
- 32 How transparent is the result (possibilities to track the origin of a result)?  
SPINE@CPM Data Tool facilitates a transparent documentation of LCI or LCA data, according to the ISO 14041 standard, e.g. as the data format is comprehensive and structured.
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Hard disk 20 MB Free, RAM 32 MB (works also on 16 MB).
- 35 Which is the memory size of the software itself?  
Hard disk requirement 10 MB, depends also on database size.
- 36 Which operating system can be used?  
Windows 95, 98, NT 4.0 (likely also Windows 2000).

**Appendix 1**

- 37 How often is the software updated?
- Monthly
- Annually
- Biannually
- Other  Next update will be made after the ISO 14048 standard on a LCA data documentation format is set.

Is it included in the support?

- Yes
- No

**Other**

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?
- Yes
- No

- 39 Additional information

## Appendix 1

### Team™ 3.0 (ECOBILAN SA, Member of PriceWaterhouseCoopers)

#### Organisation

- 1 Name and version of the LCA software tool  
TEAM™ 3.0
- 2 Name of company/organisation who is the proprietor of the tool  
ECOBILAN SA, Member of PriceWaterhouseCoopers
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
First version (1.0) launched in 1994, followed by TEAM 1.15 in 1995  
Major improvement in 1996 with the launch of TEAM 2.0 in 1996. In 1996, an independent review of Life Cycle Assessment software commissioned by Environment Canada, which examined 37 LCA software tools world wide concluded that "TEAM™ "was the most powerful and flexible of the tools evaluated in this in-depth study".  
New functionality was added to TEAM 2.5 in 1998. Last version is TEAM 3.0 launched in september 1999 with a new design user-friendly interface.
- 4 Contact for more information  
Name           Jean Michel Hebert  
Address       Tour AIG, 34 Place des Corolles, 92908 Paris-La Défense Cédex  
Phone         +33 1 56 57 11 00  
E-mail         jean-michel.hebert@fr.pwcglobal.com  
Home page     www.ecobilan.com
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes    Please give details   1996 : review of Life Cycle Assessment software commissioned by Environment Canada published on Environment 1998 . the French electricity provider, Electricité de France (EDF), has carried out an extensive research project on LCA software tools available on the market. Based on this analysis EDF has decided to use the LCA software TEAM™ (Ecobilan Group). In an in-depth analysis main features of TEAM™ were discussed and the results from the review were published on Proceeding of Euro Environment Conference in Aalborg.

No   

How many licenses of the software are sold?

More than 200

Name of customer reference

ADEME, ALCATEL, ASTOM, ANPA, ANDRA, BMW, ECO-EMBALLAGES, EDF, EUROFER, CESI, FORD, GENERAL MOTORS, HP, IBM, IISI, KODACK, MATSUSHITA, NKK, NISSAN, NIPPON STEEL, NORTEL NETWORKS,

## Appendix 1

OPEL, RHONE POULENC, ROVER GROUP, SCANIA, SCHNEIDER, USINOR,  
UNILEVER, VOLKSWAGEN, XEROX

### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
\$ 3000 for the first licence, \$ 2000 for universities  
Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
\$ 1000 for each additional licence  
Price range, if above is not answered (USD)
- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000
- 7 Any special purchasing conditions?  
Discount when more than 5 licences purchased
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) 24 hours of assistance per year at the price of \$ 1300, \$ 2300 including upcoming upgrades during the period of validity.  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? Upon request at info@ecobilan.com of downloadable from the ECOBILAN web site (www.ecobilan.com) TEAM™ 3.0 software is available in a discovery version. This version allows the user to model a system using until 15 flows and with a database not superior to 5 megas. It contains a restricted database of the most current modules and restricted impact assessments.  
No

### Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)
- LCA expert
- Design engineer
- Environmental engineer
- Other  used sometimes as an expert tool for  
DESIGN team

## Appendix 1

- 11 Size of the companies for which the software is intended  
 < 250 employees   
 250-1000 employees   
 > 1000 employees   
 Other  Indifferent
- 12 Which industrial sectors are the software user companies involved with?  
 ALL, especially Energy, raw materials, agriculture, electronic, building materials,  
 food and drugs, textile, wood and paper, car manufacturing,
- 13 The software is designed mainly for the following type of LCA work (for  
 more details, see enclosure)  
 Function-based LCA   
 Screening LCA   
 Accounting LCA   
 Other  uncertainty analysis
- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment
- 15 Please give a brief description of the practical procedure when using the  
 software.  
 User's manuals and pedagogical case studies excrcises are delivered with the  
 software. An on line help as well as a full documentation describing the LCA  
 therminology and methodology are included in the software.
- 16 What units can be used?  
 SI (Metric)   
 Other
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other  Japanese interface available fore TEAM 2.0

## Appendix 1

- 18 What kind of output results are produced?
- |   |                                     |                                     |    |                          |
|---|-------------------------------------|-------------------------------------|----|--------------------------|
| Chemical substances   | <input checked="" type="checkbox"/> |                                     |    |                          |
| Effect categories   | <input checked="" type="checkbox"/> |                                     |    |                          |
| Environmental “points”  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Tables  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Comparisons between different products                        | <input checked="" type="checkbox"/> |                                     |    |                          |
| Diagrams  | <input checked="" type="checkbox"/> |                                     |    |                          |
| Other   | <input type="checkbox"/>            |                                     |    |                          |
| Possibilities to export result to other softwares, e.g. Excel | Yes                                 | <input checked="" type="checkbox"/> | No | <input type="checkbox"/> |
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?
- In order to attribute a value to a flow, one can enter: : a numerical value (N<sub>2</sub>O = 92 g /1,000 kg of coal burned); or a formula that can use « Variables » (e.g., Ashes = 100 x «% of ash in coal»). A large range of built-in mathematical formulas is available (trigonometry, logarithms, exponential, etc.). This use of formulas and variables allows one to build a dynamic database, and to later identify key parameters with the help of sensitivity analyses.
- Variables can be defined for each module, and are used in the calculation of the value of flows and allocation rules (for sensitivity analyses on methodological choices).
- 20 Does the software support total inventory with inputs and outputs?
- Yes
- No
- Comment Inventory tables can be detailed for all steps (upstream stages, production, transport, use, end of life, etc)

## Databases

- 21 Does the software include any databases?
- Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?
- TEAM includes a database called DEAM Starter kit including data set extracted Buwal 250 and 232, APME, ETH Zürich and Ecobilan databases (DEAM)
- No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?
- Major kind of database: Pulp and paper, plastics and chemicals, glass, steel, non ferrous metals, energy, transport, end of life.
- 23 Is there a regular updating possibility of the software database contents?
- New versions of TEAM contain automatically updated database. The internal DEAM database is constantly maintained and improved and updates can be ordered.

## Appendix 1

- 24 What other databases are compatible with the software, if any?  
Database in SPOLD format are compatible.

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
Yes   
No   
Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
Yes   
No   
Comment information about data is stored in independent modules attached to the data set representing unit operations (processes, transportation, etc.), source of the data, quality, ect.
- 27 Which data formats or documentation tools are compatible with the software?  
SPINE   
SPOLD   
Other

### Learning

- 28 How long does it take to learn the software?  
< 2 hours   
< 1 day   
< 1 week   
< 1 month   
Other
- 29 How is the software taught?  
User manual   
“Virtual” course   
Teachered course   
Other



## Appendix 1

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
A group of six agricultural research stations in Switzerland calculated LCAs for fields, crop rotations, grassland systems and farms. Their goal was to compare different production systems at farm and product level and to show the potentials of ecological improvement for the agricultural production

They argued to have chosen TEAM for their work because they estimated that:

- TEAM offers well developed import/export facilities
- TEAM supports the use of variables and formulas
- TEAM offers possibilities to run Monte-Carlo simulations to assess uncertainty
- TEAM includes the most important Swiss data sets
- TEAM supports the management of our large production data sets in control panels.

According to them the disadvantages were:

- TEAM is available only in English

(We emphasize here that this is not an overall assessment of the quality of the software.)

### Valuation methods

- 31 Which valuation methods can be used by the software?

- CML-Air Acidification
- CML-Human Toxicity
- CML-Ecotoxicity (terrestrial and aquatic)
- CML-Eutrophication (2 methods)
- CML-Depletion of non renewable resources
- CML-Depletion of the ozone layer (high and low)
- CST-Human Toxicity
- CST-Ecotoxicity (terrestrial and aquatic)
- CVCH-Air
- CVCH-Water
- EC(R)-Depletion of non renewable resources
- EC(R\*Y)-Depletion of non renewable resources

## Appendix 1

- EC(Y)-Depletion of non renewable resources
- EPA-Maximum Incremental Reactivity
- IPCC-Greenhouse Effect
- USES-Human Toxicity
- USES-Ecotoxicity (terrestrial and aquatic)
- EPS-Air
- EPS-Air Acidification
- EPS-Water
- EPS-Land Use
- EPS-Metal Resources
- EPS-Non Renewable Energy
- EPS-Total
- WMO-Photochemical Oxidant Formation (high and low)

32 How transparent is the result (possibilities to track the origin of a result)?  
 YES. It is always possible to track the original flow of the impactand to understand from this flow which step of the system is responsible of the impact.

33 Is it possible to use different valuation methods for the same LCA?  
 Yes   
 No

### Technical specifications

34 What are the hardware requirements for the software (memory, etc)?  
 TEAM™ has to be installed on an IBM-compatible PC, with the following minimum characteristics:

- Pentium processor;
- 32 MB RAM for Windows 95 and 64 MB RAM for Windows NT (depending on the size of the project); and
- 50 MB free on the hard disk.

The following software should be present:

## Appendix 1

35 Which is the memory size of the software itself?  
30 MB

36 Which operating system can be used?  
Windows 95, Windows NT

37 How often is the software updated?

Monthly

Annually

Biannually

Other

Is it included in the support?

Yes

No

## Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes

No

39 Additional information

The demo version TEAM discovery is restricted in terms of modules and impact assessment methods. It presents exactly the same functionalities as the standard version. However only 97 modules are included in the discovery DEAM starter kit instead of more than 300 in the standard licence and only 5 impact assessment and valuation methods are included instead of 38 in the standard licence. Furthermore TEAM discovery can only be used with a database not exceeding 5 Megas.

## Appendix 1

### Umberto 3.5 (IFU Institut für Umweltinformatik, Hamburg GmbH)

#### Organisation

- 1 Name and version of the LCA software tool  
Umberto 3.5
  
- 2 Name of company/organisation who is the proprietor of the tool  
ifu Institut für Umweltinformatik Hamburg GmbH (hereafter IFU)  
ifeu-Institut für Energie- und Umweltforschung Heidelberg GmbH (hereafter IFEU)
  
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
First presented at CEBIT Hannover in 1994 by IFU/IFEU
  
- 4 Contact for more information  
Name Martina Prox  
Address Im Winkel 3  
Phone ++49 (0)40 48 000 90  
E-mail m.prox@ifu.com or info@ifu.com  
Home page www.umberto.de
  
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
Yes  Please give details There had been various valuation of german, swiss and austrian organizations, but none of the current version, so details won't be helpful.  
No

How many licenses of the software are sold?

Over 350 Licenses

Name of customer reference

Bosch-Siemens Hausgeräte, Giengen

DaimlerChrysler, Stuttgart

Fraunhofer Institutes (several)

M+W Zander, Stuttgart

Öko-Institut Freiburg

Otto Versand, Hamburg

Volkswagen AG, Wolfsburg

Several universities (for further references see

<http://www.umberto.de/english/referenzen/index.htm>)

## Appendix 1

### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
 Depending on the functionality (see attached price list in € - salesconditions European Community) [www.umberto.de](http://www.umberto.de) provides information on the available versions as well.  
 Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
 dito  
 Price range, if above is not answered (USD)
- |               |                                     |
|---------------|-------------------------------------|
| <1.000        | <input type="checkbox"/>            |
| 1.000-5.000   | <input checked="" type="checkbox"/> |
| 5.000-10.000  | <input checked="" type="checkbox"/> |
| 10.000-20.000 | <input checked="" type="checkbox"/> |
| >20.000       | <input type="checkbox"/>            |
- 7 Any special purchasing conditions?
- 8 Any software support offered?  
 Yes  Please give details (annual fee, etc) 10-15% p.a. per licence of the listprice of the purchased licence  
 No
- 9 Is there a demonstration version of the software?  
 Yes  Where is it available?  
<http://www.umberto.de/english/download/index.htm>  
 but there's also a test version available (not free) from  
<http://www.umberto.de/english/kontakt/testversion/index.htm>  
 No

### Features

- 10 Intended use of software  
 Type of user (LCA practitioner classification)
- |                        |                                     |   |
|------------------------|-------------------------------------|---|
| LCA expert             | <input checked="" type="checkbox"/> |   |
| Design engineer        | <input checked="" type="checkbox"/> |   |
| Environmental engineer | <input checked="" type="checkbox"/> |   |
| Other                  | <input checked="" type="checkbox"/> | Controlling and cost accounting expert,<br>process engineer |
- 11 Size of the companies for which the software is intended
- |                    |                                     |  |
|--------------------|-------------------------------------|--|
| < 250 employees    | <input type="checkbox"/>            |  |
| 250-1000 employees | <input checked="" type="checkbox"/> |  |
| > 1000 employees   | <input checked="" type="checkbox"/> |  |
| Other              | <input checked="" type="checkbox"/> | companies from 10 to 250 employees<br>may use branch solutions of Umberto, provided e.g. by their industrial<br>associations. See Example IMPROVE<br><a href="http://www.umberto.de/english/referenzen/forschung/dfiu.htm">http://www.umberto.de/english/referenzen/forschung/dfiu.htm</a> |

## Appendix 1

- 12 Which industrial sectors are the software user companies involved with?  
Not restricted to any industrial sector as the tool is very flexible, it's used in various sectors, chemical processes, manufacturing, industrial site planning, facility management, trade, waste, recycling....
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)
- |                    |                                     |
|--------------------|-------------------------------------|
| Function-based LCA | <input checked="" type="checkbox"/> |
| Screening LCA      | <input type="checkbox"/>            |
| Accounting LCA     | <input checked="" type="checkbox"/> |
| Other              | <input checked="" type="checkbox"/> |
- environmental bussiness assessment in general, process planning and optimization, economical and ecological improvement of processes, products, sites
- 14 Does the software comply with the ISO 14040 standards?
- |     |                                     |
|-----|-------------------------------------|
| Yes | <input checked="" type="checkbox"/> |
| No  | <input type="checkbox"/>            |
- Comment for the next version, reviewed LCA Data will be available in the process library
- 15 Please give a brief description of the practical procedure when using the software.  
Please refer to our website:  
<http://www.umberto.de/english/praxis/basics/struktur/index.htm>
- 16 What units can be used?
- |             |                                     |
|-------------|-------------------------------------|
| SI (Metric) | <input checked="" type="checkbox"/> |
| Other       | <input checked="" type="checkbox"/> |
- additional basic units and display units can be defined by the user
- 17 Which languages does the software communicate in?
- |         |                                     |
|---------|-------------------------------------|
| English | <input checked="" type="checkbox"/> |
| German  | <input checked="" type="checkbox"/> |
| French  | <input type="checkbox"/>            |
| Spanish | <input type="checkbox"/>            |
| Swedish | <input type="checkbox"/>            |
| Other   | <input checked="" type="checkbox"/> |
- the surface is english, documantation and online help is available in English and German, Multilingual material administration and library is available, so additional languages can be freely inserted by the user.
- 18 What kind of output results are produced?
- |                        |                                     |
|------------------------|-------------------------------------|
| Chemical substances    | <input checked="" type="checkbox"/> |
| Effect categories      | <input checked="" type="checkbox"/> |
| Environmental "points" | <input checked="" type="checkbox"/> |
| Tables                 | <input checked="" type="checkbox"/> |

## Appendix 1

Comparisons between different products   
 Diagrams   
 Other  SANKEY Diagrams  
 Possibilities to export result to other softwares, e.g. Excel Yes  No

- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 Very flexible, mathematical formulas can be used to support parameter variations, scenario technique is supported, data qualities can be used.  
 Recycling loops can be modelled, allocation rules can be freely adapted. Umberto also allows to model multi-product systems and calculate the LCI than for each single product.  
 To specify processes also scripting languages (Python, Javascript, VBscript and soon Perl) are supported.
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
 Partly Buwal, partly ETH Zürich, partly others, sources are documented in detail on the Umberto-CD. Further information on the library can be obtained under:  
<http://www.umberto.de/english/praxis/bibliothek/index.htm>  
 No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 Material hierarchies, organized as material groups with technical, economical and ecological material properties. Process-Data, e.g. transportation processes, with parameters for several truck types, distances etc. Please refer to the attached module list of Umberto as well
- 23 Is there a regular updating possibility of the software database contents?  
 Databases are updated with new Umberto-Versions, sometimes new or updated modules can be downloaded from the Umberto User Forum (webbased).
- 24 What other databases are compatible with the software, if any?  
 Databases providing sql or com/dcom technology for data exchange can be used, customizing is necessary therefore.

## Appendix 1

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other  Which will be compatible in the future depends on the ISO 14004off standards

### Learning

- 28 How long does it take to learn the software?  
 < 2 hours   
 < 1 day   
 < 1 week   
 < 1 month   
 Other  For beginners Umberto trainings normally lasts two days.
- 29 How is the software taught?  
 User manual   
 “Virtual” course   
 Teachered course   
 Other  virtual course not yet in english version available

### User reflections on the software

- 30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
 Case study is not available in ENGLISH yet except IMPROVE 1.0. See link above.  
 Another link could be helpful for this purpose as well:  
<http://www.umberto.de/english/referenzen/industrie/petcycle/index.htm>



## Appendix 1

### Valuation methods

- 31 Which valuation methods can be used by the software?  
Ecoindicators, swiss Eco-Points, Method of the GERMAN EPA, individual methods can be designed
- 32 How transparent is the result (possibilities to track the origin of a result)?  
Methods are documented and provide full transparency on how the results are calculated.
- 33 Is it possible to use different valuation methods for the same LCA?  
Yes   
No

### Technical specifications

- 34 What are the hardware requirements for the software (memory, etc)?  
Pentium Processor, 64 MB, 150 MB free hard disk space, mouse, VGA
- 35 Which is the memory size of the software itself?  
Depending on the library beeing installed, 150 MB to 400 MB
- 36 Which operating system can be used?  
Windows 95, 98, 2000, NT
- 37 How often is the software updated?  
Monthly   
Annually   
Biannually   
Other  twice to three times a year
- Is it included in the support?  
Yes   
No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

- 38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?  
Yes   
No
- 39 Additional information  
A 30-days evaluation copy is available for \$ 275 or € 281,21 excl. shipping and VAT .  
We offer in your case to extend the testing period to a maximum of 3 months.

## Appendix 1

### WISARD version 3.7 (ECOBILAN)

#### Organisation

- 1 Name and version of the LCA software tool  
WISARD version 3.7
  
- 2 Name of company/organisation who is the proprietor of the tool  
ECOBILAN
  
- 3 History of the tool (who developed it, when and where was it launched on the market?)  
First versions were issued in 1994 for private French customers. It was issued on the British market in December 1999.
  
- 4 Contact for more information
 

Name	Olivier Muller
Address	Ecobilan - Tour AIG 34, place des Corolles 92908 Paris la Défense Cedex - France
Phone	(+33) 1 56 57 14 74
E-mail	olivier.muller@fr.pwcglobal.com
Home page	www.ecobilan.com
  
- 5 Has the tool been reviewed in an unbiased report or evaluation?  
 Yes  Please give details Peer reviews in France+England (1999)  
 No 
  
 How many licenses of the software are sold?  
 More than 80  
 Name of customer reference  
 Mr Terry Coleman (Environment Agency of England and Wales)

#### Commercial specifications

- 6 Price of software (purchase of license) (USD)  
 1,500 USD per one-year licence for local authorities and waste operators in England per licence, including a two-day training, 3,000 USD per one-year licence for consultants in France (excluding training sessions), free for university lectures (teaching purposes only)  
 Differentiated prices, for example if many licenses are sold to a single company the percentage reduction per license (USD)  
 Yes, to be agreed

## Appendix 1

Price range, if above is not answered (USD)

- <1.000
- 1.000-5.000
- 5.000-10.000
- 10.000-20.000
- >20.000

- 7 Any special purchasing conditions?  
A two-day training is compulsory in England and Wales and prior to using the tool
- 8 Any software support offered?  
Yes  Please give details (annual fee, etc) included in the price in England and Wales  
No
- 9 Is there a demonstration version of the software?  
Yes  Where is it available? on CD - send e-mail to Olivier Muller  
No

## Features

- 10 Intended use of software  
Type of user (LCA practitioner classification)  
LCA expert   
Design engineer   
Environmental engineer   
Other  Technical staff from local authorities,  
waste managers
- 11 Size of the companies for which the software is intended  
< 250 employees   
250-1000 employees   
> 1000 employees   
Other  any size
- 12 Which industrial sectors are the software user companies involved with?  
Waste management, Governments, Environment Agencies, NGOs
- 13 The software is designed mainly for the following type of LCA work (for more details, see enclosure)  
Function-based LCA   
Screening LCA   
Accounting LCA   
Other

## Appendix 1

- 14 Does the software comply with the ISO 14040 standards?  
 Yes   
 No   
 Comment This was investigated during the peer-reviews
- 15 Please give a brief description of the practical procedure when using the software.  
 Data collection using the electronic questionnaires provided+system description (graphical user interface)+data calculation with TEAM+result interpretation (either guided with pre-defined presentation formats or defined by the user)
- 16 What units can be used?  
 SI (Metric)   
 Other
- 17 Which languages does the software communicate in?  
 English   
 German   
 French   
 Spanish   
 Swedish   
 Other
- 18 What kind of output results are produced?  
 Chemical substances   
 Effect categories   
 Environmental "points"   
 Tables   
 Comparisons between different products   
 Diagrams   
 Other   
 Possibilities to export result to other softwares, e.g. Excel Yes  No
- 19 Please give special information on how calculations are made, i.e. analytical equations, loops, allocations. What are the possibilities to use mathematical formulas, sensitivity assessments, etc?  
 allocations are defined and explained+sensitivity analyses are available+Monte Carlo calculations
- 20 Does the software support total inventory with inputs and outputs?  
 Yes   
 No   
 Comment

## Appendix 1

### Databases

- 21 Does the software include any databases?  
 Yes  Which ones (referring to external source such as PWMI, Buwal, etc)?  
 PWMI+Buwal+specific ones for waste management  
 No
- 22 What kind of data do the databases contain (group of materials, products, processes, etc)?  
 processes (waste management)+ancillary materials/processes (e.g. lime production, diesel production)
- 23 Is there a regular updating possibility of the software database contents?  
 Yes the database can and is updated at least once a year
- 24 What other databases are compatible with the software, if any?  
 TEAM

### Documentation

- 25 Does the software include documentation of the LCA, “metadata”, e.g. description of the conditions and choices?  
 Yes   
 No   
 Comment This feature has been emphasized to provide the user with transparent data sources and methodological choices as a result of the peer reviews
- 26 Can new data be added by the practitioner and can the origin of the new data be documented?  
 Yes   
 No   
 Comment This feature has been emphasized as a result of the peer reviews
- 27 Which data formats or documentation tools are compatible with the software?  
 SPINE   
 SPOLD   
 Other  The document is very similar to the SPOLD format

## Appendix 1

### Learning

28 How long does it take to learn the software?

- < 2 hours
- < 1 day
- < 1 week
- < 1 month
- Other

29 How is the software taught?

- User manual
- “Virtual” course
- Teachered course
- Other

### User reflections on the software

30 Describe a case study in which this software was used. (experience with advantages and disadvantages regarding complexity, time consumption, etc)  
15 case studies have been performed in 1999 in England with local authorities using the tool. The whole projects (from learning the software to presenting the results) lasted no more than 4 months

### Valuation methods

31 Which valuation methods can be used by the software?

Critical Volumes (Buwal 132), Eco-indicator 95 and 99 (Pré), Environmental Priority Strategies (Swedish Environmental Research Institute (IVL))

32 How transparent is the result (possibilities to track the origin of a result)?

Results are presented for each sub-system defined by the user (incineration, landfill, etc.) and for each sub-system it is possible to differentiate between site emissions, supply of utilities, construction and demolition.

33 Is it possible to use different valuation methods for the same LCA?

- Yes
- No

### Technical specifications

34 What are the hardware requirements for the software (memory, etc)?

Pentium processor - 32Mb RAM - 100Mb HDD + IBM-PC compatible

## Appendix 1

35 Which is the memory size of the software itself?  
90 Mb

36 Which operating system can be used?  
Windows 95, 98 - NT (preferred)

37 How often is the software updated?  
 Monthly   
 Annually   
 Biannually   
 Other

Is it included in the support?

Yes   
 No

### Other

The next step after this survey of LCA software tools is to do an in depth evaluation of some of the softwares. We would also like to do some practical testing to get a better picture of the software tools.

38 Would it be possible for you to cooperate in the in depth evaluation for example by lending us your software for some time?

Yes   
 No

39 Additional information  
 specific versions of the tool have been developed in , England and Wales, Scotland, New-Zealand. Some data collection have been organised in Spain and Italy. We do have colleagues in Sweden (Mr Martin Gavelius, PricewaterhouseCoopers Öhrlings in Stockholm, martin.gavelius@se.pwcglobal.com) which could be your direct point of contact.

## Appendix 2

### Different types of LCA

The life cycle assessments performed today can look very different, e.g. depending on the purpose of the study and the commissioner's cost and quality demands. In this survey three different types of life cycle assessments are distinguished, in order to point out certain important requirements on the LCA software, namely the *quality review capacity* and the *calculation capacity*.

Accordingly, an "accounting LCA" complies with the quality requirements in the ISO standard 14025 regarding Environmental Product Declaration (EPD), that is, it may be the base for eco-labelling involving a third part review. The "function-oriented LCA" requires extensive mathematical capacity as it involves comprehensive system modelling. Finally, the other types of LCA, which may not be subordinated the two earlier mentioned categories, are gathered under "screening LCA". Thus, this category may include many different kinds of LCA. Below, these types of life cycle assessments are described further.

#### Accounting LCA

There is an identified group of life cycle assessments, based on the same methodology, referred to as accounting life cycle assessments. They are thorough and transparent assessments that make a good survey of environmental performance, based on all activities in the whole life cycle. This type of LCA can be used for e.g. market claims, such as LCA-based eco-labelling and environmental product declarations for comparison. This type of LCA should stand up to a third part review according to the standard requirements e.g. in ISO 14025 regarding EPD, ISO 14041 regarding goal and scope definition and inventory analysis in LCA, and the up-coming ISO 14048 regarding a data documentation format for life cycle inventory (LCI) data.



## Appendix 2

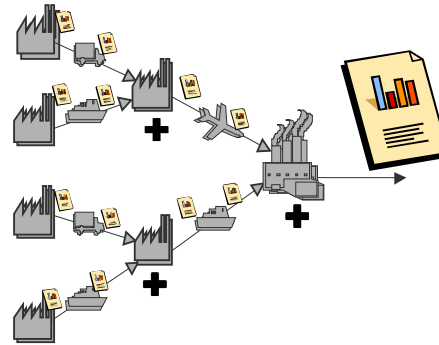


Figure 1 A schematic picture of an accounting LCA, where all parts of the system add up to a life cycle product chain.

## Function-oriented LCA

Function-oriented life cycle assessments are made to study the function of the system. It involves comprehensive system modelling and is often performed as a comparison study, to investigate the effects of change in a process or a process line. This type of LCA requires comprehensive mathematical capacity.

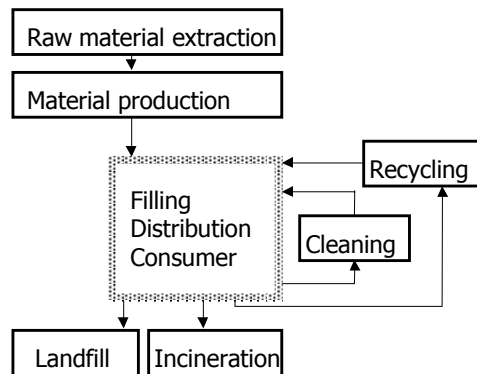


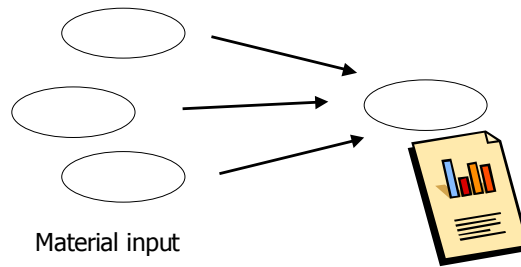
Figure 2 A schematic picture showing four function LCAs modelling the effects of change depending on the handling of packaging waste; landfill, incineration, cleaning and recycling.

## Screening LCA, includes estimating and qualitative LCA

These types of life cycle assessments may look very different, but one thing they have in common is that they, in rough outlines, calculate the environmental life cycle impact. These life cycle assessments should not claim to be transparently documented or complete, but to present a survey of the system. These types of life cycle assessments are often made in product development, in order to involve the environmental design of the product, or simply to learn and explore the

## Appendix 2

environmental systems analysis tool LCA. This type of LCA may also be used as a follow-up or a development of a previous accounting or function-oriented LCA. However, these types of assessments do *not* meet the requirements for environmental product declarations (EPD) and are *not* recommended using as a base for market claims.



*Figure 3 A schematic picture of a screening LCA, using rough estimations regarding suppliers and transportation in the supply chain.*



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