



## Deliverable D7.2

# Analysing the Impact of LCA to go, a Sector Specific Life Cycle Assessment Tool

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## 2 Introduction

### 2.1 Background

The current report presents an analysis of the appropriateness of using the LCA to Go approach for the seven sectors addressed in the project [Boosting Life Cycle Assessment Use in European Small and Medium-sized Enterprises].

The framework for the present analysis was set by the "Detailed Policy Recommendation Report and Briefings" [deliverable D7.2]. The report aimed to provide guidance on how the LCA to Go project supports and complements existing and future policies.

It was highlighted that important sectors of the European economy such as employment, social capital and innovation are highly dependent and driven by Small and Medium Enterprises (SME). About 23 million SMEs in the EU account for 99% of all businesses and provide around 90 million jobs. According to the European Commission, SMEs created 85% of net new jobs in the EU between 2002 and 2010. Therefore it is reasonable to suggest that SMEs are the backbone of the European economy and their contribution is essential for pursuing the goals of sustainable development and the Europe 2020 agenda. However, SMEs also contribute approximately 64% of the industrial pollution in Europe. However, these same SMEs face difficult barriers to compliance with environmental legislations. It can be argued that these barriers are higher in SMEs than larger corporation as they do not have the resources to effectively comply with environmental legislation.

In response to this, the European Commission, alongside individual Member States, has aimed to promote the transition towards sustainable consumption and production (SCP). This resulted in a life cycle integration of environmental considerations becoming more common among policy makers and businesses. On the one hand this is due to the new policy context and on the other to the continued development and refinement of sophisticated analysis tools such as life cycle assessment.

However, the existing academic literature and the needs assessment of the LCA to Go project suggests that only a small minority of leading SMEs undertake Life Cycle Assessments (LCA) and that the majority of LCAs are undertaken by larger companies. The "Detailed Policy Recommendation Report and Briefings" identified a wide range of barriers to the successful implementation of LCAs in particular applicable to SMEs, including lack of awareness, short term planning, and limited resources.

As a direct response, the LCA to Go tool was developed as part of the European funded project "Boosting Life Cycle Assessment Use in European Small and

Medium-sized Enterprises". This project aims to address the identified lack of successful LCA implementation in SMEs by reducing the identified barriers for its application. It is proposed that the developed LCA to Go approach could overcome the identified barriers to LCA by customising the tool to specific sectors, reducing the risks and time involved and improving the effectiveness of the outputs of an assessment. It aims to assist businesses in seven sectors [Smart Textiles; Bio-based Plastics; Photovoltaics; Electronics; Industrial Machinery; Sensors; and Printed Circuit Boards] reduce the environmental impact of their products through life cycle thinking. However, it remains unclear if choosing a sector specific approach for the LCA can remove the identified barriers in the LCA application. Therefore, it is immanently important to observe and analyse how this sector specific approach can overcome the barriers to LCA application.

This report presents the following chapters:

## CHAPTER 2 – METHODOLOGY

This chapter provides an overview over the obtained data, the candidate selection process and the questionnaire development. Furthermore, it explains the analytical approach for the analysis of the questionnaire data.

## CHAPTER 3 – RESULTS

A summary of the results of the questionnaire are presented in this chapter.

## CHAPTER 4 – ANALYSIS AND DISCUSSION

An emergent content analysis approach was taken to create meaning from the free text answers provided in the questionnaire. Implications of this approach are discussed in this chapter.

## CHAPTER 5 – CONCLUSION

This chapter draws a conclusion based on the findings of the analysis and makes recommendation for the further development of the LCA to Go tool.

## CHAPTER 6 – RECOMMENDATIONS

Based on the gained results, this chapter sets out to make recommendations for the future development of the LCA to Go tool.

## CHAPTER 6 – LIMITATIONS

This chapter highlights the limitations of the obtained data and analysis undertaken.

## **2.2 Aim**

The aim of this report is to analyse the degree of successful implementation, suitability and continuous usage of the sector specific LCA to Go tool in European SMEs. Particular attention will be given to how the LCA to Go tool assisted in overcoming the identified barriers and if new incentives for the application of an LCA were created. This analysis will provide the basis for further refinements of the existing LCA to Go tools and directions for the development of subsequent sector specific LCA to Go tools. In a subsequent step, the results will provide the basis for wider discussions about the implementation of the LCA to Go tool at a European policy level.



## **3 Methodology**

### **3.1 Data and Candidate Selection**

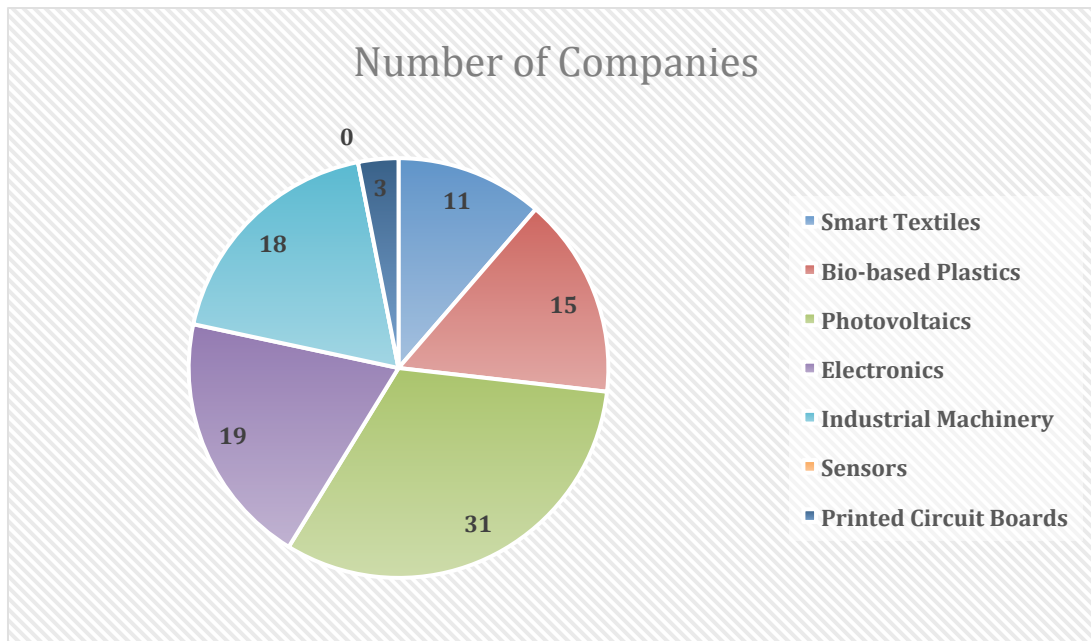
#### **3.1.1 Questionnaire Data**

Seven sector specific LCA to Go tools were developed as part of the European funded project "Boosting Life Cycle Assessment Use in European Small and Medium-sized Enterprises". These sectors are:

1. Smart Textiles
2. Bio-based Plastics
3. Photovoltaics
4. Electronics
5. Industrial Machinery
6. Sensors
7. Printed Circuit Boards

A sector description, including future trends and key standards and policies are provided in the report "Detailed Policy Recommendation Report and Briefings" [deliverable D7.2].

As part of the deliverables of the project, 100 European SMEs were to be trained in the application of the newly developed sector specific LCA to go tools. An effective proxy to obtain relevant feedback from the trained companies was identified in the responsible LCA to Go trainers. Seven trainers were contacted and asked to complete the questionnaire [see Appendix]. Within 14 days, all seven LCA to Go trainers of the project provided a completed questionnaire accounting for a total of 97 trained companies.



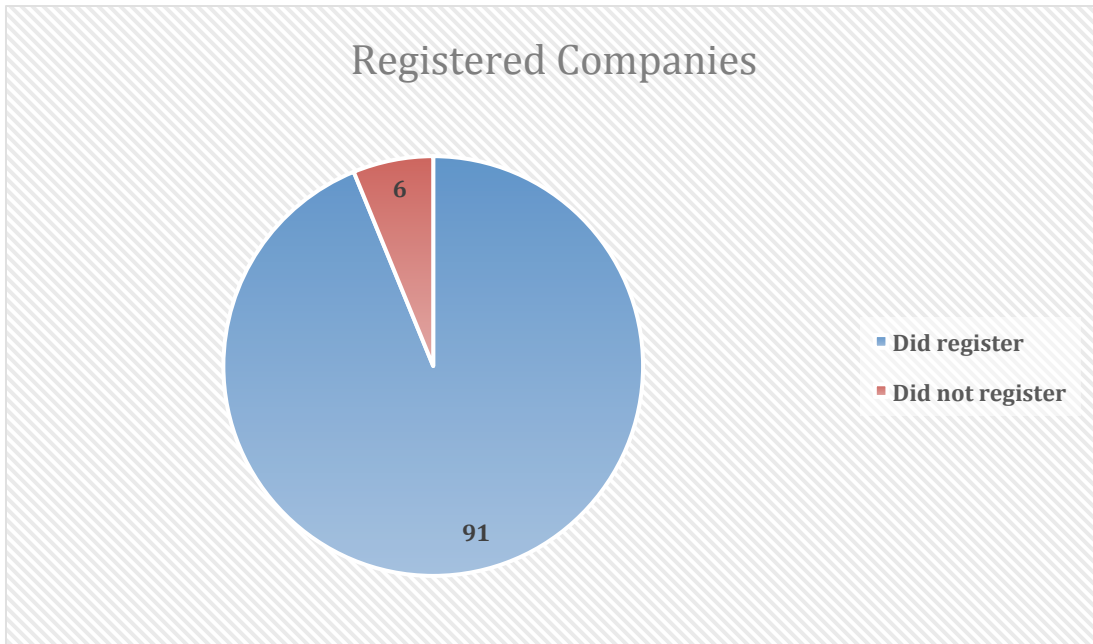
**Figure 1: Data sample according to sectors**

### 3.1.2 Additional Data

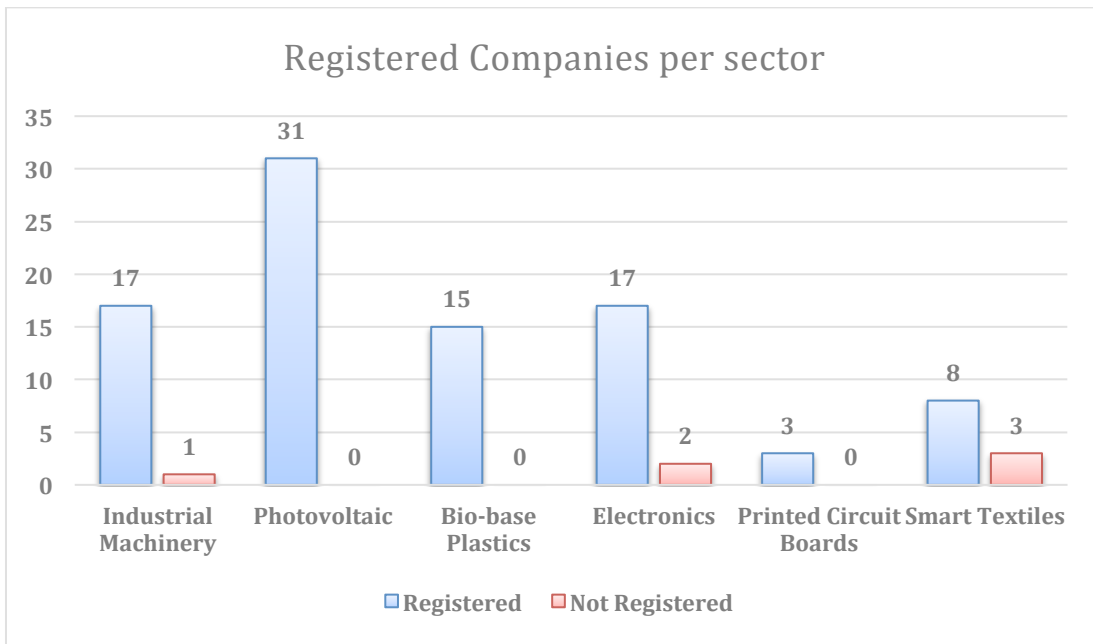
#### 3.1.2.1 Login Data for the LCA to Go Web Tool

The login data for the LCA to Go web tool was provided for all companies which completed the LCA to Go tool training. The login data included the dates of the first registration, the amount of logins and the date of the last login. Based on this data an analysis was undertaken to assess the extent to which trained companies made use of the LCA to Go web tool. An analysis regarding the continuation of the LCA to Go web tool is not feasible as many companies received their training within the last three months of the date of this report.

In total 6 out of 97 companies did not sign up for the LCA to Go web tool.



**Figure 2: Companies registered for the LCA to Go web tool**



**Figure 3: Companies registered for the LCA to Go web tool according to sector**

## **3.2 Questionnaire Design**

A questionnaire was developed in order to obtain the necessary data for the analysis. The questionnaire consisted of two different parts with 14 open ended questions.

1. General Questions
2. Company Specific Questions
  - a. Barriers to LCA
  - b. Incentives for LCA

The first part includes seven general questions to the trainers regarding the trained companies and their personal experience. The second part includes two company specific parts regarding the identified barriers and incentives for LCA. The full questionnaire is included in the appendix.

## **3.3 Analyses- Questionnaires**

### **3.3.1 Approach**

Bryman and Bell (2003) state that no clear rules exist on how to analyse qualitative data. Hence, the analyses of qualitative data will always largely depend on the researcher's approach and desired outcome. Two general approaches on how to conduct qualitative data analyses are described as "inductive analysis" and "deductive analysis". The inductive analysis approach is concerned about finding emerging themes in the data itself (Patton, 2002). This approach is commonly referred to as "grounded theory" as themes are "grounded in the data itself" (Bryman and Bell, 2003, Patton, 2002). A deductive approach relies on an existing framework for the data analysis and is known as "analytic induction". This pre-existing framework or hypothesis is derived from theory and the qualitative data analysis is used to validate the framework or hypothesis (Bryman and Bell, 2003, Patton, 2002). This type of analysis is first deductive by applying the existing framework onto the data and then inductive by examining the data for further reoccurring themes (Patton, 2002).

Following this classification, an analytical induction approach was chosen as the appropriate analytical method to assess the questionnaire responses. This approach ensures that the existing framework, following the structure of the questionnaire, can be applied to the data for further analysis and further emerging themes can be obtained.

### **3.3.2 Data Management**

In order to analyse the questionnaire data it was essential to manage the data in an orderly fashion. Data management is fundamentally linked to data analysis and ensures that the data is stored in an accessible and structured way, conducted data analyses are documented and retained for any future use (Miles and Huberman, 1994). All obtained questionnaire data was transferred into the qualitative data analysis (QDA) computer software package NVivo Version 10.

### **3.3.3 Data Reduction/ Coding**

This data reduction is part of the analysis of the qualitative data as the choices for the data reduction narrow and organise the data. Several approaches to data reduction exist, namely writing summaries, coding, teasing out themes, making clusters, making partitions and writing memos (Miles and Huberman, 1994). In particular, assigning codes to qualitative data is a commonly used method to assign a connotation to certain reoccurring themes within the datasets. These codes aim to organise and categorise the data relating to particular research topics (Bryman and Bell, 2003, Miles and Huberman, 1994). Bryman and Bell (2003) and Mason (2006) state that there is no right or wrong way of coding the data. However, it is recommended to reappraise the codes during the analysis and to ensure consistency in all codes throughout the entire dataset. A common problem with the coding approach for analysing qualitative data is that the data might be analysed without considering the wider context. This analysis of data fragments can incur the danger of changing the meaning of any results (Bryman and Bell, 2003).

Following the analytical induction approach, all obtained questionnaires were coded according to the structure of the questionnaire. A second inductive scan of the data was performed to identify further emerging themes and the data was coded accordingly.

### **3.3.4 Questionnaire-Analysis**

For the analysis of questionnaires via the analytical induction approach, Patton (2002) describes cross-case analysis as one of the most important strategies. The cross-case analysis is seen as one of the most appropriate methodologies to analyse conflicting or opposing findings and establishing a theoretical framework (Patton, 2002). In order to conduct a cross-case analysis, first individual questionnaires should be analysed independently. Only if the single questionnaires are analysed and fully understood is it appropriate to group the

questionnaires and conduct a cross-case analysis across all questionnaires (Patton, 2002).

### **3.4 Deductive Coding**

Following the deductive approach of the analytical induction methodology, the questionnaire was coded according to the seven questions. The deductive codes are:

1. Number of companies
2. Sector
3. Supplier of intermediate products
4. Seller of final products
5. Identification of companies
6. Personal experience – Implementation difficulties
7. Personal experience – Advantages of the LCA to Go tool
8. Personal experience – Limitations of the LCA to Go tool
9. Barriers BEFORE
10. Barriers REMOVED
11. Barriers WHICH REMOVED
12. Barriers STILL EXISTING
13. Incentives to PARTICIPATE in training
14. CONTINUED usage of the tool
15. INTENDED usage of the tool

### **3.5 Inductive Coding**

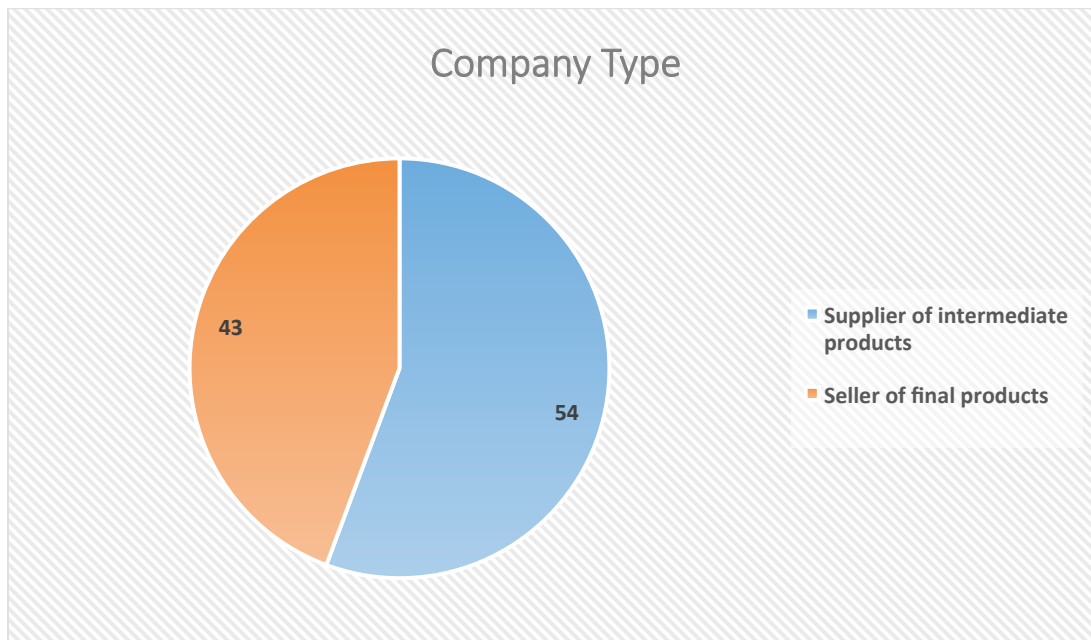
A second inductive scan of the questionnaire was performed to identify additional emerging themes. No further emerging themes were identified and no additional inductive codes were created.

## 4 Results

All results were summarised and are presented in the following.

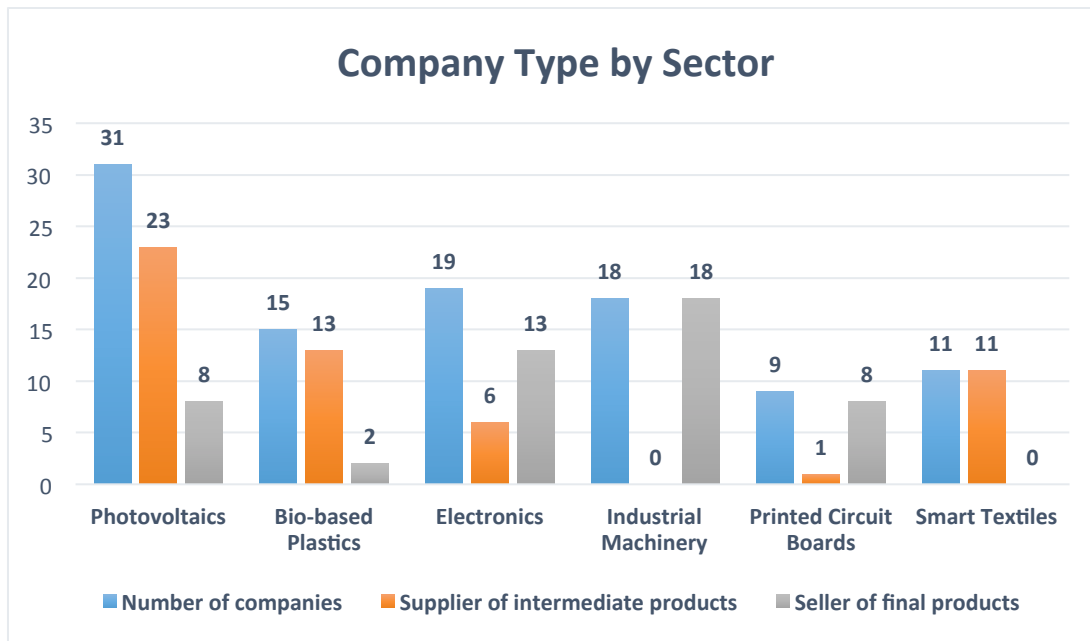
### 4.1 General Questions

WERE THESE COMPANIES:	
Answer Options	Response Count
Supplier of intermediate products to larger companies.	54
Selling final products to distributors/retailers?	43
<i>answered question</i>	7
<i>skipped question</i>	0



**Figure 4: Data sample according to company type**





**Figure 5: Data sample by sector according to company type**

HOW DID YOU IDENTIFY COMPANIES TO TRAIN?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
Bio-based Plastics	<ul style="list-style-type: none"> <li>• Existing databases</li> <li>• Sector specific workshops</li> <li>• Sector specific web seminars</li> <li>• Previous EU project participants</li> <li>• Email contact</li> <li>• Phone contact</li> </ul>

<b>Electronics</b>	<ul style="list-style-type: none"> <li>• Contacted known companies with a "sustainability driven" business model</li> </ul>
<b>Industrial Machinery</b>	<ul style="list-style-type: none"> <li>• Trade shows</li> <li>• Newsletters from different organisations/associations</li> <li>• Personal contacts</li> </ul>
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• Existing databases</li> <li>• Email contact</li> <li>• Phone contact</li> <li>• Personal meetings</li> <li>• Sector specific seminar</li> <li>• Email campaign in cooperation with National Chamber of Commerce for Electronics and Telecommunications (KIGeIT)</li> <li>• Recruiting during several sector specific seminars and exhibitions</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Trade associations</li> <li>• Academic institutes who work across industry</li> <li>• Welsh Government</li> <li>• Google search</li> <li>• Trade association websites</li> <li>• Recommendations from previously trained companies</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• Identified SMEs that work in the field of PV as designers and installers, and are interested in a "green" solution and image.</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Internet survey</li> <li>• Conferences</li> <li>• Personal contacts</li> </ul>

FROM YOUR PERSONAL EXPERIENCE, WHAT WERE THE DIFFICULTIES THAT COMPANIES HAD IN IMPLEMENTING THE SECTOR SPECIFIC LCA TO GO TOOL?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
Bio-based Plastics	<ul style="list-style-type: none"> <li>• Lack of time</li> <li>• Fear of the high complexity of LCA calculations</li> </ul>
Electronics	<ul style="list-style-type: none"> <li>• Uncertainty if the LCA tool is usable for a particular type of product:</li> <li>• High usability for computers and their refurbishment</li> <li>• High usability confirmed only after trials: smartphones</li> <li>• Limited usability: Lighting products, other electronics products</li> <li>• Not usable: Packaging (separate tool has been developed)</li> <li>• Usability still under investigation: Telecommunications equipment</li> <li>• The "LCA to Go" tool for electronics gives some initial support (identifying hot spots for further ecodesign analysis or as an initial phase of a full scale LCA), but the embedded simplifications hinder a deep-level analysis.</li> </ul>
Industrial Machinery	<ul style="list-style-type: none"> <li>• Time</li> <li>• Resources</li> </ul>
Printed	<ul style="list-style-type: none"> <li>• Lack of awareness of LCA</li> </ul>

<b>Circuit Boards</b>	<ul style="list-style-type: none"> <li>• No major issues after the training</li> <li>• Usage and willingness to use the LCA to Go tool is very limited due missing legal obligations and lack of staff</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Supporting material might be insufficient</li> <li>• Lack of clarity regarding the data input</li> <li>• Lack of information on how certain indicators are calculated</li> <li>• Optimization of PV sector section was not clear for all companies</li> <li>• Finding some manufacturing information to enter into the tool</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• LCA to Go tool application is limited to installers and designers</li> <li>• Difficulties to identify required data input</li> <li>• Tool is not designed for manufacturers of PV modules</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Tool did not always work properly (error message upon result page, impossible to register as a new user)</li> <li>• Internal database is too limited</li> </ul>

<b>FROM YOUR PERSONAL EXPERIENCE, WHAT ARE THE ADVANTAGES OF THE SECTOR SPECIFIC LCA TO GO TOOL?</b>	
<b>Answer Options</b>	<b>Response Count</b>
	7
<i>answered question</i>	7

<i>skipped question</i>	0
<b>Sector</b>	<b>Response text</b>
<b>Bio-based Plastics</b>	<ul style="list-style-type: none"> <li>• Simplified LCA process</li> <li>• With few data points a company can estimate in few minutes the environmental impact of their products.</li> <li>• All required data can easily be obtained</li> </ul>
<b>Electronics</b>	<ul style="list-style-type: none"> <li>• Very technical, non-environmental language</li> <li>• Data can easily be gathered even without being involved in product development / manufacturing.</li> <li>• Parameterisation, thus coverage of a broader range of product specifications.</li> <li>• Usage of familiar terminology (e.g. KEPI "Carbon Footprint")</li> </ul>
<b>Industrial Machinery</b>	<ul style="list-style-type: none"> <li>• User friendly</li> <li>• Clear structure</li> <li>• Quick result that is clear and easily understood</li> <li>• Two step approach with the detailed result enabling the user to derive improvements</li> <li>• Clear result enables communication both internally and externally</li> <li>• Proactive (standardised) approach to upcoming legislation/regulation/standards</li> <li>• Comparison of two products</li> </ul>
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• Improved understanding of LCA issues</li> <li>• Better understanding of how to improve the environmental performance of products</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• User friendly</li> <li>• Quick results</li> <li>• Because the tool was sector specific, SMEs were interested in training as they could relate to it, and could better understand the tool</li> </ul>

	<ul style="list-style-type: none"> <li>• Adequate LCA tool for the PV sector</li> <li>• Common understanding/language of the sector among all stakeholders</li> <li>• Tool covering the most important indicators for the sector and with the relevant units that can easily be communicated to their customers e.g. carbon footprint, energy payback time</li> <li>• Comparison chart with fossil fuel energies</li> <li>• Most companies wanted to use the tool to support their marketing activities</li> </ul>
Photovoltaic II	<ul style="list-style-type: none"> <li>• Improvement of understanding of the environmental impacts of the PV installations</li> <li>• Good for marketing and selling strategy</li> <li>• The results of the tool can easily be communicated to customers</li> <li>• Carbon footprint is a well-known indicator for many people, so the results are not too technical</li> <li>• Ability to compare different PV-technologies</li> </ul>
Smart Textiles	<ul style="list-style-type: none"> <li>• Users are guided to evaluate the specific material composition of smart textiles. They are guided to take the full life cycle into account.</li> </ul>

FROM YOUR PERSONAL EXPERIENCE, WHAT ARE THE DIFFICULTIES/ LIMITATIONS OF THE SECTOR SPECIFIC LCA TO GO TOOL?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0

Sector	Response text
<b>Bio-based Plastics</b>	<ul style="list-style-type: none"> <li>• LCA to Go tool is not suitable for some specific situations and processes</li> </ul>
<b>Electronics</b>	<ul style="list-style-type: none"> <li>• LCA to Go tool is limited to “computer-like devices” (i.e. small servers, PCs, laptops, tablets and also smartphones).</li> <li>• Low market demand as a driver for LCA</li> <li>• Missing link to a standard or verification scheme</li> </ul>
<b>Industrial Machinery</b>	<p>Difficulties:</p> <ul style="list-style-type: none"> <li>• Companies often have a clear set strategy for development and do not want to create ‘extra work’ by diverting from this strategy, which in most cases focuses on energy efficiency in work piece processing rather than the LC.</li> <li>• Getting companies to understand the data needs and believe the limited time necessary to carry out a first assessment.</li> </ul> <p>Limitations:</p> <ul style="list-style-type: none"> <li>• No central database of results – means that companies cannot compare their product to a competitors or the market average/best in class</li> <li>• No Energy Efficiency Index or Energy Label result, which is what the companies seem to desire the most.</li> </ul>
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• Certain types of printed circuit boards are not covered by the LCA to Go tool</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Danger that the LCA tool to Go will be outdated in the emerging photovoltaic market</li> <li>• Missing comparison of PV system and concentrated PV systems</li> <li>• Missing information on how the results are calculated</li> </ul>

	<ul style="list-style-type: none"> <li>• Limited support system leads to the need of further support beyond the initial training for an independent usage of the LCA to Go tool</li> <li>• Lack of customer and market demand and regulations consequentially leads to a lack of incentives to undertake LCA.</li> </ul>
Photovoltaic II	<ul style="list-style-type: none"> <li>• Limited to the carbon footprint and energy results for photovoltaic installations</li> <li>• LCA to Go tool is not applicable to large installations</li> </ul>
Smart Textiles	<ul style="list-style-type: none"> <li>• The LCA to Go tool does not cover the analysis of all possible design variations of smart textiles.</li> <li>• The LCA to Go tool is not applicable to not yet developed products as it relies solely on exact data input rather than anticipated usage.</li> <li>• Limitations regarding LCI data (eco-cost data are missing)</li> </ul>

## 4.2 Barriers to LCA

WHICH BARRIERS TO LCA EXISTED PREVIOUS TO THE SECTOR SPECIFIC LCA TO GO TOOL TRAINING?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
Bio-based Plastics	<ul style="list-style-type: none"> <li>• Lack of knowledge</li> <li>• Lack of time</li> <li>• Lack of resources</li> </ul>



	<ul style="list-style-type: none"> <li>• Cost intensive</li> <li>• Lack of awareness; companies are interested in cost reduction rather than in a reduction of the environmental impact.</li> <li>• Unclear or non-existent regulatory drivers on LCA</li> <li>• Concern that for instance higher transport distances negatively affect carbon footprint results, resulting in a trade barrier.</li> <li>• Complexity of current tools are not adapted to SME requirements.</li> <li>• Requirements from customers (especially in the large retail sector)</li> <li>• Difficulties to implement an LCA software in the company.</li> <li>• Need of external assistance (consultants) for LCA</li> <li>• Need for trained staff</li> <li>• No existing tools for quick and consistent estimation of the environmental impact of plastic pallets that include accurate data about bio-based and biodegradable plastics.</li> <li>• Lack of reliable data required for the LCA data input</li> </ul>
<p><b>Electronics</b></p>	<ul style="list-style-type: none"> <li>• Insufficient time to implement LCA</li> <li>• Lack of data available for LCA; no access to data from the product supply chain</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Lack of internal expertise</li> <li>• Lack of knowledge</li> <li>• Lack of awareness</li> <li>• Lack of training</li> <li>• Lack of motivation</li> <li>• A view of environmental issue as peripheral to the core business</li> <li>• Complexity of current LCA tools</li> </ul>

	<ul style="list-style-type: none"> <li>• Lack of managerial and operational resources</li> <li>• Technical barriers</li> <li>• Insufficient time to implement LCA (supply chain)</li> </ul>
<b>Industrial Machinery</b>	<ul style="list-style-type: none"> <li>• Lack of resources</li> <li>• Lack of time</li> <li>• Lack of awareness of benefits</li> <li>• Lack of incentives</li> </ul>
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• Uncertainty/doubt on benefit of environmental improvements</li> <li>• A view of environmental issue as peripheral to the core business</li> <li>• Commercial disadvantage as a results of LCA</li> <li>• Not a high value innovation activity</li> <li>• Economic short-termism (i.e. quick payback on investments)</li> <li>• Lack of data available for LCA</li> <li>• Substitutability barriers (e.g. materials, chemicals)</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Low perceived value in LCA investment</li> <li>• Lack of internal expertise</li> <li>• Lack of internal knowledge</li> <li>• Lack of managerial and operational resources (including time, cost, skills)</li> <li>• Lack of top management commitment</li> <li>• Lack of awareness, training, and motivation of employees</li> <li>• Fragmented product development processes in SMEs</li> <li>• Unclear or non-existent regulatory drivers</li> <li>• Unclear market demands for ecodesign</li> <li>• Insufficient time to implement LCA (supply chain)</li> </ul>

	<ul style="list-style-type: none"> <li>• Government information asymmetries (related to interventions)</li> <li>• Uncertainty and poor appropriability of LCA</li> <li>• Misalignment and lack of incentives</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Lack of knowledge</li> <li>• Lack of time</li> <li>• Lack of experience with LCA</li> <li>• Lack of internal expertise</li> <li>• Lack of appropriate tools to perform LCA</li> <li>• Low perceived value in LCA investment</li> <li>• A view of environmental issue as peripheral to the core business</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• Lack of knowledge</li> <li>• Lack of time</li> <li>• Lack of financial resources</li> <li>• Lack of data available for LCA</li> <li>• Lack of internal expertise</li> <li>• Lack of managerial and operational resources (including time, cost, skills)</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Lack of organisational capacity (especially start-ups)</li> <li>• Managerial culture</li> <li>• Insufficient time to implement LCA (supply chain)</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Lack of interest and motivation</li> <li>• Lack of resources</li> <li>• Lack of skills</li> <li>• Lack of knowledge</li> </ul>

DID THE SECTOR SPECIFIC LCA TO GO TOOL REMOVE ANY OF THESE BARRIERS?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
Bio-based Plastics	<ul style="list-style-type: none"> <li>• Barriers were removed for 11 out of 15 companies</li> <li>• Barriers were partially removed for 4 out of 15 companies</li> </ul>
Electronics	<p>COMPANY A - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Some interesting insights in how to assess lighting products were gained.</li> <li>• The main need of getting a convenient tool for their kind of products has not been achieved.</li> </ul> <p>COMPANY B - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• The data models embedded in the tool are not directly applicable. Further data had to be sourced in the course of the training and has been implemented now. Consequently, Proton has got another tool now with at least more recent data than the tool used before, but still it is usable for rough assessments only, not for detailed assessments of lighting products.</li> </ul> <p>COMPANY C - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Some time saving were achieved.</li> <li>• "LCA to Go" tool is only usable for narrow sectorial</li> </ul>

segments

#### COMPANY D - ELECTRONICS

- Partly, as screening was successfully done, but the LCA tool to Go is not suitable for dedicated Eco design.

#### COMPANY E - ELECTRONICS

- All barriers at least have been tackled, but it is not clear, whether barriers have been removed to an extent to make them work on LCA now independently / regularly.

#### COMPANY F - ELECTRONICS

- Rather than removing a barrier, the exercise of going through an LCA approach beyond the "LCA to Go" methodology unveiled the challenge of getting hold of supply chain data as a company with only limited (market) relevance for the whole electronics industry.
- The "LCA to Go" approach helped to set the focus right on the most important contributors to the product carbon footprint.
- Experts' advice helped to save time to do a full-scale LCA.

#### COMPANY G - ELECTRONICS

- "LCA to Go" could not tackle the general capacity issue, so it is still existing.

#### COMPANY H - ELECTRONICS

- The tool was not detailed enough on packaging materials, thus a customized tool had to be

	<p>developed.</p> <p>COMPANY I - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• No answer</li> </ul> <p>COMPANY J - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• No answer</li> </ul> <p>COMPANY K - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• All barriers at least have been tackled, but it is not clear, whether barriers have been removed to an extend to make them work on LCA now independently / regularly.</li> <li>• A shortcoming is, that LCA is with a single person in this company only, so further use depends on only one person.</li> </ul> <p>COMPANY L - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• All barriers at least have been tackled, but it is not clear, whether barriers have been removed to an extend to make them work on LCA now independently / regularly.</li> </ul> <p>COMPANY M - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Besides the broad variety of products a second challenge is, that telecommunications products are different to computer products. The simplified approach of "LCA to Go" for computers is not transferrable to telecommunications products without further adjustments; work is in progress to assess, how the "LCA to Go" tool might be applicable for telecommunications products.</li> </ul>
<b>Industrial</b>	<ul style="list-style-type: none"> <li>• The barriers were partly removed for all companies</li> </ul>

<b>Machinery</b>	in the industrial machinery sector
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>The barriers were partly removed for all companies in the printed circuit board sector</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>The barriers were removed for 26 out of 31 companies in the photovoltaic sector.</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>All barriers were removed for 2 out 5 companies</li> <li>Most barriers were removed for 1 out of 5 companies</li> <li>Some barriers were removed for 2 out of 5 companies</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>The barriers were not removed but lowered for 11 out of 11 companies in the smart textiles sector.</li> </ul>

WHICH BARRIERS DID THE SECTOR SPECIFIC LCA TO GO TOOL REMOVE AND HOW?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
<b>Bio-based Plastics</b>	<ul style="list-style-type: none"> <li>Knowledge that only with few data the environmental impact of products can be estimated as well as to find strategies for environmental improvement on design and production processes.</li> <li>Knowledge that LCA estimations for products can be made in a few hours and for free.</li> </ul>

	<ul style="list-style-type: none"> <li>• Simplified LCA tool is available</li> <li>• Complexity barrier has been removed by applying and easy-to-use and friendly way to carry out LCA of products.</li> <li>• Knowledge that environmental results can be combined with the operational costs of such Eco design strategies</li> <li>• Improved knowledge about carbon footprint</li> <li>• Knowledge about a tool that provides a clear way for the assessment of product alternatives during Eco design</li> <li>• User friendly and easy way of entering data that is available for the company</li> <li>• A chance to speed up the quantitative assessment for taking decisions on product environmental strategy and market applications</li> <li>• Knowledge about LCA possibilities and the successful implementation of LCA of products in the product development strategy</li> <li>• Understanding of the difference between product and corporate carbon footprint</li> <li>• Ability to react to LCA requests from customers</li> </ul>
<p><b>Electronics</b></p>	<p>COMPANY A - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• None of the main barriers removed, tool hardly applicable for the products.</li> </ul> <p>COMPANY B - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Data issue: sourcing of more recent data on products.</li> </ul> <p>COMPANY C - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• First screening for clients can be done with limited input, so the tool can be used for some kind of "Rapid Prototyping LCA".</li> </ul>



#### COMPANY D - ELECTRONICS

- Tool (plus complementary guidance and data) allows simplified calculations, thus a first screening can be easily done.

#### COMPANY E - ELECTRONICS

- The training facilitated a better understanding of the issue (i.e. addressing knowledge / skills / expertise / awareness / training etc.).

#### COMPANY F - ELECTRONICS

The tool as such did not remove barriers as it is not appropriate for company F's high ambitions to go for a full-scale LCA, preferably with real supply chain data. The main effect was to accelerate the process of compiling an LCA.

#### COMPANY G - ELECTRONICS

- Other secondary barriers, such as LCA expertise, could be removed through an assessment of design aspects by "LCA to Go" staff, which however was not based on applying the tool, but on applying the "LCA to Go" thinking: Focus on most relevant aspects, make a first judgment on very rough assessments to get directions right.

#### COMPANY H - ELECTRONICS

- "LCA to Go" developed a separate excel based calculator for packaging products, which solved the data issue (at least for a given set of packaging options, not for all kinds of packaging materials).

	<p>COMPANY I - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Lack of data available for LCA due to a customised solution for company I.</li> </ul> <p>COMPANY J - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Barriers were removed by providing a training on how existing product data can be used to assess refurbishment.</li> </ul> <p>COMPANY K - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• The training facilitated a better understanding of the issue (i.e. addressing knowledge / skills / expertise / awareness / training etc.) and showed a way, how to apply this knowledge systematically.</li> </ul> <p>COMPANY L - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• The following barriers were removed by providing a training on how existing product data can be used to assess refurbishment.</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Lack of internal expertise</li> <li>• Lack of internal knowledge</li> <li>• Lack of awareness, training, and motivation of employees</li> </ul> <p>COMPANY M - ELECTRONICS</p> <ul style="list-style-type: none"> <li>• Training and related usability investigations are still on going.</li> </ul>
<p><b>Industrial Machinery</b></p>	<p>Two of the barriers were removed:</p>

	<p>Time and resources issues</p> <ul style="list-style-type: none"> <li>• This barrier could be removed in some cases through the preparation for training. The companies were asked to fill a very simple (15 line) excel sheet with some basic data, which was entered into tool either before or during the training. A first assessment was therefore possible in around 15 minutes, which impressed the companies and interested them in further assessments. However, getting them to believe that a training (Data entry, Generating results, Identifying improvements, Comparing products) could be done in approximately one hour was a hard sell as their experience with these types of tools to require a large reporting burden. The user friendliness and clear structure of the data entry and the results removed this barrier in those cases where the tool could be demonstrated.</li> </ul> <p>Understanding of the benefits of LCA</p> <ul style="list-style-type: none"> <li>• We made a list of direct benefits to companies such as taking a proactive approach to upcoming legislation, analysis of the tool from a different standpoint to identify improvements, communication of results, detailed assessment of the 'Use phase', etc. to motivate companies to participate. In some cases this was successful, in others, companies still did not see the direct benefit and therefore did not participate. This barrier will likely only be removed if the tool starts to serve for standardized reporting to fulfil legal requirements and or the awareness in this sector will rise especially on the customer side.</li> </ul>
<p><b>Printed Circuit Boards</b></p>	<p>The "LCA to Go" tool for PCB sector removed following barriers:</p> <ul style="list-style-type: none"> <li>• Uncertainty / doubt on benefit of environmental improvements,</li> <li>• The PCB tool showed possibility of environmental improvements – e.g. possibility of saving water and</li> </ul>

	<p>energy, reducing CO2.</p> <ul style="list-style-type: none"> <li>• A view of environmental issue as peripheral to the core business,</li> <li>• The PCB tool and trainings showed that environmental issue are important for company. They can influence both on companies' profits and the image. They can be used for marketing purposes also.</li> <li>• Commercial disadvantage as a results of LCA,</li> <li>• The PCB tool helps to design more environmental friendly PCB and its transport profile. The LCA results from the tool can be used for creation the design recommendations for customers, influence on optimizations of production processes, giving possibility of companies' image creation and finally leads to commercial success.</li> <li>• Not a high value innovation activity,</li> <li>• The tool can be used for creation of the company as the eco-innovator what is the newest top trend in the European bodies and give the chance obtaining financing for further development of the products and the company from national and European institutions.</li> <li>• Economic short-termism (i.e. quick payback on investments),</li> <li>• The tool significantly shortens the environmental analysis time, which does not extend the product design process.</li> <li>• Lack of data available for LCA</li> <li>• The PCB tool has implemented all needed data for LCA of PCB. In the case of sophisticated version of the PCB tool for PCB factories, the company has all the necessary data.</li> <li>• Substitutability barriers (e.g. materials, chemicals),</li> <li>• The PCB tool has implemented different technological options use in production processes of PCBs.</li> <li>• Poor access to appropriate knowledge, skills,</li> </ul>
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	<p>technology and LCA best practices,</p> <ul style="list-style-type: none"> <li>• The PCB tool has implemented all needed LCA and technology information. The user of the tool doesn't need a specialized knowledge in the area LCA.</li> <li>• Lack of internal expertise,</li> <li>• The PCB tool has implemented all needed LCA information.</li> <li>• Lack of internal knowledge,</li> <li>• The PCB tool has implemented all needed LCA information.</li> <li>• Lack of managerial and operational resources (including time, cost, skills),</li> <li>• The PCB tool has implemented all needed LCA information. The LCA analyses aren't time consuming and tool is for free.</li> <li>• Lack of awareness, training, and motivation of employees</li> <li>• The "LCA to Go" tool give all to help removed this barrier if will be top management commitment for this.</li> <li>• Fragmented product development processes in SMEs,</li> <li>• The PCB "LCA to Go" tool focused mainly on PCB life cycle stages related with materials, production and transport. The SME has influence on all these stages or most of them and the tool can be used for their optimization.</li> <li>• Outside of scope of responsibility</li> <li>• The PCB tool shows that both PCB designer and producer are responsible for environmental issues related with PCB. Moreover customer requirements may increase the liability of the manufacturer in the area environmental protection. In such cases, the tool will help the PCB manufacturer choose a better option of PCB and will be a significant advantage.</li> <li>• Insufficient time to implement LCA (supply chain),</li> <li>• The PCB tool has implemented all needed LCA information related with PCB manufacture process</li> </ul>
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	and its transport. The PCB designer can analyse the whole life cycle of PCB.
<b>Photovoltaic I</b>	<p>The following barriers were removed:</p> <ul style="list-style-type: none"> <li>• Lack of knowledge due to received training</li> <li>• Lack of time due to usability of the LAC to Go tool and fast results</li> <li>• Lack of benefits due to realising the potential of creating a competitive advantage by communicating environmental benefits with the help of the LCA tool to Go.</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• Lack of data available for LCA</li> <li>• Lack of internal expertise</li> <li>• Lack of internal knowledge</li> <li>• Lack of managerial and operational resources (including time, cost, skills)</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Organisational capacity (especially in the case of start-ups)</li> <li>• Managerial culture</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Lack of awareness</li> <li>• By thinking about products in a life cycle perspective helped to open eyes for environmental issues (such as recycling) of some of the designers / engineers involved in product innovation.</li> <li>• Helped to debunk some misconceptions (e.g. regarding recyclability).</li> </ul>

<b>WHICH BARRIERS ARE STILL EXISTING?</b>	
<b>Answer Options</b>	<b>Response Count</b>
	7

<i>answered question</i>	7
<i>skipped question</i>	0
<b>Sector</b>	<b>Response text</b>
<b>Bio-based Plastics</b>	<ul style="list-style-type: none"> <li>• Commercial disadvantage as a results of LCA (they would like to know which is the carbon footprint range where other companies are)</li> <li>• LCA to Go tool does not exactly match the industry processes. Implementation of customisable values can solve this problem.</li> <li>• Economic short-terminism (i.e.: quick payback on investments)</li> <li>• Unclear or non-existing regulatory drivers</li> <li>• Lack of a common framework for carbon footprint calculation.</li> <li>• Lack of managerial and operational resources (including time, cost, skills)</li> <li>• Lack of data available for LCA; not all materials are covered in database</li> <li>• Not a high value innovation activity</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Need for external assistance as the training is not sufficient to implement to approach as a regular practice</li> <li>• Lack of resources</li> </ul>
<b>Electronics</b>	<ul style="list-style-type: none"> <li>• LCA to Go tool is not applicable for certain electronic sectors</li> <li>• Lack of time</li> <li>• Lack of resources</li> <li>• Lack of data available for LCA; not all materials are covered in database</li> <li>• The LCA to Go tool is not applicable to not yet</li> </ul>

	<p>developed products as it relies solely on exact data input rather than anticipated usage.</p>
<b>Industrial Machinery</b>	<p>The following barriers are still existing:</p> <ul style="list-style-type: none"> <li>• Uncertainty / doubt on benefit of environmental improvements</li> <li>• Lack of managerial and operational resources (including time, cost, skills)</li> <li>• Lack of top management commitment</li> <li>• Unclear or non-existent regulatory drivers</li> <li>• Misalignment and lack of incentives</li> </ul> <p>The following barriers are still partly existing:</p> <ul style="list-style-type: none"> <li>• A view of environmental issue as peripheral to the core business</li> <li>• Not a high value innovation activity</li> <li>• Economic short-termism (i.e. quick payback on investments)</li> <li>• Lack of data available for LCA</li> <li>• Technical barriers (e.g. products)</li> <li>• Substitutability barriers (e.g. materials, chemicals)</li> <li>• Poor access to appropriate knowledge, skills, technology and LCA best practices</li> <li>• Low perceived value in LCA investment</li> <li>• Lack of awareness, training, and motivation of employees</li> <li>• Unclear market demands for Eco design</li> <li>• Insufficient time to implement LCA (supply chain)</li> <li>• Government information asymmetries (related to interventions)</li> </ul>
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• Low perceived value in LCA investment,</li> <li>• Lack of top management commitment,</li> <li>• Unclear or non-existent regulatory drivers,</li> <li>• Unclear market demands for Eco design,</li> </ul>



	<ul style="list-style-type: none"> <li>• Uncertainty and poor appropriability of LCA,</li> <li>• Misalignment and lack of incentives.</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Lack of (customer) request for LCA</li> <li>• LCA to go tool is not suitable for large scale projects</li> <li>• Unclear market demands for Eco design</li> <li>• Unclear or non-existent regulatory drivers</li> <li>• Lack of LCA certificates</li> <li>• Lack of data available for LCA</li> <li>• Unclear demands for data input</li> <li>• Data calculation process is unclear</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• Lack of data available for LCA</li> <li>• External capacity</li> <li>• Lack of customisable data</li> <li>• Lack of data available for LCA</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Uncertainty / doubt on benefit of environmental improvements</li> <li>• A view of environmental issue as peripheral to the core business</li> <li>• Economic short-termism (i.e. quick payback on investments)</li> <li>• Lack of data available for LCA</li> <li>• Low perceived value in LCA investment</li> <li>• Lack of managerial and operational resources (including time, cost, skills)</li> <li>• Fragmented product development processes in SMEs</li> <li>• Outside of scope of responsibility</li> <li>• Unclear or non-existent regulatory drivers</li> <li>• Unclear market demands for Eco design</li> <li>• Insufficient time to implement LCA (supply chain)</li> <li>• Government information asymmetries (related to</li> </ul>

	interventions) • Misalignment and lack of incentives
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### 4.3 Incentives for LCA

WHAT WERE THE INCENTIVES TO PARTICIPATE IN THE SECTOR SPECIFIC LCA TO GO TOOL TRAINING?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
Bio-based Plastics	<ul style="list-style-type: none"> <li>• Improve knowledge about LCA</li> <li>• Improve knowledge about LCA calculation</li> <li>• Anticipate customer requirements</li> <li>• Learn how to implement LCA results into the product development and sales strategy</li> <li>• Learn how to reduce costs with LCA</li> <li>• To meet market requirements</li> <li>• To meet new legal regulations</li> <li>• Learn about simplified LCA tool that allows quantitative assessments without external expert assistance</li> <li>• Implement a simplified method for carbon footprint calculation and anticipate to the requirements of the large retail sector</li> <li>• Learn about product improvements through Eco design</li> </ul>

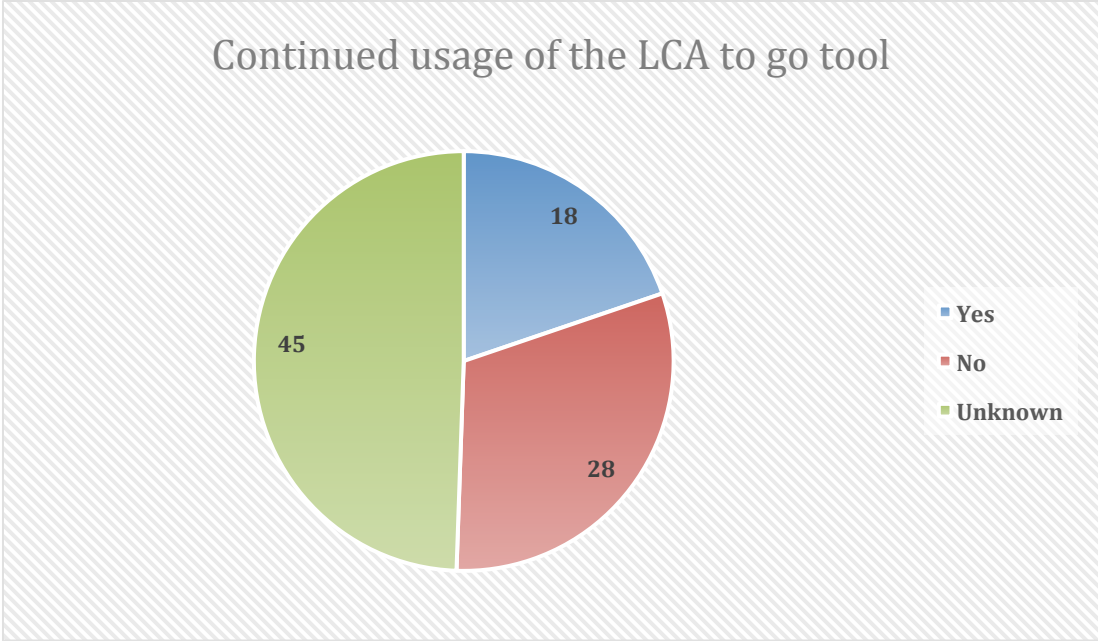
	<ul style="list-style-type: none"> <li>• Out of curiosity and to be at the forefront of product design</li> </ul>
<b>Electronics</b>	<ul style="list-style-type: none"> <li>• Anticipated environmental improvement</li> <li>• Customer demand (B2B and B2C)</li> <li>• New ways of looking at existing products/services</li> <li>• Improved communications</li> <li>• Better supplier/customer communications</li> <li>• Improved regulator relationships</li> <li>• Improved brand perception / equity</li> <li>• New market opportunities (increasing existing market share)</li> <li>• New product/service ideas</li> <li>• Product differentiation</li> <li>• "added value", Increased sales, Public sector contracts</li> <li>• Resource efficiency</li> <li>• Increased material knowledge, technology awareness and market intelligence</li> <li>• Improved management, design and innovation capacity</li> <li>• Improved OEM relationship</li> <li>• Long-term innovation opportunity</li> <li>• Integration of R&amp;D and other functions</li> <li>• Motivated staff</li> <li>• Improved access to finance / investment</li> <li>• Improved supply/value chain management</li> <li>• Reduced packaging</li> </ul>
<b>Industrial Machinery</b>	<ul style="list-style-type: none"> <li>• Free assessment of their products</li> <li>• Cooperation with the Vienna University of Technology</li> <li>• Discussion of the results and identification of improvements together with external experts</li> </ul>

	(outsiders view)
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• Anticipated environmental improvement,</li> <li>• Customer demand (B2B and B2C)</li> <li>• Legislation (anticipated),</li> <li>• Better supplier/customer communications,</li> <li>• Cost reduction (e.g. energy, bill of materials),</li> <li>• Improved OEM relationship</li> <li>• Increased efficiency in production, storage, distribution</li> <li>• Identified potential for material re-use,</li> <li>• New market opportunities (entering new markets) – in recycling</li> <li>• Resource efficiency.</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Improve knowledge</li> <li>• Add customer value</li> <li>• Interest</li> <li>• Advantage in tenders for the commercial and public sector</li> <li>• Competitive advantage</li> <li>• Added product value</li> <li>• Customer demand (B2B and B2C)</li> <li>• Anticipate customer requirements</li> <li>• Free training</li> <li>• Potential use of LCA as a promotional and marketing tool</li> <li>• Improve the understanding of LCA results</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• Improved communications</li> <li>• New ways of looking at existing products/services</li> <li>• Motivated staff</li> <li>• Environmentally aware staff</li> <li>• New market opportunities (entering new markets)</li> </ul>

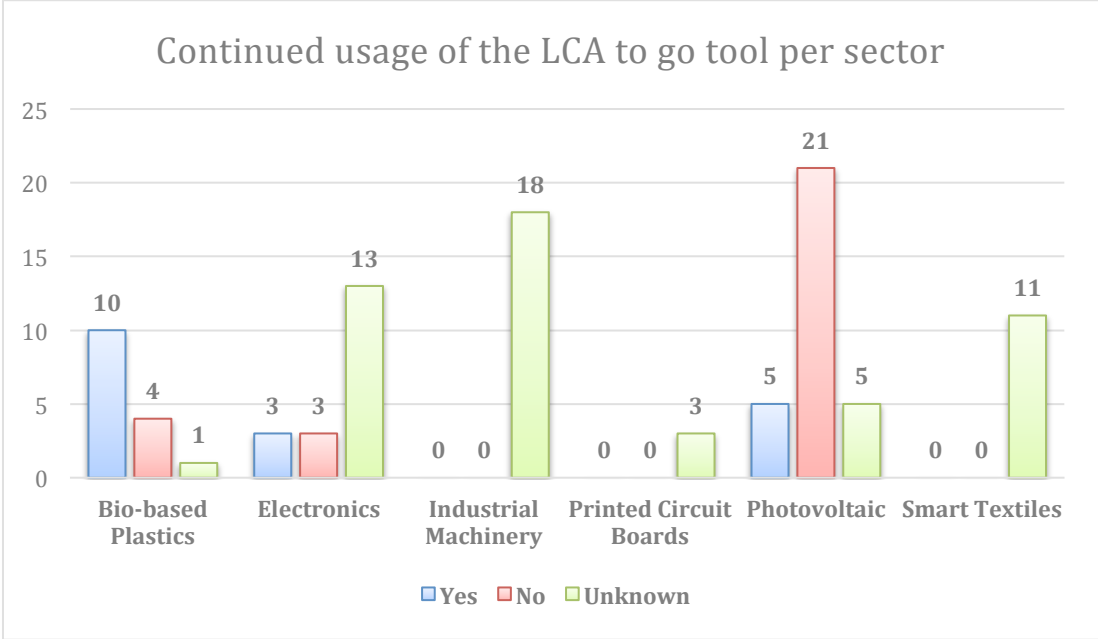
	<ul style="list-style-type: none"> <li>• New market opportunities (increasing existing market share) Improved access to finance / investment</li> <li>• “added value”</li> <li>• Increased sales</li> <li>• Public sector contracts</li> <li>• Improved communications</li> <li>• Anticipated environmental improvement</li> <li>• New product/service ideas</li> <li>• Integration of R&amp;D and other functions</li> <li>• Cost reduction (e.g. energy, bill of materials)</li> <li>• Improved access to finance / investment</li> <li>• Foresight / sector changes e.g. critical metals</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Personal interest of participants in the training programme in environmental issue</li> <li>• Some might have participated just as a favour to TU Delft or because they felt committed due to other project collaborations.</li> </ul>

HAVE THE TRAINED COMPANIES STARTED AND CONTINUED USING THE LCA TO GO TOOL?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text

<b>Bio-based Plastics</b>	<ul style="list-style-type: none"> <li>• Ten out of 15 companies have started and continued using the LCA to Go tool.</li> <li>• Four out of 15 companies have not started or continued using the LCA to Go tool.</li> <li>• For one company out of 15 it is unknown if the company started and continued using the LCA to Go tool.</li> </ul>
<b>Electronics</b>	<ul style="list-style-type: none"> <li>• For 7 companies out of 19 it is unknown if the company started and continued using the LCA to Go tool.</li> <li>• Three out of 19 companies have started and continued using the LCA to Go tool.</li> <li>• Three out of 19 companies have not started or continued using the LCA to Go tool.</li> </ul>
<b>Industrial Machinery</b>	<ul style="list-style-type: none"> <li>• The trained companies reacted differently. Some have started to use the tool and have indicated that they intend to continue doing so, while others participated in the training to obtain a first assessment and consult with the VUT on their product. Their continued use of the tool is unknown.</li> </ul>
<b>Printed Circuit Boards</b>	<ul style="list-style-type: none"> <li>• All trained companies started using the LCA tool to Go and most of them declared that they will use them in the future. In practice most of them are waiting for legal obligation or for customer requests to continued using the LCA to Go tool.</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• Twenty-one out of 26 companies have not started and continued using the LCA to Go tool.</li> <li>• Five out of 26 companies have started and continued using the LCA to Go tool.</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• For all 5 companies it is unknown if the company started and continued using the LCA to Go tool.</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• For all 11 companies it is unknown if the company started and continued using the LCA to Go tool.</li> </ul>



**Figure 6: Continued usage of the LCA to Go tool after the training**



**Figure 7: Continued usage of the LCA to Go tool after the training by sector<sup>1</sup>**

<sup>1</sup> Photovoltaic was the only sector which provided data based on tracking the user behaviour using the web tool. All other answers are based on estimations.

FOR WHAT SPECIFIC PURPOSE ARE THE TRAINED COMPANIES USING/ INTENDING TO USE THE LCA TO GO TOOL FOR?	
Answer Options	Response Count
	7
<i>answered question</i>	7
<i>skipped question</i>	0
Sector	Response text
<b>Bio-based Plastics</b>	<ul style="list-style-type: none"> <li>• Customer demand (B2B and B2C)</li> <li>• Cost reduction (e.g. energy, bill of materials)</li> <li>• New market opportunities (entering new markets)</li> <li>• New market opportunities (increasing existing market share)</li> <li>• Associated quality indicators</li> <li>• Improved management, design and innovation capacity</li> <li>• Customer demand (B2B and B2C)</li> <li>• Improved management, design and innovation capacity</li> <li>• Product differentiation</li> </ul>
<b>Electronics</b>	<ul style="list-style-type: none"> <li>• Unknown</li> <li>• Communicating the benefits of LED lighting technology and of reusing some bulk material parts of the lamp.</li> <li>• Supporting partners / clients in R&amp;D projects with LCA evidence.</li> <li>• Eco design of buoy products.</li> <li>• Quantify carbon footprint savings</li> <li>• Increase environmental transparency for external communications</li> </ul>



	<ul style="list-style-type: none"> <li>• Comparison of different packaging designs they are developing for their clients</li> <li>• Compiling auditable data to provide evidence that LCA is in place</li> <li>• Individually customised assessments for individual clients.</li> </ul>
<p><b>Industrial Machinery</b></p>	<p>Intended usage of the LCA to Go tool (fully applicable)</p> <ul style="list-style-type: none"> <li>• Anticipated environmental improvement</li> <li>• Customer demand (B2B and B2C)</li> <li>• Legislation (anticipated/actual)</li> <li>• New ways of looking at existing products/services</li> <li>• Improved communications</li> <li>• Cost reduction (e.g. energy, bill of materials)</li> <li>• Long-term innovation opportunity</li> <li>• Resource efficiency</li> <li>• Foresight / sector changes e.g. critical metals</li> </ul> <p>Intended usage of the LCA to Go tool (partly applicable)</p> <ul style="list-style-type: none"> <li>• Better supplier/customer communications</li> <li>• Increased material knowledge, technology awareness and market intelligence</li> <li>• improved management, design and innovation capacity</li> <li>• Improved regulator relationships</li> <li>• Improved supply/value chain management</li> <li>• Increased efficiency in production, storage, distribution</li> <li>• Associated quality indicators</li> <li>• On-site recycling</li> <li>• Reduced packaging</li> <li>• Identified potential for material re-use</li> <li>• New market opportunities (entering new markets)</li> </ul>

	<ul style="list-style-type: none"> <li>• New market opportunities (increasing existing market share)</li> <li>• Long term gains arising from short term investments</li> <li>• Product differentiation</li> <li>• Integration of R&amp;D and other functions</li> </ul>
<p><b>Printed Circuit Boards</b></p>	<ul style="list-style-type: none"> <li>• Marketing purposes,</li> <li>• Meeting requests from customers regarding environmental/LCA information,</li> <li>• Optimizing transport profile of the product,</li> <li>• Improvement of environmental efficiency of products - especially energy consumption,</li> <li>• Assessing manufacturing process of PCBs: to reduce the material/energy consumption, reduce the waste and improve efficiency of manufacturing process,</li> <li>• Assess, check and evaluate factories co-operated with us to ensure that they consistently maintain environmental standards that comply with regional laws,</li> <li>• If there will be a request from our customers to present Carbon footprint indicators,</li> <li>• The tool might help us to undertake new recycling operations in the area of electronics products and PCBs,</li> <li>• For new products assessment,</li> <li>• The results like water and energy consumption could be used to improve the environmental efficiency of our company,</li> <li>• We will be inform also our customers about possibilities of the environmental reports offering by the "LCA to Go " tool,</li> <li>• Information about CO2 emissions and energy consumption could be used to improve the environmental efficiency of our products,</li> <li>• For company budget planning by utilization of sophisticated version of PCB tool,</li> <li>• Results from the tool will be disseminated dependence from customer requirements or law</li> </ul>

	<p>obligations,</p> <ul style="list-style-type: none"> <li>• To planning place of PCB manufacture,</li> <li>• To improving environmental efficiency of the products,</li> <li>• To generating environmental reports for customers or other parties when such law obligation will be or customers' requests.</li> </ul>
<b>Photovoltaic I</b>	<ul style="list-style-type: none"> <li>• To improve PV system design</li> <li>• Make environmental performance improvements</li> <li>• To use in marketing activities</li> <li>• Feed into organisational sustainability/ environmental performance reporting</li> <li>• To improve knowledge of LCA</li> <li>• Enhance marketing</li> <li>• Add customer value</li> <li>• Support to win tender contracts</li> <li>• Increase sales from commercial clients</li> <li>• Assist in making environmentally friendly decisions</li> <li>• Marketing tool</li> <li>• Supporting information to gain customers</li> <li>• Improve company image</li> <li>• Customer demand</li> </ul>
<b>Photovoltaic II</b>	<ul style="list-style-type: none"> <li>• To open up new markets</li> <li>• Work with governmental organisations</li> <li>• Calculate the environmental impacts of products</li> <li>• R&amp;D support</li> <li>• Manufacturing support</li> </ul>
<b>Smart Textiles</b>	<ul style="list-style-type: none"> <li>• Most SMEs did not actually pursue a purpose when using the tool – it was rather that we convinced them to test it out and they did it out of curiosity.</li> </ul>

## 5 Analysis & Discussion

### 5.1 General Questions

The questionnaire was divided in three main parts, general questions, questions about the barriers to LCA and questions about the incentives for LCA. The first part concentrated on general questions about numbers, type and sectors of the trained companies. Further three questions aimed to get insight into the opinions and experience of the trainers. All trainers provided training to companies in their specific sectors ranging from 31 companies in the photovoltaic sector to 3 trained companies in the printed circuit board sector, summing up to a total of 97 trained companies [see Figure 1]. Respondents were then asked how the trained companies were identified. The answers given revealed a wide range of different approaches. The vast majority of the chosen approaches related to recruitments through personal contact with the companies. Only in two sectors, industrial machinery and printed circuit boards was a general advertising campaign amongst other approaches included. The choice of the recruitment approaches might indicate a general lack of interest in LCA as companies were almost exclusively recruited via a personal approach. Interestingly, the least companies were recruited in the printed circuit board sector which is one of the sectors where a general advertising approach was incorporated which might again indicate a lack of interest in LCA training. Arguably a number of different reasons might have influenced the under representation of companies from the printed circuit board sector in data sample.

Based on their personal experience, the respondents were asked what difficulties the trained companies had in implementing the LCA to Go tool. The most frequent answers were the lack of time and resources across most of the sectors. For the sectors bio-based plastics and printed circuit boards no difficulties were mentioned, indicating that the training resolved any problems in implementing the LCA to Go tool. The only outstanding point for the printed circuit board sector is the reported perceived lack of interest in participating in the training, perhaps due to a lack of legal obligations for LCA. This provides the first insight into why it might have been difficult to recruit companies for the LCA to Go tool training. Several other points for the different sectors stood out, revealing shortcomings of the LCA to Go tool itself for the sectors electronics, photovoltaic and smart textiles. For example, the respondent for the electronics sector reported that the application of the LCA to Go tool is limited to a small number of specific products within the sector. Further, where the tool is applicable it was only able to provide top level indicators rather than providing assessment at a deeper level.

Despite these limitations, clear advantages of the tool were also highlighted by the respondents including the user friendliness due to a clear structure and

easily operated interface. Together with a choice of appropriate and easily understood language, the simplified process of the LCA assessment was seen as an advantage, simplifying the understanding of the usage of the tool and enabling the users to get quick results based on limited data input. Hence, LCA to Go tool was perceived as a suitable marketing and communication tool, especially as an introduction to the concept of LCA and for stimulating awareness of LCA.

Two major sectors of limitations were specified, the limitation of the LCA to Go tool in its application and missing incentives for LCA in general. Limitations in particular regarding the scope of the application became apparent for all sectors except for the industrial machinery sector. The top missing incentives for LCA were a lack of or low customer and market demand probably as a result of a lack of requirements for engagement through legal frameworks. Further missing incentives such as energy labels for LCA or a missing central database of best LCA practice are especially in the industrial machinery sector existent.

In particular, the missing incentives provide further insight into potential reasons for why it was difficult to attract companies to the training. Arguably, the companies were not aware of the limitations of the tool itself or other factors such as missing energy labels and the lack of a central database of best practice. Besides, it remains questionable if these limitations might be outweighed by the advantages of the LCA to Go tool. Hence, the missing customer and market demand and missing legal regulations for LCA might be a major barrier to the usage of the LCA to Go tool. Although firm conclusions on this point cannot be reached as a result of this research, a focus on the potential for external stimulation of LCA as appropriate to different industrial sectors should be the subject of further research.

## **5.2 Barriers to LCA**

The second part of the questionnaire concentrated on the barriers to LCA before and after the received LCA to Go tool training from a company participant perspective. The sector specific LCA to Go tool aims to minimise or remove identified barriers. Gaining further insight into how the LCA to Go tool assisted in overcoming the identified barriers will be an important contribution to understanding the degree of successful implementation and continuous usage of the sector specific LCA to Go tool in European SMEs.

All companies reported a wide range of barriers to LCA prior to the LCA to Go tool training. The major barriers can roughly be categorised into a lack of a range of resources, lack of awareness and knowledge and lack of incentives. All three categories seem to be interrelated. Existing LCA appears to be highly complex, resource, time and cost intensive and only feasible with the help of

special training or external expertise. Due to unclear or non-existing market regulatory drivers, a lack of market and customer demands and poor access to LCA best practice guides, the participating companies perceive LCA as a low value activity which is peripheral to core business. At the same time this low perceived value leads to a lack of interest, knowledge and awareness in LCA. Hence, a lack of incentives to undertake LCA in conjunction with the necessity for major investments in order to undertake a LCA must inevitably lead to a lack of interest, awareness and knowledge of LCA.

Asked if any of the previously existing barriers to LCA were removed with the sector specific LCA to Go tool, all sectors except for the electronics sector reported that barriers were removed or minimised. Recognising, through the research, that the LCA to Go tool for the electronics sector is very limited in its application it is not surprising that the reduction in the barriers was much more modest in this sector.

In order to gain further insight into which barriers were removed or minimised by the LCA to Go tool, respondents were asked to provide further details. Across all sectors respondents frequently specified the barriers 'lack of knowledge' and 'awareness' as having been removed. Furthermore, the removal of lack of time, resources and data for the LCA to Go tool emerged from the provided answers. Singular cases also reported that the lack of incentives was minimised due to the training as some participants started recognising a potential competitive advantage in the usage of the tool.

The final question of the second part of the questionnaire addressed the question of which barriers still existed after the received training in the LCA to Go tool. The remaining barriers across all sectors can roughly be categorised into barriers due to the inherent limitations of the LCA to Go tool and a lack of incentives. As all sector specific LCA to Go tools disclose shortcomings in its universal application in the specific sectors, companies are faced with the uncertainty of if the tool is applicable for their specific situation, creating a natural barrier to its application. Again, the missing incentives in the form of market and customer demands and legal regulations led to a low perceived value of LCA which is seen as peripheral to the core business, thus there remains a lack of management commitment. Single cases also still reported a lack of resources and time as a remaining barrier after the LCA to Go tool training.

However, it has clearly emerged that the sector specific LCA to Go tool removed a wide range of resource related barriers due to its simplification. At the same time, it emerged that the LCA to Go tool has shortcomings in its development which created an additional barrier to the previously existing ones. This points to the need for additional research that explores the balance between comprehensive assessment and simple implementation. The major barrier of missing incentives for LCA obviously cannot be addressed by the LCA to Go tool.

### **5.3 Incentives for LCA**

In order to make recommendations for the future usage of the tool and further development directions it is important to gain further insight into the incentives of the participating companies to undergo the training and for the future usage of the LCA to Go tool. Comparing the incentives to undergo the training to the intended usage of the LCA to Go tool will also provide valuable insight into the suitability of the tool.

The major incentive across all sectors for the participation in the training was to improve the general knowledge about LCA and to meet market, customer and legal requirements. This incentive is surprising in view of the fact that it was highlighted as the major barrier to LCA by the trainers and participating companies. Most of the other incentives were related to adding value in various different ways such as, exploring new market opportunities, gaining new customers, adding customer value, winning tenders, reducing costs, creating a competitive advantage and increasing sales.

When asked about the intended usage of the LCA to Go tool, using it as a marketing and communication tool stood out. Furthermore, a wide range of value adding activities such as, exploring new market opportunities, adding customer value, reducing waste and increasing resource efficiency were mentioned.

The continued usage of the LCA to Go tool was determined in two ways. The login data of the web tool of the LCA to Go tool revealed that six trained companies did not register. All other companies registered for the web tool and used it at least once. Based on the answers of the trainers, only eighteen companies continued to use the tool. Twenty-eight companies did not continue using the tool and the continued usage remains unknown for 45 companies.

Following economic principles, the major incentives for companies to participate in the training was adding value in various different ways with the application of the LCA to Go tool. The intended usage after the training confirms that the LCA to Go tool appears suitable to fulfil these expectations. The continued usage of the LCA to Go tool after the training however, does not indicate that these incentives are strong enough to ensure a continued usage of the tool.

## 6 Conclusion

This report presents the results of a questionnaire based investigation into the implementation, suitability and continuous usage of the sector specific LCA to Go tool in European SMEs. The results demonstrated that the sector specific LCA to Go tool is limited in the scope of its application. This applies in particular to the electronics sector. Nevertheless, the simplification of the LCA and its clear and user friendly interface removed and minimised a range of resource related barriers that had previously prevented businesses from implementing LCA. The barriers of a lack of market and customer demand and missing legal regulations however remained.

The analysis of the questionnaires presents four main conclusions:

- The LCA to Go tool is limited in the scope of its application
- The LCA to Go tool removed major resource related barriers for its application due to its simplification and clear and easy interface
- The major remaining barriers for the application of the LCA to Go tool are outside of the scope of the tool and are concerned with external demand generation (e.g. legal frameworks)
- The LCA to Go tool is suitable to add value to businesses in various ways and is highly suitable as a marketing and communication instrument.



## **7 Recommendation**

Based on the results of this report the following recommendations are made.

The LCA to Go tool requires some improvements if it is to achieve wide scale use. Thus, research is required to understand the effective balance between comprehensiveness and accessibility. No companies have been trained for the sensors sector. Hence, it is proposed to address this shortcoming in future developments of the LCA tool to Go. Inevitably, it will also be necessary to customise the LCA to Go tool for additional sectors to enable a widespread application of the tool.

Of outstanding importance, and the subject of policy recommendations, is the development and implementation of external encouragement for LCA use, e.g. through legal regulations for LCA on national and European levels. The report has highlighted that lack of legal regulations are the main barriers in implementing LCA in business procedures as a lack of market and customer demands means that there is inadequate incentive for use. Furthermore, it is highly recommended to create obligatory and reliable LCA best practice standards and the introduction of LCA energy labels across all industry sectors.

## 8 Limitations

A range of limitations of this report must be taken into consideration. The major limitation of the report is inherent with the undertaken data gathering. The LCA to Go tool trainers were used as a proxy to obtain the data underlying this report. As all trainers are simultaneously project partners of the project "Boosting Life Cycle Assessment Use in European Small and Medium-sized Enterprises" a degree of bias cannot be excluded. However, it is notable that the answers across all respondents were of similar nature. Furthermore, it was not possible to obtain factual data regarding the continued usage of the LCA to Go web tool. Hence, no reliable conclusion can be drawn.

An additional limitation lies in the nature of the undertaken training. The training was undertaken by seven different trainers without a form of quality assurance which might have led to companies receiving a different quality of training, leading to a potentially biased feedback on the tool itself. However, as most of the responses report generic issues around incentives, depth of the capabilities of the tool and usefulness in raising awareness, the indicators for future research investigation remain valid.

## 9 References

BRYMAN, A. & BELL, E. 2003. *Business, Research, Methods*, New York, Oxford University Press Inc. .

MASON, J. 2006. *Qualitative Researching*, London, SAGE.

MILES, M. B. & HUBERMAN, A. M. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*, London, SAGE.

PATTON, M. Q. 2002. *Qualitative Research & Evaluation Methods*, Thousand Oaks, SAGE.

### GENERAL QUESTIONS

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1. HOW MANY COMPANIES DID YOU TRAIN?
2. FROM WHICH OF THE FOLLOWING SECTORS WERE THE COMPANIES YOU TRAINED?

Please provide the exact numbers if you trained companies from more than one sector.

- a. Bio-based Plastics
  - b. Industrial Machines
  - c. Smart Textiles
  - d. Photo Voltaic
  - e. Sensors
  - f. Electronics
  - g. Printed Circuit Boards
- 
3. WERE THESE COMPANIES:
    - a. Supplier of intermediate products to larger companies, or
    - b. Selling final products to distributors/retailers?

# COMPANY SPECIFIC QUESTIONS

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Please answer each the following questions for each of the companies you trained.

## 1. Barriers to LCA

The “Detailed Policy Recommendation Report and Briefings” report (please see attachment) identified a number of barriers to LCA [see Table 1]. The sector specific LCA to go tool aims to minimize or remove these barriers. Please answer the following questions in as much detail as possible and whenever possible separately for each of your companies.

1.1 WHICH BARRIERS TO LCA EXISTED PREVIOUS TO THE SECTOR SPECIFIC LCA TO GO TOOL TRAINING?

1.2 DID THE SECTOR SPECIFIC LCA TO GO TOOL REMOVE ANY OF THESE BARRIERS?

1.2.1 WHICH BARRIERS DID THE SECTOR SPECIFIC LCA TO GO TOOL REMOVE AND HOW?

1.3 WHICH BARRIERS ARE STILL EXISTING?

Table 1: Market barriers to LCA

level	barrier	type
strategic	Uncertainty / doubt on benefit of environmental improvements	Managerial culture
strategic	A view of environmental issue as peripheral to the core business	Managerial culture
strategic	Commercial disadvantage as a results of LCA	Internal capacity to exploit external resources
strategic	Not a high value innovation activity	Managerial culture
strategic	Economic short-termism (i.e. quick payback on investments)	
strategic	Failure of SME managers to act strategically	Internal capacity to exploit external resources
strategic	Sunk investments (e.g. technologies, equipment)	Organisational capacity (especially in the case of start-ups)
operational	Lack of data available for LCA	External capacity
operational	Functional barriers (e.g. products)	Internal capacity to exploit external resources
operational	Technical barriers (e.g. products)	Internal capacity to exploit external resources
operational	Substitutability barriers (e.g. materials, chemicals)	Internal capacity to exploit external resources
managerial	Poor access to appropriate knowledge, skills, technology and LCA best practices	Organisational capacity (especially in the case of start-ups)
managerial	Low perceived value in LCA	Managerial culture

<b>managerial</b>	<b>Low perceived value in LCA investment</b>	<b>Managerial culture</b>
<b>managerial</b>	Lack of internal expertise	Organisational capacity (especially in the case of start-ups)
<b>managerial</b>	Lack of internal knowledge	Organisational capacity (especially in the case of start-ups)
<b>managerial</b>	Lack of managerial and operational resources (including time, cost, skills)	Managerial culture
<b>managerial</b>	Lack of top management commitment	Managerial culture
<b>managerial</b>	Lack of awareness, training, and motivation of employees	Internal communication and information systems
<b>managerial</b>	Fragmented product development processes in SMEs	Organisational capacity (especially in the case of start-ups)
<b>external</b>	Outside of scope of responsibility	Organisational capacity (especially in the case of start-ups)
<b>external</b>	Unclear or non-existent regulatory drivers	Organisational capacity (especially in the case of start-ups)
<b>external</b>	Unclear market demands for ecodesign	Internal capacity to exploit external resources
<b>external</b>	Insufficient time to implement LCA (supply chain)	Managerial culture
<b>external</b>	government information asymmetries (related to interventions)	Organisational capacity (especially in the case of start-ups)
<b>external</b>	Uncertainty and poor appropriability of LCA	Organisational capacity (especially in the case of start-ups)
<b>external</b>	Misalignment and lack of incentives	Organisational capacity (especially in the case of start-ups)

# 1. INCENTIVES FOR LCA

The “Detailed Policy Recommendation Report and Briefings” report (please see attachment) identified a number of drivers for LCA [see Table 1]. For the further improvement and refinement of the sector specific LCA to go tool it will be important to identify sector specific drivers. Please answer the following questions in as much detail as possible and whenever possible separately for each of your companies.

## 1.1 WHAT WERE THE INCENTIVES TO PARTICIPATE IN THE SECTOR SPECIFIC LCA TO GO TOOL TRAINING?

## 1.2 HAVE THE TRAINED COMPANIES STARTED AND CONTINUED USING THE LCA TOOL TO GO?

## 1.3 FOR WHAT SPECIFIC PURPOSE ARE THE TRAINED COMPANIES USING/ INTENDING TO USE THE LCA TOOL TO GO FOR?

Table 1: Drivers for LCA

level	driver
external	Anticipated environmental improvement
external	Customer demand (B2B and B2C)
external	Legislation (anticipated/actual)
managerial	Reduced risk
managerial	New ways of looking at existing products/services
managerial	Improved communications
managerial	Better supplier/customer communications
managerial	Increased material knowledge, technology awareness and market intelligence
managerial	improved management, design and innovation capacity
managerial	Improved OEM relationship
managerial	Improved regulator relationships
managerial	Improved supply/value chain management
operational	Cost reduction (e.g. energy, bill of materials)
operational	Increased efficiency in production, storage, distribution
operational	Reduced compliance costs – e.g. landfill tax
operational	Reduced end-of-life treatment costs
operational	Associated quality indicators
operational	Motivated staff
operational	Healthy environmentally aware staff
operational	On-site recycling
operational	Reduced packaging
operational	Identified potential for material re-use
strategic	Improved brand perception / equity

<b>strategic</b>	<b>New market opportunities (entering new markets)</b>
<b>strategic</b>	New market opportunities (increasing existing market share)
<b>strategic</b>	Increased product functional quality
<b>strategic</b>	Long-term innovation opportunity
<b>strategic</b>	New product/service ideas
<b>strategic</b>	Long term gains arising from short term investments
<b>strategic</b>	Product differentiation
<b>strategic</b>	"added value", Increased sales, Public sector contracts
<b>strategic</b>	Resource efficiency
<b>strategic</b>	Improved access to finance / investment
<b>strategic</b>	Foresight / sector changes e.g. critical metals
<b>managerial</b>	Integration of R&D and other functions



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