



Title:

**Workshop 2
Documentation**

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1 Introduction

1.1 The second work shop

The second eLCAr Stakeholder Workshop took place on October 9th in Aachen, Germany. In the first eLCAr Stakeholder Workshop, held in June in Zurich, Switzerland, the eLCAr consortium assessed needs and expectations of our stakeholders concerning the guidelines. The results of this workshop were of great significance and influenced the development of the draft version of the guidelines significantly.

The aim of the second eLCAr Stakeholder Workshop was to present intermediate results to the stakeholders and to receive feedback on the guidelines' current status as well as the potential for further improvement. To facilitate the exchange the guideline drafts of the discussed key chapters were available beforehand. The focus was laid on the chapters concerning goal definition, scope definition and LCI modelling for the production, use and end-of-life (EOL) phase.

In addition to the drafts there were presentations concerning concepts for testing the guidelines and give insights in learning materials addressing the guidelines.

This document will present the setup and realization of the workshop (chapter 2). The course of discussion is documented in chapter 3. Outcomes of the two surveys will be presented in chapter 4 (Survey on training materials) and chapter 5 (survey on the workshop and the guidelines in general). Finally, chapter 6 will present the conclusions drawn from discussion outcomes and surveys will be summed up and their influence on the further proceeding of the project will be described.

1.2 Workshop Agenda

A detailed overview of the workshop agenda is given below.

Time	Agenda/ Topic	Responsible
09:00	Registration & Coffee	-
09:30	Welcome	<i>Sebastian Winter (RWTH)</i>
09:45	Challenges and framework for the development of ILCD guidelines for BEVs	<i>Andrea Del Duce (Empa)</i>
10:15	Main results from the first workshop and its influence on the guidelines	<i>Eva Szczechowicz (RWTH)</i>
10:45	Coffee Break	-
11:00	Presentation of guidelines: Goal Definition	<i>Andrea Del Duce (Empa)</i>
11:30	Presentation of guidelines: Scope Definition and LCI modelling framework	<i>Patricia Egede (TUBS)</i>
12:15	Lunch	-
13:15	Presentation of guidelines: LCI Analysis - Production phase	<i>Andrea Del Duce (Empa)</i>
13:45	Presentation of guidelines: LCI Analysis - Use phase	<i>Thomas Büttler (Empa)</i>
14:15	Presentation of guidelines: LCI Analysis - End-of-Life phase	<i>Patricia Egede (TUBS)</i>
14:45	Coffee Break	-
15:00	Feedback session	<i>eLCAr Consortium</i>
16:00	Break	-
16:10	Testing of the guidelines: Introduction to concepts	<i>Eva Szczechowicz (RWTH)</i>
16:25	Learning Material: Introduction to concepts and learning material development	<i>Marten Stock (ifu)</i>
16:45	Wrap up & Goodbye	<i>Sebastian Winter (RWTH)</i>
17:00	End	-

2 Workshop Setup

The second eLCAr stakeholder workshop was structured in three presentations concerning organization of the development of the guidelines, five input presentations concerning the guidelines content and a feedback session. Further presentations were given concerning the testing of the guidelines and additional learning material. The lunch and coffee breaks were used for continuing discussions and bilateral exchanges.

Each input presentation was used to present the ideas developed in the guidelines. No further information than documented in the guideline drafts was introduced. The input presentations were used to create a common knowledge level among all participants. Additionally each participant received a printed version of the draft guidelines at the beginning of the workshop.

After each input presentation a questions round was introduced. At that point some questions especially concerning particular presentation slides came up. Discussions with the eLCAr consortium and among participants were encouraged but not steered by the eLCAr consortium in order to facilitate an open conversation atmosphere and to avoid any bias. When time was not sufficient for the discussion the remaining questions and open discussion topics were written on flip charts to keep them in mind and sight. During the breaks some discussions were ongoing. Open topics were also documented on the flip chart.

The documented open issues were addressed again during the dedicated feedback session. Lively and constructive discussions between participants as well as between participants and consortium members took place. Questions were answered and feedback was given. Some stakeholders identified issues with an additional need for guidance and provided literature references that covered these specific issues. The consortium experienced this session in a very positive way.

At the end of the discussion session an additional questionnaire was handed out. This questionnaire covered general topics of the organizational infrastructure and certain aspects of the guideline content (see also chapter 5).

After the feedback session the methodology for testing the guidelines and the concept of the training materials were introduced to the participants. Concerning the training materials a short questionnaire was handed out in order to collect some feedback for further development of training materials (see also chapter 4).

All presentation slides are available online at:

<http://www.elcar-project.eu/downloads/workshop-2/presentations/>

3 Course of Discussion

3.1 Goal Definition

Within the general ILCD Handbook the following six aspects are addressed in the context of the goal definition:

- Intended application(s) of the deliverables/results
- Limitations due to the method, assumptions, and impact coverage
- Reasons for carrying out the study and decision-context
- Target audience of the deliverables/results
- Comparative studies to be disclosed to the public
- Commissioner of the study and other influential factors.

During the “Goal Definition” session, these six aspects were presented and their adaptation to the case of electric vehicles was described.

At the end of the presentation a participant asked whether the guidelines would cover in the same way the two decision contexts addressing decision support (i.e. Situation A and B). It was replied that, since Situation A addresses studies which focus more on a contemporary or near future time frame and on short term technology innovation, guidance can be provided in a comprehensive way as the main context of the scenarios is known to a good degree. Instead, in Situation B, which concerns studies involving large changes which may occur due to more radical electric vehicle penetration scenarios, the scope of possible studies is larger and makes the formulation of precise and comprehensive guidance more difficult if not impracticable.

For this reason it was argued that the guidelines will mainly focus on Situation A, while also discussing key aspects which should be taken into account when addressing Situation B.

3.2 Scope Definition and LCI modelling framework

Regarding the scope definition and the LCI modelling framework the following aspects were discussed during the workshop:

- Function, functional unit and reference flow
- LCI modelling framework
- System boundaries
- Preparing the basis for the impact assessment
- Technological, geographical and time-related scope and data representativeness
- Comparison between systems
- Identifying critical review needs
- Planning reporting

After the presentation the following issues were discussed.

Functional unit

The question was asked how detailed the functional unit should be defined in order to reach a functional equivalence of an ICEV and a BEV. It was replied that the definition of the functional unit

depends on the goal and scope. For a majority of studies, the transport service in kilometers is a good functional unit if two similar cars are compared. However, depending on the goal and scope, the LCA practitioner has to go into detail when special functions have to be fulfilled. For example, it has to be examined if it makes sense to compare a family car and a sports car when the number of seats is important. Another issue is the inability of the current and short-term BEVs to drive long distances. It was suggested by one participant to use the integration of a rental car in the LCA to make up for the shortcoming as an optional solution. However, it was emphasized of the consortium that the guidelines are not able to define each individual case, but left some flexibility for own choices and only demand from a respective LCA practitioner to report how and why the functional unit was defined in a certain way.

Infrastructure

The question was asked whether the infrastructure has to be included or not. It was replied that in compliance with the ILCD Handbook the infrastructure has to be included in the scope of the LCA.

Allocation rules

The question was asked if there will be guidance on allocation rules, e.g. in refineries. It was replied that in general the ISO hierarchy is followed. Particular guidance is given on system expansion as this is of particular interest for recycling processes. When using different databases particular attention has to be put on the allocation rules in order to achieve comparability and consistency.

Life time of batteries

It was discussed whether the life time of the batteries depends on the charging and discharging management or not and about the extent of the associated impact on an LCA. An agreement was not reached on this topic. It was emphasized that the guidelines must mention the issue of the life time of batteries.

Due to the time schedule several aspects concerning the scope and LCI modelling framework were postponed to the feedback session in the afternoon. These discussions are summarized in the following paragraphs.

Comparability considering price difference

It was discussed how the price difference of alternatives can be considered in the LCA. It was suggested to include it in the interpretation when deriving conclusions and recommendations.

Include hybrid electrical vehicles and plug-in electrical vehicles

The suggestion was made to include hybrid electrical vehicles (HEVs) and plug-in hybrid electrical vehicles (PHEVs) into the guidelines. It was replied that the BEV is in the focus of the eLCAr guidelines. However, the concepts should also be applicable for PHEVs. The only restriction lies in the guidelines for the use phase which do not cover PHEVs.

Fuel cell electrical vehicles

The remark was made to include fuel cell electrical vehicles (FCEVs) in the guidelines due to their technical similarity with BEVs. It was replied that guidelines on fuel cells in general already exist and

that FCEVs are out of the scope of the eLCAr project. However, a reference in the guidelines can be given.

System boundary of batteries

It was remarked that information on the batteries (XXX per kg battery) must be more specific, e.g. what is meant with batteries: is it only the cells or is the casing included as well. This suggestion was met with general approval by the audience and the project consortium and the subject will be addressed in more detail in the next guideline versions.

Part-system interaction

It was asked how part-system interactions will be addressed in the guidelines. In the answer it was pointed out that the interdependency matrix discussed in the first workshop addresses this issue. A quantitative approach was seen as critical by some stakeholders as e.g. the effects do not add up (e.g. one measurement reducing the consumption 10% and another one reducing it 5% each do not add up to -15%).

3.3 LCI Analysis - Production phase

The technical session on the Life Cycle Inventory Analysis started with looking in more detail at the production phase. Apart from reviewing the main steps in the development of an LCI within the ILCD framework and describing the concepts of modularity and avoidance of black-box datasets, the key processes within the system boundaries of vehicle production listed in the guidelines were presented and recommendations for the data collection of various components were given.

At the end of the presentation a participant commented that a high degree of transparency and the complete avoidance of black-box processes are mainly important for the foreground system since, in a comparison, many processes of the background would be the same and could be less interesting for the understanding of the system.

It was confirmed to the participant that the concept of avoidance of black-box processes was particularly relevant for the foreground system. Nevertheless, a good degree of modularity should still be used in the background since this allows to understand the relative contribution of the various parts of the system.

3.4 LCI Analysis - Use phase

During this session, some of the key processes within the system boundaries of the use phase of an electric vehicle were listed and the relevant aspects which should be considered during the estimation of the consumption of a vehicle were described. In the evaluation of the consumption of an electric vehicle, the contributions coming from the pure motion, the use of heating and cooling systems due to climatic conditions, the use of auxiliaries (e.g. radio, navigation, lighting, etc.), and the charger were addressed. At the end of the presentation several questions concerning ways of quantifying these contributions were asked by the participants.

Firstly it was asked whether in the guidelines a specific distinction between a wheel drive and rear wheel drive (shift in axle load during braking) was taken into account in the context of regenerative braking. It was replied that this differentiation was not covered, since most of the trajectories on which consumption calculations are performed (typically driving cycles) are flat and would therefore not benefit so strongly from a different position of the traction axle. Also, due to the specific algorithmic strategy used by recuperation systems, the amount of recuperated energy is lower than the peak energy which may come out of the electric motor, which cuts off the influence of extreme driving behaviours to protect important system components (maximum current for battery charging, maximum current of the power electronics). It was recognized, nevertheless, that the overall efficiency of regenerative braking will change with new technologies.

Several questions then addressed the use of heating and cooling systems. It was first observed that in terms of consumer behaviour climate comfort is very critical and that in this context suitable devices need to be included in the modelling. Solutions which in real situations would heat up the car in about 15 minutes are simply not realistic. In this context, it was replied that various devices are discussed in the guidelines: PTCs as well as heat pumps, even though exact user statistic and related consumptions for real-world analysis are not precisely known yet. It was then observed by a participant that these systems are not only used for the comfort of the passengers, but also for safety reasons as in the case of the demisting of the windows in humid climates, where heating and dry, cool air are used simultaneously. It was replied that this particular aspect has not been considered to this stage, but that it will be looked at during the last part of the project. It was finally asked whether the guidelines give indications on the use of pre-conditioning (i.e. the programmed heating or cooling of the car while it is still connected to the grid and prior to the departure) in the evaluation of the consumption. This may be beneficial in terms of vehicle consumption since a better use of the human heat is made and less ventilation may be required. It was stated by the consortium that no reference was present in the guidelines due to lack of data but that it should be mentioned as a possible strategy which should be accounted for when used.

A participant commented that the values of the auxiliaries reported seemed low. The consortium answered that it would look again at the figures, even though these were meant as an example for illustrating how to evaluate their contribution and that every user can use the values corresponding to the specific devices used in the vehicle analysed.

Overall, it was commented by some participants that there were some papers they could suggest on the use of comfort devices and auxiliaries which it may be worth looking into to see whether some further general indications could be extracted. The consortium welcomed this offer.

Finally, it was observed that a key issue in the use phase are the details of the electricity mix used such as, for example, where the electricity comes from and when it is taken from the grid. Here the consortium replied that it acknowledges that more specific recommendations on these topics could be included. Technically, a practitioner could derive the answers to these topics from the general recommendations given on data representativeness and on planning data collection. Nevertheless it would be helpful to translate the general indications in more specific guidance on the treatment of electricity mixes.

3.5 LCI Analysis - End-of-Life phase

Initially, the general process of the EoL treatment of an electric vehicle was presented schematically. This general process was subdivided into four main process steps: the mandatory pretreatment/dismounting, optionally the further treatment or the shredding and separation and finally the recycling processes which lead to the secondary good. Examples of battery and electric motor treatment were discussed and different potential options of their recycling were pointed out. Finally, an example of solving multifunctionality with system expansion and substitution was described on the basis of steel recycling.

After the presentation it was discussed, how energy recovery should be handled. According to the ILCD Handbook the system expansion and substitution (i.e. crediting) is also recommended. But it has to be clearly documented, for what the credit is given. Furthermore, a high ratio of energy recovery could lead to negative results from the EOL phase which has to be described as well.

In the case of plastics, three options for the recycling were pointed out: material recycling, energy recovery from the incineration plant and the replacement of coal as combustible material in cement plants.

It was discussed that the modelling of the steel recycling process (as shown in the example of the draft guidelines) is challenging. The reasons are the use of steel as a mix of primary and secondary material and the fact that scrap is used not only to produce secondary steel but is also used in small amounts to produce primary steel. Hence, some participants suggested that the system boundary should be shifted to include the scrap and recycling process for the share of secondary steel on the input side. It was indicated that double counting has to be avoided and that only the net amounts of scrap have to be considered.

Other questions concerned the differentiation of production scrap and scrap in the end-of-life phase with regard to time and the appropriate credit. The consortium answered that these issues are addressed in the guidelines and suggested to point it out even more. It was also discussed to separate the credit values for production and end-of-life in order to consider the importance of time and increase transparency.

Another point of discussion was the availability of materials and the development of recycling technologies. It was stated that for steel it is well-established, but lightweight materials (e.g. Al, Mg) are more critical, particularly with regard to their availability in the future. Materials that might become rare will most likely be needed for batteries. It was expected that the development of technologies will increase.

4 Survey on Training Materials

During the second workshop the training materials currently in development were introduced to the participants of the workshop. Within this short presentation it was explained, that the training concept works with three different training modes: namely a self-learning script, materials for seminar trainings such as presentation slides and trainer instructions and finally an e-learning concept including web based training (WBT) materials (presentation slides with learner navigation) and the infrastructure for online trainings organized by trainers.

The introduction of the training concept was used to receive a feedback from the stakeholders. In particular feedbacks concerning

- (1) the preferred type of training material
- (2) the appropriate time spend on learning in each training type
- (3) the specific content of the training materials which should be in focus

Feedback was gathered via a short survey, which was handed out during the presentation of the training concept.

4.1 Preferred Type of Training Material

The stakeholders were asked about their attitude towards different training modes in order to eventually adapt the focus of the overall concept of the training and learning materials.

The stakeholders were able to indicate their preferences for each training mode by “thumb up” and “two thumbs up” for positive feedback and accordingly “thumb down” and “two thumbs down” for negative feedback. Neutral indication was not possible. The results are displayed in the figure below:

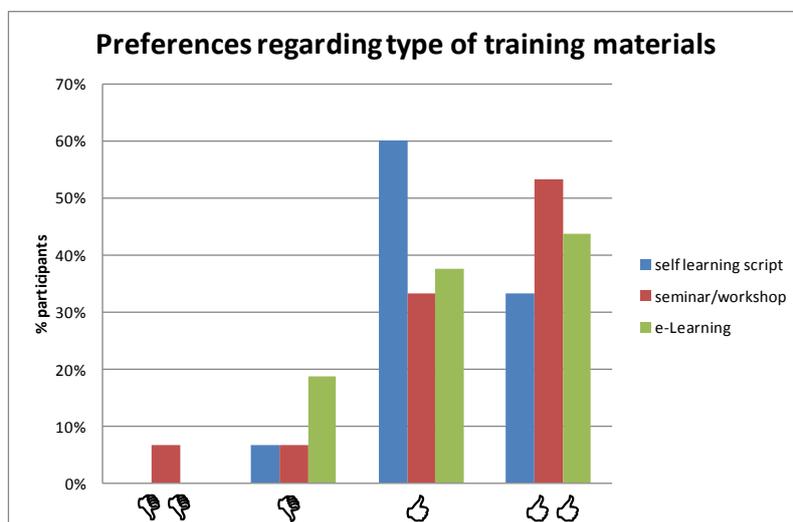


Figure 1: Histograms of the answers regarding the learning types

Concerning self learning script

A vast majority of the stakeholders (93%) indicated a positive attitude towards a self-learning script. Still, the option “one thumb up” was chosen considerably more often than the option “two thumbs up”. We conclude from this, that the self-learning script is demanded by the stakeholders self-evidently as a standard training mode, and not seen as an innovative solution that triggers excitement

Concerning seminar / workshop materials

This training mode seems to be the least popular one only at a first glance. While for both other modes, the answer given the most often was “two thumbs up”, the seminar training mode receives “one thumb up” from the majority of the stakeholders. It also is the only mode where the option “two thumbs down” was chosen at all. Nevertheless, the options “one thumb down” or “two thumbs down” were chosen by only 13% in total while the remaining 87% indicated “one or two thumbs up”.

Concerning eLearning

The stakeholders seem to have divided opinions about the e-learning option. On the one hand, this training mode holds the second highest rating in both positive categories. On the other hand, it shows the highest rating for “one thumb down”. This result supports the fact, that e-learning is a new training mode which is not very common yet. Some stakeholders cannot identify themselves with the training mode, whereby others are very interested. The latter one is the majority (81%).

We conclude from the answers given that all training modes offered are regarded as useful. For every training mode, the majority indicated strongly a positive attitude. Even the training mode with the least positive answers (e-Learning) is supported by 81% of the stakeholders.

These results imply for the further course of the project, that all training and learning materials will be equally developed in order to achieve a balanced supply of all the training modes, suiting different types of learners and different situations.

4.2 Appropriate time spend on learning

Choosing an appropriate extent for every training mode is important. On the one hand, all important issues have to be covered. On the other hand, developing materials too lengthy could lead to learners who discontinue the training.

The following histograms display the result for the survey assessment about appropriate quantitative dimension of each training mode.

31% of the stakeholders indicated a page range of 35 to 45 pages as being appropriate for the self learning script. A small minority of about 8% asks for page range of 65 to 75 pages.

About 70% are asking for page range below 45 pages.

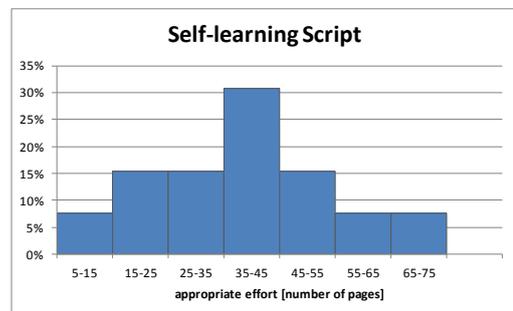


Figure 2: Appropriate effort for the self-learning script. Answers are given in number of pages.

50% of the stakeholders indicate an appropriate time for a seminar training of one day or less. About 25% prefer seminar training with duration of one and a half to two days. The remaining 25% would prefer a long training of about two and half to three days.

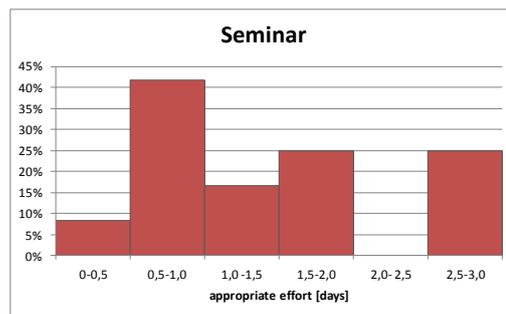


Figure 3: Appropriate time for seminar.
Answers are given in days.

67% of the stakeholders suggested the learning time (learning time for e-Learning = time spend in front of the computer) not to exceed 10 hours. Most of them (40% in total) even think that the e-learning should only take up to 5 hours

A minority of 10% indicates learning time of more than 15 hours.

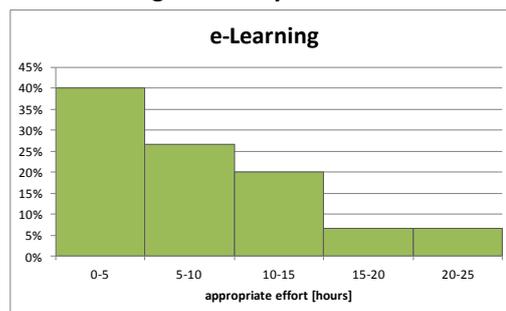


Figure 4: Appropriate time for e-Learning.
Answers are given in hours.

The answers given will strongly influence the development of the training materials. We aim at a range of 35 to 45 pages for the self-learning script. The materials developed for seminars will suit a training course with the length of one to two days which fits the requirements of the majority of the stakeholders. E-Learning is the mode which requires the biggest expenditure of time to create compared to the learning time. The learning time will be will not exceed 10 hours.

4.3 Content of the training materials

For the assessment of essential topics for the training materials, the stakeholders were able to freely list important and non-important issues according to their preferences-

Regarding "Important topic", the following answers were given

- Give some figures
- particular difficulties of BEV-LCA, examples & example calculation
- allocation, crediting, EOL, important technical parameters, function of system, system boundaries
- examples, consequence of doing certain things, keeping things straight forward (use standards)
- explain how to model use phase & end of life treatment
- understanding sensibility of individual parameters based on technology knowledge/understanding
- electricity production, energy consumption of BEV, battery (production + EOL), computer model, reporting format, application to examples, future developments, handling of date
- case studies & examples (all the methodology is already included in the guidelines)

- best practices, examples

As unimportant topics, the following answers were given:

- general information on LCA (according to ISO)
- overarching aspects
- full LCA background, link to any LCA software
- repeat the guidelines

Regarding the answers that were given as “important topics”, there seems to be a strong need for examples and the practical application of the guidelines. The answers given regarding “unimportant topics” could imply the wish for a compact training concept.

We will follow these opinions as far as possible during the further development of the training materials. The Self learning script will focus on examples and case studies. There will not be a general repetition of the guidelines content. However, the training slides and the eLearning modules will cover the content of the guidelines. Additional working tasks (training slides and eLearning) will use case samples

5 Outcomes from Stakeholder Feedback Questionnaire

5.1 Introduction

The workshop participation of the stakeholders determines a successful development of the eLCAr guidelines ensuring the quality and usability of the guidelines. Therefore, we continued to ask the participants of the second workshop to assess and if necessary to improve the guidelines and the last workshop. The aim of the questionnaire is to get independent feedback from each participant regarding the guidelines.

We received 17 questionnaires back from the participants. Not everyone answered every question therefore the total number of answers is varying. The scale for the questions was defined as follows:

- 1 → strongly disagree (NO)
- 2 → disagree
- 3 → agree
- 4 → strongly agree (YES)

The answers to every question is included in Annex B. Answers to important aspects are presented in the following starting with the result of each question and a short interpretation afterwards.

5.2 Draft version of the eLCAr guidelines

The answers regarding the draft version of the eLCAr guidelines are important to get an impression if the draft was comprehensible and the provisions sufficient for the participants.

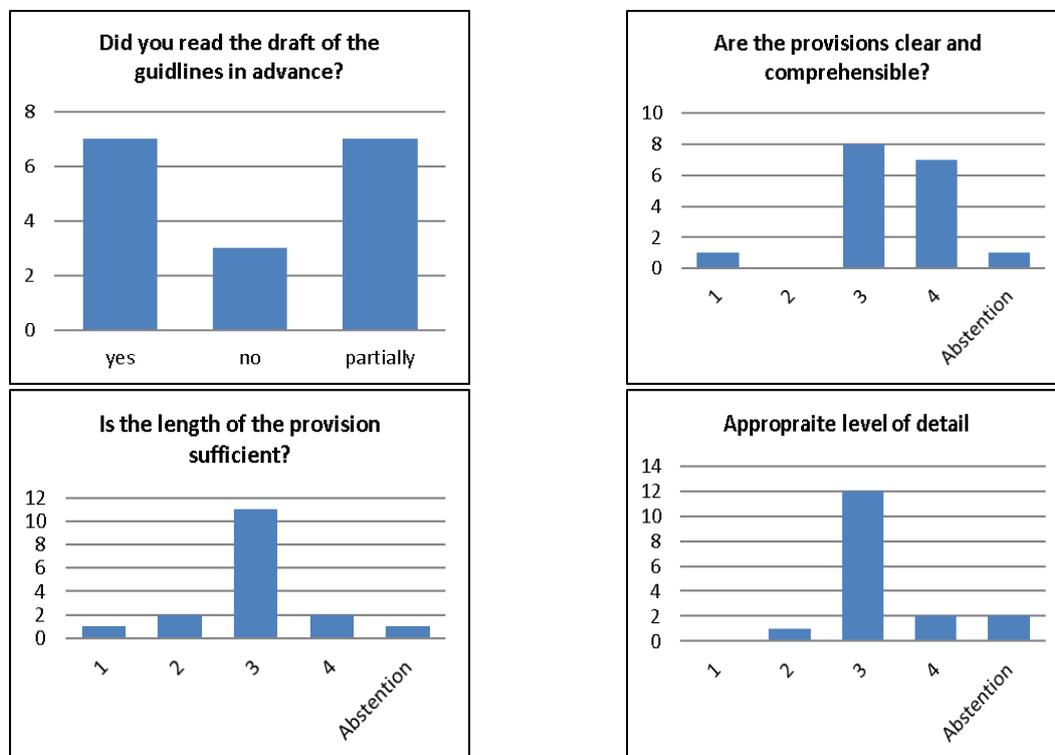


Figure 5: Histograms depicting the answers of questions concerning the eLCAr guidelines

The draft version of the eLCAr guidelines has been completely read by seven participants entirely and not at all by three. Seven participants read the draft version partially, because of the length of the draft. Some suggested that the next version of the guideline should be briefer and not too scientific. The level of detail was agreeable to the participants but they asked for more examples, which will help them to follow the guidelines.

5.3 Important LCA topics and challenging aspects

The participants had different points of view about the most challenging parts of the LCA.

- Use phase, Evaluation of the use phase
- User behaviour model and predicting changes in user behavior when confronted with mobility
- End of Life (EoL), EoL of batteries (2nd use)
- Electricity mix and the cycle of energy consumption
- Ensuring comparability of results
- Including and scaling up new technologies for comparison, including recycling/reuse of components
- Assumptions on the system
- Functional unit and system boundary, System boundaries with respect to the EoL
- Battery issues such as weight, EoL, Materials used in batteries etc
- The LCI phase, due to the few available data
- Data collection, in particular battery composition and battery efficiency

On the one hand, many of them have problems with the use phase, but on the other hand the system boundary and the functional unit is a big challenge as well. An important topic is also the comparison of different studies.

However some topics have not been covered during the 2nd workshop but nevertheless important for the stakeholders. These topics are:

- Are there differences in the maintenance during the whole life cycle of the vehicle, between EV and combustion engine vehicle (oils, etc.)? Are there differences considered in the guidelines?
- Electricity mix & vehicle life time: if the lifespan of the vehicle is 10 years, the electricity mix (CO₂ content) will vary during this time.
- PHEV specificities
- The dependency of batteries life time on charging and aspects of vehicle to grid issues
- Common terminology and standard unit for parameter i.e. Wh/km for consumption, not kWh/100km.
- Battery efficiency depending on battery technology and chemistry
- Existing LCI (ecoinvent, ...)?
- How to go from LCA on raw materials to an integration of those figures in a global LCA of a battery? What unit system comparing energy/c-footprint/toxicity?

The consortium will cover these open points in different topics in our online forum and will discuss it with the stakeholders before the next workshop (6.12.2012). These points will be included in the revision of the guidelines with the aim to cover all these important and missing aspects.

5.4 Summary

The organization and arrangement of the workshop has been accepted and liked by the practitioners. Therefore, we will not change the general approach for the workshop organizing one-day workshops to present the guidelines and to exchange the view and opinions with the stakeholders. All the open points mentioned by the participants will be included in the final version of the guidelines. Furthermore we will develop examples, which will help the practitioner to understand and use the new guidelines. Moreover, the recommended missing topics will be included in the eLCAr forum to provide an area for discussions.

6 Conclusions for further proceeding of the project

A summary of the conclusions drawn from the workshop and how they will influence the further work of the project is given below.

Auxiliaries

As described in paragraph 3.4, during the discussion of the LCI of the use phase various questions were asked by the participants with respect to the use of heating and cooling devices, auxiliaries and to the modelling of electricity mixes.

In the context of the use of heating and cooling devices, the consortium will explore during the remaining months the topics mentioned by the participants (i.e. the use of comfort systems for safety reasons and the impact of pre-conditioning of the vehicle). Some members of the audience commented on the existence of literature on at least part of these topics and suggestions on these papers will be collected. If it will not be possible to derive methodological guidance on how to include these topics then these will at least be included in the system boundaries and mentioned as processes to take into consideration, if necessary.

A similar comment holds for the use of auxiliaries. Literature on typical auxiliaries' consumptions will be looked up again to verify that the presented examples are realistic.

With respect to guidance on electricity mixes, the consortium will elaborate the general concepts on data representativeness and the planning of data collection, which are valid for all processes, into additional information for the modelling of the contributions coming from the electricity.

Functional Unit

The issue of the functional unit was discussed elaborately during the workshop (see 3.2). To improve the guidance on defining the functional unit two different directions were suggested. Particular focus was put on the comparisons of different systems, mostly ICEV and BEV. On the one hand, it was proposed by the audience to define the functional unit even more in detail in order to achieve a better equivalence in the function of the alternatives. E.g. not only the driving distance should be defined but also the number of people that can be transported, the entertainment system, etc. On the other hand, it was discussed to compare mobility systems rather than vehicles. Because the characteristics of ICEVs and BEVs are de facto very different, some experts stated that they as a matter of principal must not be compared. E.g. it is today simply not possible to drive long distances with a BEV. Therefore, as an example, a family would inevitably have to switch to other alternatives to satisfy their demand for mobility which they would not necessarily have to do when owning an ICEV. This should be considered and included in the LCA.

For the project consortium this is an indication to include further examples or pieces of advice on the definition of the functional unit. The specific requirements on this element of an LCA depend strongly on the goal and scope definition. This is why no general solution can be given. However, examples or advice can help the LCA practitioner to find the right solution for his or her specific case.

Solving multifunctionality in EoL

Steel recycling as an example of solving multifunctionality with system expansion and substitution was described in accordance to the ILCD handbook during the workshop (see 3.5). In this context the system boundary, the consideration of time and the appropriate crediting were special issues of the discussion. It will be evaluated if the suggestions will be followed and a more detailed description of the example or two examples describing the production and end-of-life phase separately are more helpful for the LCA practitioner to apply the guidelines. Literature on this issue especially on steel recycling will be looked up again and reconsidered for the guidelines.

Training Materials

For the training materials, valuable conclusions could be drawn from the survey done during the workshop. The extent of the developed training materials will refer to the opinion expressed by the majority of the stakeholders. The training materials will focus on the application of the guidelines and work with examples and case studies. The concept of equally balanced training modes, which was presented during the workshop will be kept in order to suit a broad target group.

The overall results and impression from the second stakeholder workshop are very positive. The current status of the guidelines was a fruitful ground for discussions and common understanding. All conversation and discussion rounds had a constructive and cooperative character. Hence, the second stakeholder workshop was very productive and important for a successful ongoing development of the guidelines.

Annex A – List of Participants

Institution	Surname	Name
Forschungszentrum Jülich	Ramchandra	Bhandari
ArcelorMittal	Jan	Bollen
ThyssenKrupp Steel Europe	Jia-Uei	Chan
University of Nottingham	Matteo	Cossutta
CDAUT - Coordinator of e-Light - Leader of Green eMotion WP7	Luis	de Prada
ip GmbH	Carsten	Dietsche
Institute for Technology Assessment and Systems Analysis (itas, Karlsruhe)	Hanna	Dura
PE International	Alexander	Forell
MOBI (University of Brussels)	Javier Sanfelix	Forner
Environmental Campus Birkenfeld	Eckard	Helmers
IFEU	Hinrich	Helms
Johanneum	Gerfried	Jungmeier
Ford (Forschungszentrum Aachen GmbH)	Heiko	Maas
Electricité de France (EDF)	Marie-Lou	Picherit
University of Liège	Robert	Renzoni
ISEA RWTH Aachen	Matthias	Rogge
University of Florence - Department of Mechanics and Industrial Technologies	Filippo	Romoli
SOLVAY Specialty Polymers	Baert	Thierry
Forschungszentrum Jülich	Clemens A.	Trudewind
RWTH (IKA)	Sebastian	Winter
Karlsruhe Institute of Technology	Benedikt	Zimmermann

Annex B – Detailed results of the questionnaire

Organization of the workshop

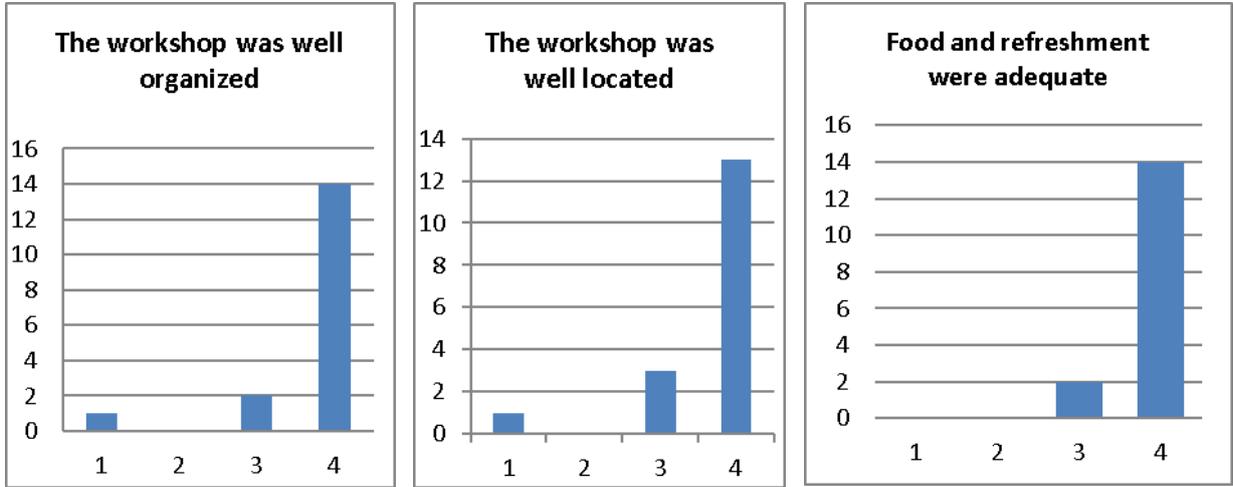


Figure 1: Organization of the workshop

Most of the participants were satisfied with the workshop organization; the location as well as the provisions during the workshop (see Figure 1). However, some participants were not fully pleased but just one participant commented this questions. He or she recommended to send the information about the workshop earlier and to start the workshop one hour later. Additionally he or she requested more vegetarian food and a list of participants with affiliations and emails. Therefore, the standard of the organization of the workshops will be kept and some additional measures (see recommendation) have to be taken.

Content of the workshop

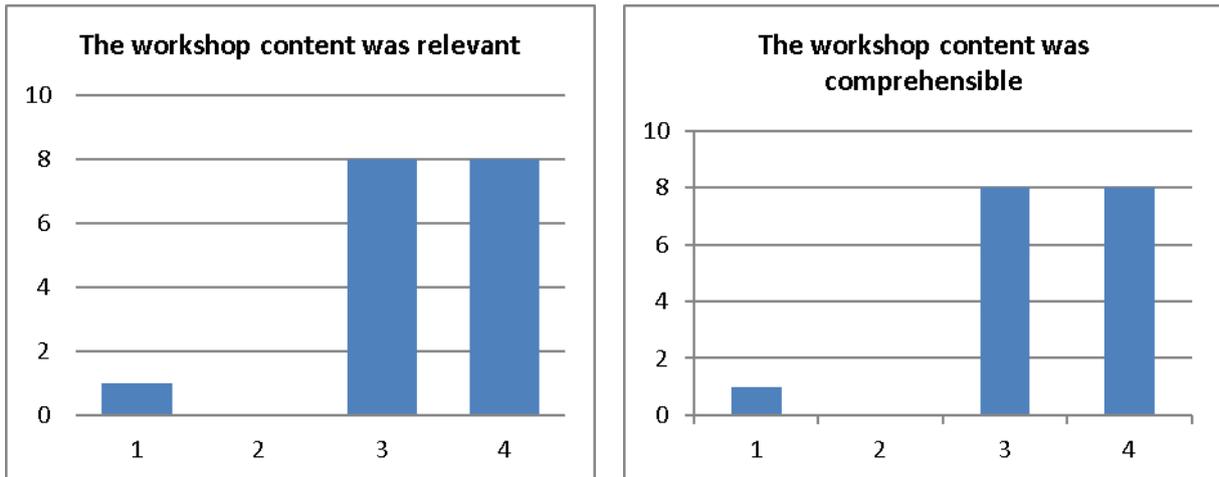


Figure 2: Content of the workshop

Most participants think that the content of the workshop was relevant for the development of LCA guidelines for EV and their components (see Figure 2). The only comment was that not every speaker

could be clearly understood, because of the voice level. In addition to that, the content was a bit too theoretical /abstract.

Briefing notes

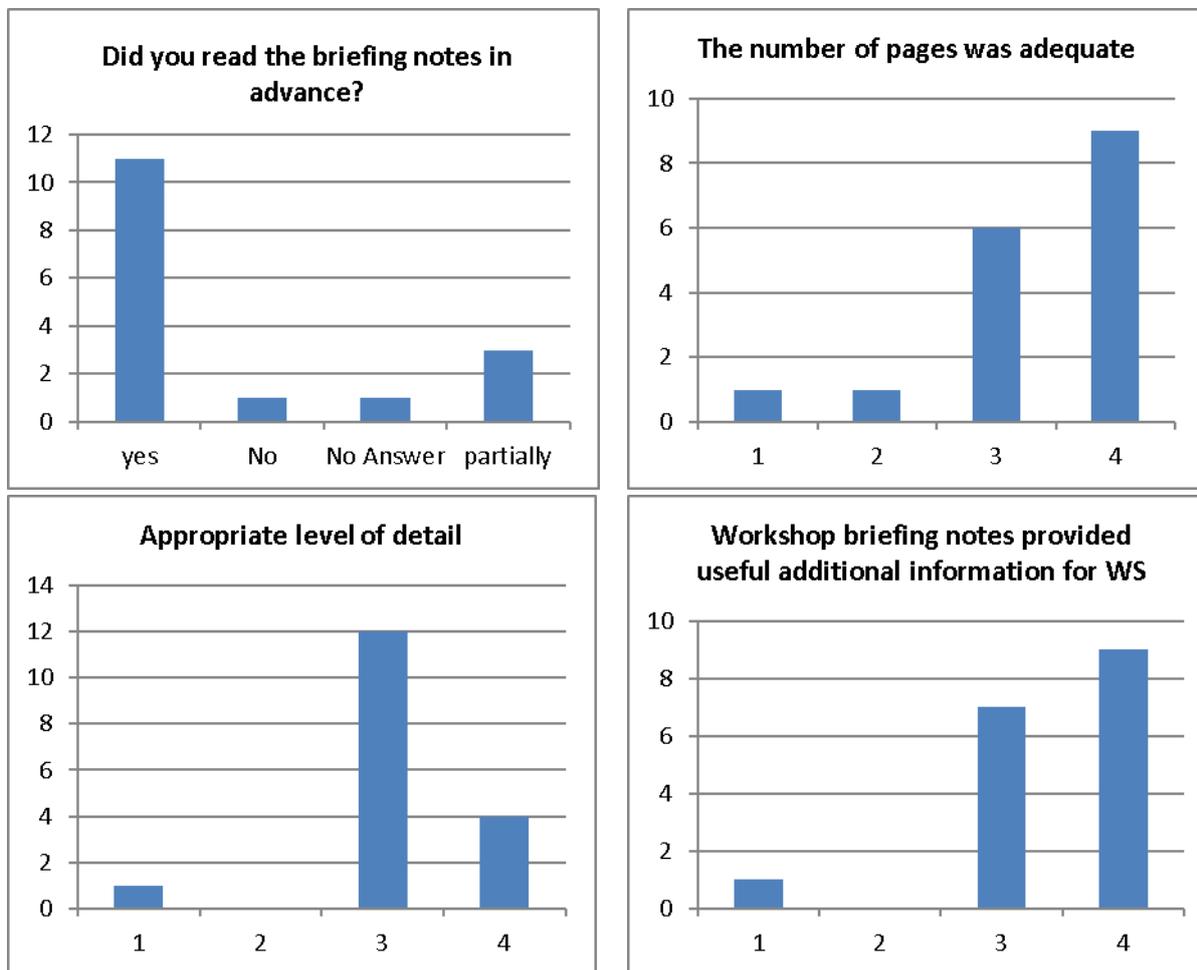


Figure 3: Briefing notes

Nearly all participants have read the briefing notes in advance. Overall, most of the participants think that the briefing notes provided an appropriate level of detail and that the number of pages was adequate (see Figure 3).

The workshop briefing notes have been useful for the preparation for the workshop and included additional information for the practitioners.

Focus and decision context of LCA studies of the participants

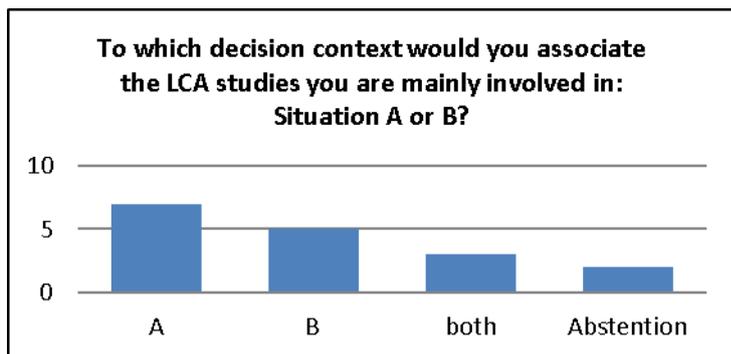


Figure 4: Decision context

The decision context of LCA studies of the participants mainly focus on the entire vehicle system. In addition the studies are often on the components, especially the battery system. Thus, the majority of the participants want to focus the LCA on the entire vehicle and also on the components. They recommend that the LCA should be as detailed as possible for the entire vehicle, with special attention for the particular component.

Future workshops

After the experience of the second eLCAr workshop, we have been interested in the question, if the stakeholders would participate in the last workshop in Wolfsburg again where the final version of the guidelines will be presented. The answers are shown in Figure . Most of the participants are willing to participate in the next workshop.

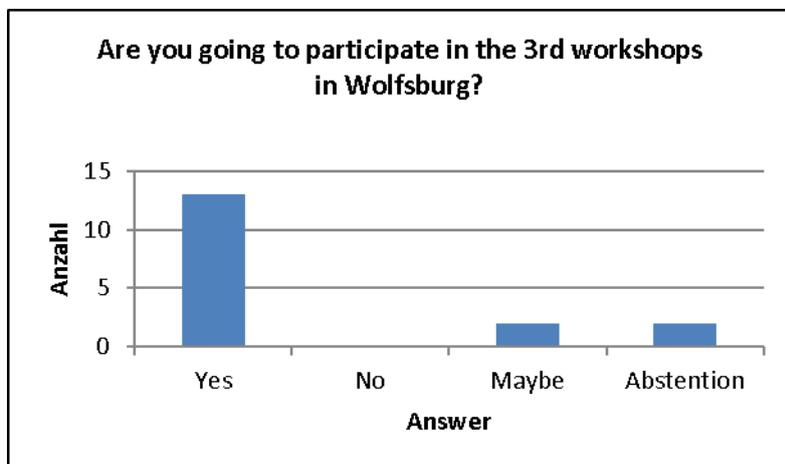


Figure 5: Future workshops