Supporting tools for implementing LCM in SMEs.- The LiMaS Project

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Abstract. Finding practical solutions to integrate environmental protection and LCM in business activities is a challenge, especially for SMEs. The main objective of the LiMaS project (www.limas-eup.eu) is to support SMEs (which manufacture energy-using products and Electrical & Electronic Equipment) in the day-to-day management of the following environmental topics: Environmental legislative compliance (i.e. REACh, RoHS, WEEE and Eco-Design Directive); Environmental Communication (e.g. Eco-labelling alternatives); Environmental Management System (i.e. identification of relevant environmental aspects associated to the organisation); Monitoring of hazardous substances used in products/processes and Environmental Assessment of products during its complete life cycle (simplified LCA). This paper will present the up-to-date results of the LiMaS project funded by EACI inside the CIP-EIP-Eco-Innovation 2008.

1 Introduction

The main objective of the LiMaS Project, standing for "Life Cycle Innovation & Management for SMEs (EuP & EEE))", is to supply to SMEs a practical Methodology and a web application that help them to integrate life cycle thinking and eco-innovation in their business. Additionally, to facilitate this integration, a web-based commercial software tool will be developed to include this methodology. The target group is SMEs that manufacture Energy-using Products and/or Electrical & Electronic Equipment and components. This project is funded

by EACI (Executive Agency for Competitiveness and innovation) the CIP-EIP-Eco-Innovation 2008 call.

The innovative aspect of this project is that users (focused on SMEs) will be able to manage different environmental topics (e.g. Life Cycle Assessment, Eco-design, legislative requirements, Environmental Product Declarations (EPD), quantification of most significant environmental aspects associated to the organisation - EMS-, etc.) using a common approach (i.e. gathering and input the needed data only once) and without being an environmental expert.

The Work Package workflow of the project and the involved partners are shown in Figure 1.

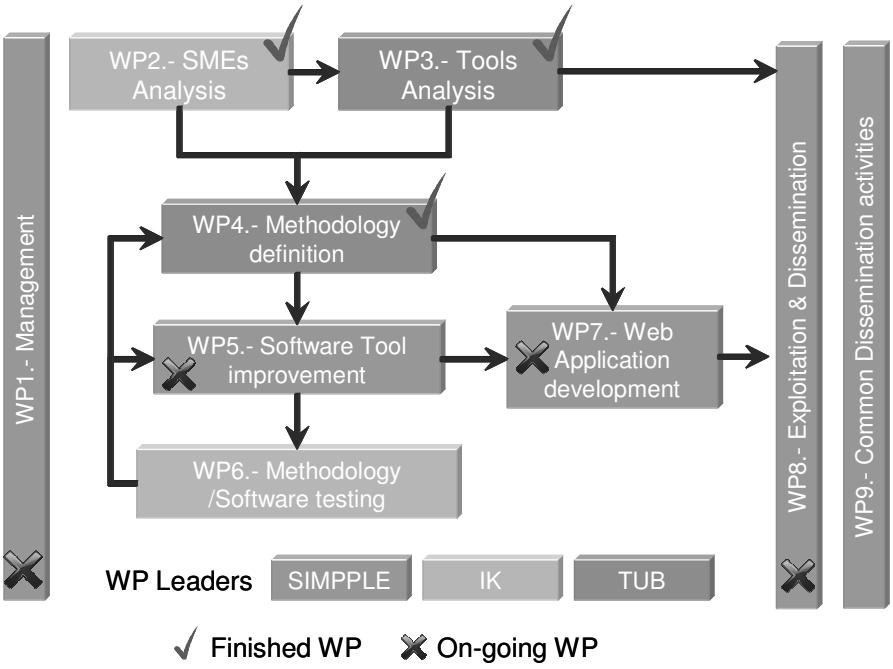

Figure 1.- LiMaS Project workflow and partners involved in the project

In the WP2 a survey to analyse the situation of SMEs was carried out during September 2009 to May 2010. In total, 557 companies were directly contacted by phone, e-mail and/or on-site visits, 20 Industrial associations were asked to support the survey and many other companies were indirectly contacted (via announcements, etc.). The survey showed how manufacturers are handling eco-innovation and what they are looking for in a software tool for managing it (e.g. benchmarks with competitors' products, environmental legislation update, Best-Available-Techniques, legislative requirements compliance monitoring, LCA, etc.). The software should provide clear exportable results, be easy to use, include

specific databases for each sector and allow common data entry to cover all the relevant aspects. Obviously, the price of the tool should be affordable.
In WP3, the already available tools in the market, which cover LCA, Eco-design and Legislative requirements, were identified and the most promising ones were analysed in detail. More than 80 tools were identified and described in a summary table, with information about main characteristics, links for additional information, etc. Detailed technical analysis were done of the 5 selected tools (Greenfly, Solidworks Sustainability, Ecodesign X, C2P Enterprise & Aras Innovator)
All this information was used as backup of the proposed methodology and software tool. The public reports of WP2 and 3 can be downloaded from the project website.

2 Proposed Methodology

The proposed methodology tries to solve the main problems that SMEs could find when they try to implement LCM or eco-innovation in their business. They can be summarised as a lack of:

- resources to dedicate to this implementation
- environmental specialists and simplified tools to develop LCA studies and extract useful conclusions from them
- information about the possible implications of latest legislative requirements
- knowledge about how to communicate the environmental improvements achieved with eco-innovation activities (e.g. environmental product declarations, etc.)
- knowledge about Best Available Technologies (BATs) that could be implemented in their products

To support and help SMEs on this implementation process, the LiMaS methodology has developed practical information for the following environmental topics:

Legislative requirements:

- ErP / Eco-design Directive 2009/125/EC (former EuP Directive), on establishing a framework for the setting of Eco-design requirements for energy-related products [1]
- RoHS Directive 2002/95/EC, on the restriction of the use of certain hazardous substances in electrical and electronic equipment [2]

- WEEE Directive 2002/96/EC, on waste electrical and electronic equipment [3]
- REACh Regulation EC 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals [4]

Self-regulatory initiatives based on standards:

- Environmental Management System (based on ISO-14001) [5]
- Eco-labelling and Environmental Product Declaration (based on ISO-14020 series) [6]
- Simplified Life-cycle assessment (based on ISO-14040 series) [7]
- Hazardous substance monitoring (self monitoring)

In the proposed methodology, the user first gets an initial short questionnaire and enters some data, which provide first results and an orientation to detailed assessment through specific modules for the different environmental topics (see Figure 2).

The information required for the LiMaS methodology can basically be divided into two categories:

- Information on the product in the form of answers to simple questions
- Numerical data on the products and processes characteristics

The methodology includes also some methods to estimate the missing data in case the user do not know some required information, for example estimation of the air emissions associated to the combustion of fuel/gas, depending on the annual consumption of these substances.

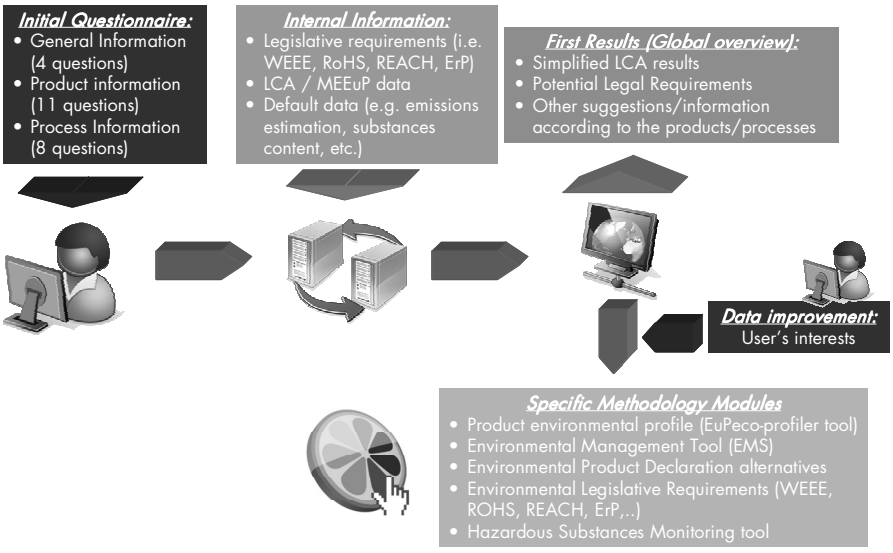

Figure 2.- Methodology approach

The key issue, to reduce the resources needed to cover the proposed topics, is to take advantage of the data synergies between them. Table 1 shows the data synergies used in the proposed methodology, considering the inputs of the initial questionnaire.

Table 1.- Data asked in the initial questionnaire and data synergies to the specific modules

Modules **Data**	**LCA**	**ROHS**	**WEEE**	**REACh**	**Hazard. Sub.**	**ErP**	**Eco-label**	**EMS**
PRODUCT INFORMATION:	-	-	-	-	-	-	-	-
Product Name:	X	X	X	X	X	X	X	X
PRODCOM number:	-	X	X	-	-	X	X	-
Product Family	-	X	X	-	-	-	-	-
% of units over total production	X	-	-	-	-	-	-	-
Total volume (m3):	X	-	-	-	-	-	-	-
Total weight (kg):	X	-	-	-	-	-	-	-
% of metals:	X	-	-	-	-	-	-	-
% of plastics:	X	-	-	-	-	-	-	-
% of electronic components:	X	X	-	X	-	-	-	-
Average energy consumption in use (W):	X	-	-	-	-	-	-	-
Number of hour of use per year (h/y)								
Lifetime in years (y):	X	-	-	-	-	-	-	-
MANUFACTURING:								
Electricity Consumption (kWh/y):	X	-	-	-	-	-	-	X
Gas Consumption (Nm3/y):	X	-	-	-	-	-	-	X
Fuel Consumption (ltr/y):	X	-	-	-	-	-	-	X
Water Consumption (m3/y):	X	-	-	-	-	-	-	X
Hazardous Wastes (kg/y):	-	-	-	-	-	-	-	X
Non-Hazardous wastes (kg/y):	-	-	-	-	-	-	-	X
Solvents Consumption (kg/y):	-	-	-	-	-	-	-	X
Use of hazardous substances (y/n)	-	-	-	X	X	-	-	X

More details about the proposed Methodology can be found in the LiMaS WP4 Public Report, which can be downloaded from the project website.

3 Supporting Tools

The basic idea of these supporting tools is to facilitate the integration of the different environmental topics covered by the LiMaS project in a simplified common approach. The supporting tools are based on Microsoft EXCEL spreadsheets, and they follow the methodological approach defined in the previous chapter. Basically, the supporting tools include the following modules:

HOME module, which includes the following spreadsheets:

- "MAIN INTRODUCTION", where the tools are presented (e.g. objectives, how to use, limitations, etc.).
- "MAIN QUESTIONNAIRE". Simplified questionnaire that has to be filled in by the user. It includes about 20 questions on product and process characteristics. This information is used in the following specific questionnaires as default data, using the assumptions proposed in the methodology.
- "TOOLS", where the environmental aspects that could be relevant for the analysed product are presented (according to the information included in the main questionnaire) and links to specific modules are given. Figure 3 shows a screenshot of this spreadsheet.
- "SUMMARY", where the main results of the specific modules are summarised, supplying a global perspective of the different environmental aspects that could apply to the analysed product.

Figure 3.- Screenshot of the initial results and links to the specific questionnaires

Specific modules. The following aspects are covered by the specific modules. In all the cases links to relevant legislation and information are given in case the user needs additional details:

- **Legislative Requirements Questionnaires,** where asking a simplified questionnaire and using the previous info, the user will be able to know whether and how the product and the organisation could be affected by:
    - the WEEE Directive.
    - the RoHS Directive.
    - the ErP Directive and its specific Regulations (those published before October 15th 2010). Also, links to the preparatory studies for similar product families are given.
    - the REACh Regulation (mainly as "Downstream user"). Information about “definitions” and other sources of information are given to help the user in the implementation of this questionnaire.
- **The “Hazardous substances Tool”**, partially related with the previous questionnaire, allows the user to monitor the hazardous substances used in their products/processes and the information to be required to the

substances' suppliers (e.g. Material Safety Data Sheets, Exposure Scenarios, etc.).

- **The "Eco-label Questionnaire"** has been developed to allow an easy and quick search of Eco-labels that may apply to a specific electrical or electronic product (using information included in previous questionnaires). This tool could support communication policies related to product improvement. The Eco-label types included in the tool are: the European Eco-label; the Blue Angel Eco-label; the European Energy Star; the Nordic Eco-label and the International EPD System.
- **The "Environmental Management Tool"** can be helpful for assessing and determining which organisation's environmental aspects (e.g. raw materials, energy, wastes, emissions, noise, etc.) cause or may cause the most significant impacts on the environment. It allows the identification of environmental priorities to be considered during the establishment of future organisation's environmental objectives and targets. This tool is totally aligned with EMAS and ISO 14001 requirements and the assessment criteria can be modified by the user.
- **The "EuPeco-profiler tool"** supplies a base case structure and data to be included in the free LCA software tool EuPeco-profiler (described hereafter). This "first" data is generated making some assumptions that facilitate the data entry into the mentioned software. A first estimation of the environmental impacts during product's complete life cycle can be obtained as a result of the assessment. Afterwards, the user can improve this "first" data with more accurate data in order to better simulate his product, using the EuPeco-profiler software.

The simplified LCA software tool (EuPeco-profiler) for Energy-using Products has been developed in the LiMaS project. This desktop software is available in English, German and Spanish and it is designed to:

- Allow SMEs to know the environmental impacts associated to their products and processes (for example Global Warming Potential) taking into account their complete life cycle. The software is easy to use and clearly shows the assessment results (numerically and graphically). These characteristics facilitate the use of the software by people that are not environmental experts.
- Prioritise the most relevant environmental aspects associated to their products. Afterwards, the redesign efforts can be focused on the most relevant ones to obtain better results.
- Compare different design alternatives to assess which is better from an environmental point of view

- Communicate the achieved environmental improvements by using the quantitative results.

The tool is based on the MEEuP methodology developed by VHK for the European Commission [8], which is used in the preparatory studies of the ErP Directive [1].

The steps to be followed to analyse the environmental profile of a product, using the EuPeco-profiler software tool, are:

STEP 1.- DATA INPUT.- Input of information considering product life cycle. Selection of different materials and processes using dropdown lists (159 materials/processes for EuP Sector).

STEP 2.- INDICATORS SELECTION.- Selection of the environmental impact indicators to be assessed. Sixteen indicators are available, including global warming potential, electricity requirement, waste generation and water use.

STEP 3.- RESULTS.- Calculation of the selected environmental impact indicators for each material or process (displayed in tables). Results can be aggregated / disaggregated and presented as values or percentages. It is possible to highlight the most relevant impacts using the "significance assessment" function.

STEP 4.- GRAPHICS.- Graphical display of the contribution of each material or process for each impact indicator (in percentages). Figure 4 shows an example of the graphical representation of the results, which could be customised by the user depending on the level of detail needed for its assessment.

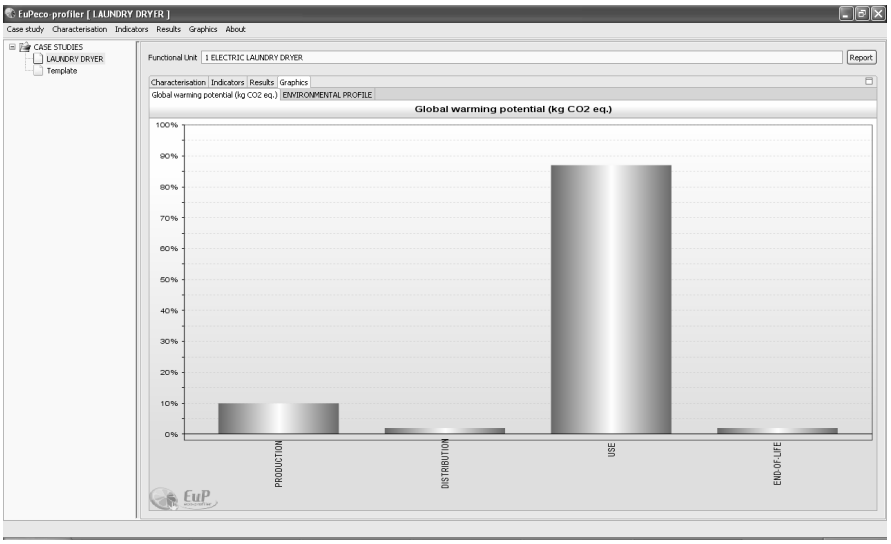

Figure 4.- Example of graphic results using EuPeco-profiler software tool (i.e. Global Warming Potential Impact)

All the mentioned tools can be downloaded for free from the project website (*www.limas-eup.eu*).

4 Next steps

The following activities will be carried out in the LiMaS project:

- Test the proposed methodology and Supporting Tools in SMEs (case studies)
- Develop the commercial web-based software tool that will integrate the different tools in one single application
- Test the web-based software tool in SMEs (case studies)
- Increase the public information of the project with additional information on Eco-design, Best Available Technologies, etc.
- Disseminate and exploit the results of the project

The LiMaS project will finish in December 2011, but the dissemination and exploitation activities will follow afterwards.

5 Conclusions

The developed methodology and supporting tools allow the user (mainly SMEs) to implement LCM and Eco-innovation concepts on its day-to-day business. This common and simplified approach allows identifying which environmental aspects could affect (or could be of interest) to the user's product or organisation. In case, more detailed information is required, the tools supply links to the most relevant sources of information.

The aspects covered by these tools, which are specific for Energy-using Products and electrical/electronic equipment, are the following:

- First approach to the most relevant environmental legislation that could affect to this type of products (i.e. WEEE, RoHS, REACh and ErP/Eco-Design legislation)
- Simplified method to assess the most relevant environmental aspects associated to the organisation (first step for implementing an Environmental Management System)
- Simplified method to monitor the hazardous substances used in the products/processes and the required information from suppliers
- Environmental communication alternatives for the analysed product (i.e. possible eco-labels and Environmental Product Declarations)
- Simplified LCA of the product to identify and quantify the most relevant environmental impacts during the product life cycle. These results highlight where to focus the eco-innovation efforts

The main advantage of the proposed approach is that the required information is minimal. Consequently, the efforts needed to enter data in the respective modules are kept to a minimum.

This can be done taking advantage of the data synergies and the developed assumptions.

To promote the use of these methodology and tools, the LiMaS project has made them available for free in the project website (www.limas-eup.eu).

6 Acknowledgement and Disclaimer

The authors thank the grant support received from EACI to develop this project. This paper is done by the authors and it is not to be perceived as the opinion of EACI. The Agency is not responsible for any use that may be made of the information contained therein.

7 References

[1] The European Parliament and the Council. Directive 2009/125/EC of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. *Official Journal of the European Union*. L285/10. 31.10.2009

[2] The European Parliament and the Council. Directive 2002/95/EC of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. *Official Journal of the European Union*. L37/19. 13.2.2003

[3] The European Parliament and the Council. Directive 2002/96/EC of 27 January 2003 on waste electrical and electronic equipment (WEEE). *Official Journal of the European Union*. L37/24. 13.2.2003

[4] The European Parliament and the Council. REGULATION (EC) No 1907/2006 of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACh). CORRIGENDA. *Official Journal of the European Union.* L136/3. 29.5.2007

[5] <http://www.iso.org/iso/catalogue_detail?csnumber=31807>. ISO 14001:2004 Environmental management systems (Accessed 22.03.2011).

[6] <http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=34425>. ISO 14020:2000 Environmental labels and declarations -- General principles (Accessed 22.03.2011)

[7] <http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=37456>. ISO 14040:2006 Environmental management -- Life cycle assessment -- Principles and framework (Accessed 22.03.2011)

[8] VHK for European Commission. MEEuP Methodology Report, Final / 28.11.2005 / and its EuP_EcoReport_v5.xls. Copyright © Van Holsteijn en Kemna BV 2005. Distribution rights European Commission 2005