Course Memo

LIFE CYCLE ASSESSMENT (AG2800)

Welcome to the course in Life Cycle Assessment!

This course memo contains important information about the course, each activity, and course requirements. If you have further questions, please contact the course coordinator.

Please take your time to read this course memo carefully. Then read parts of it again before every lecture, computer lab, supervision meeting, or seminar.

Contents

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KTH Drottning Kristinas väg 30, III SE-100 44 Stockholm. Phone: +46 8-790 86 21. Fax: +46 8-790 85 80. E-mail: annab@infra.kth.se

GENERAL COURSE INFORMATION

7, 5 credits

Grading: A-F

Language: English

Coordinator: Yevgeniya Arushanyan, 08-790 8636, yevgeniya.arushanyan@abe.kth.se

Teachers: Anna Björklund, annab@abe.kth.se

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Teaching unit: Division of Environmental Strategies Research-fms, Dept of Urban Planning and Environment

Visiting adress: Drottning Kristinas väg 30 (3rd floor)

Web-site: http://www.kth.se/abe/fms

Course registration:

Please register for the course through *My Pages* → *Registrations* latest **October 25.** To be able to register you have to be admitted to the course, which is done through your program coordinator or study advisor. If for some reason you are not able to complete the registration through *My Pages*, please contact the course coordinator.

AIMS OF THIS COURSE

The overall aim of this course is to develop your skills of systems thinking in environmental issues, related to your own area of expertise. This course will give you a basic analyst's competence in Life Cycle Assessment (LCA).

After completing the course, you should be able to:

- Explain the overall purpose and principles of LCA.

- Discuss possible applications and limitiations of LCA.

- Describe the content and explain the purpose of the analytical steps of LCA.

- Carry out a complete LCA of a product or service system, including:

    1. identify and delimit the system,

    2. specify and handle allocation problems,

    3. identify and use relevant data from LCA databases,

    4. collect and use data from other sources,

    5. choose characterisation method based on coverage and relevance to the intended application,

    6. implement and use a computer model of the system in the LCA software SimaPro,

    7. analyse, explain, and interpret model results.

- Write a report of the performed LCA, applying to the reporting guidelines and terminology as defined in the ISO standard for LCA.

- Make a critical review of another LCA.

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LECTURES (L1 – L8)

The lectures give theoretical coverage of LCA methodology. This is important for you to work efficiently in your projects. To get you started at an early stage, most lectures are given at the beginning of the course.

In the following, it is indicated what parts of the course litterature relates to the topic of each lecture. Use this as a help to read ahead and to find the right litterature when working on your projects. You are encouraged, but not required, to do the exercises in the course book.

L1 - Introduction. What is LCA?

The lecture covers key features of LCA, such as the history and purpose of LCA, LCA methodology in brief, and applications of LCA. The purpose is to give students a possibility to start reflecting over how LCA can be used in various fields of industry and society. Throughout the remainder of lectures, LCA methodology will be covered in depth.

NOTE: Possible topics for project lectures are briefly introduced at the end of the lecture. Please start thinking about what you would be interested in and possible group members, until Lecture 2.

Litterature for L1:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 1

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 1 (Download from Bilda)

- Klöpffer (2006) *The Role of SETAC in the Development of LCA* (Download from Bilda)

L2 – LCA software & SimaPro demo. Forming project groups.

Overview of LCA software in general and SimaPro in particular. We will run a demo of main features of SimaPro, the LCA software that you will use in your projects.

NOTE: At this lecture, we will discuss project ideas and form project groups of 2-4 members. Prepare by considering what topic you would like to focus on in your project. If you miss this, you need to contact the course coordinator ASAP!!!

NOTE: At this lecture we will make sure that all students have access to the computer labs and have valid KTH login credentials. If you miss this, you need to contact the course coordinator ASAP!!!

Litterature for L2:

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 8 (Download from Bilda)

- *Suggested topics for LCA projects in AG2800*

L3 - Goal definition and scoping

How to set up and design a LCA study. Understanding this phase of LCA is important for you to make an adequate and meaningful formulation for the topic of your project. This is necessary as background for the first project supervision meeting (PS1).

Litterature for L3:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 3

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 2 (Download from Bilda)

- Rebitzer et al. (2004) *Life cycle assessment. Part 1: Framework, goal and scope definition, inventory analysis, and applications.* (Download from Bilda)

L4 - Inventory analysis

Constructing a flow model and collecting data of the technical system, as defined in the goal and scope. Understanding this phase of LCA is important for you to make a detailed description of the technical system of your project, and to help you start collecting relevant data. This is necessary as background for the second project supervision meeting (PS2).

Litterature for L4:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 4

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 3 (Download from Bilda)

- Rebitzer et al. (2004) *Life cycle assessment. Part 1: Framework, goal and scope definition, inventory analysis, and applications.* (Download from Bilda)

L5 – Impact assessment

Describing the environmental consequences of the environmental loads of a technical system, the principles and methods available for doing so. Understanding this phase is important when you start interpreting the results of your project. This is necessary as background for the third project supervision meeting (PS3).

Litterature for L5:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 5

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 4 (p. 19-24) (Download from Bilda)

- Pennington et al. (2004) *Life cycle assessment Part 2: Current impact assessment practice*, sections 1-6, 8. (Download from Bilda)

- Bare and Gloria (2006) *Critical analysis of the matematical relationships and comprehensiveness of life cycle impact assessment approaches.* (Download from Bilda)

L6 – Normalisation and Weighting

Methods for further aggregation of impact assessment results, as an aid to interpret the impact assessment results. This is necessary as background for the fourth supervision meeting (PS4).

Litterature for L6:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 5 (p. 142-143)

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 4 (p. 25-27) (Download from Bilda)

- Pennington et al. (2004) *Life cycle assessment Part 2: Current impact assessment practice*, section 7. (Download from Bilda)

Lecture 7 – Social LCA

Overview of Social LCA, its main characteristics, methodology and guidlines. Presentation of a case study.

Litterature for L7:

- Benoît et al (2009) *The guidelines for social life cycle assessment of products: just in time!* (Download from Bilda)

- Ekener-Petersen and Finnveden (2012) *Potential hotspots identified by social LCA— part 1: a case study of a laptop computer* (Download from Bilda)

- Ekener-Petersen and Moberg (2012) *Potential hotspots identified by social LCA–Part 2: Reflections on a study of a complex product* (Download from Bilda)

Lecture 8 – LCA in practice

Lectures by invited speakers from companies that use LCA in their sustainability work.

- "LCA and eco design at Bombardier" Yannos Wikström, Bombardier.
- "Life cycle perspective in environmental management at HP" Madeleine Bergrahm, Hewlett Packard.

COMPUTER EXERCISES (C1 – C5)

We will meet at five occasions in the computer lab, for you to run the SimaPro tutorial, run some excercises, and get acquainted with the software. Work togeteher with your project group. At the last meetings, use the scheduled meetings in the computer lab to work on your project, with assistance of teachers. Ofcourse, you also need to work on your own at other times in the computer lab with these exercises and your projects.

80% attendance at the computer exercises (4 out of 5) is required, but we engourage you to attend at every occasion. Learning to use SimaPro early on in the course is important to be able to complete a successful project. Attending computer exercises is well-invested time for you and your group.

Throughout the course, SimaPro will be available to you in two of the computers labs at KTH (MacLean and Faggott).

Course requirement – Computer excercises

80% attendance at the computer exercises (4 out of 5) is required.

Litterature for C1-C4:

- PRé Consultants (2006) *SimaPro 7 Introduction to LCA* (Download from Bilda)

- PRé Consultants (2006) *SimaPro 7 Tutorial* (Download from Bilda)

- *Instructions to SimaPro demo in AG2800* (Download from Bilda)

WRITTEN EXAM

A written home-exam is given at mid-term. It covers Lectures 1-6, with basic LCA theory and some minor calculation assignments. The objective of this exam is to ensure that all students grasp what is necessary to actively contribute to the group projects.

- You have four days to complete the exam.
- It will be posted at Bilda (Message board) on <u>Saturday, Nov 10 at 00.01</u>.
- Answers are submitted by uploading your answers at Bilda (Assignments/Home exam).
- Submission of answers is allowed until <u>Tuesday, Nov 13 at 23:59</u>. After this, the assignment submission in Bilda will be closed.

Any aid (eg. course book, collaboration with friends) is allowed, or even encouraged! Working on the exam is a way to better learning. However, copying does not improve learning, and answers <u>must</u> be written individually. Copying text from the course book and other written sources, or from your friends, is plagiarism! Exams with too high degree of similarity between each other will be assessed as failed (F). The exam will be graded A-F.

Course requirement – Written exam

To pass the course, you need to acquire the grade E or higher on the exam.

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PROJECTS

You will perform an LCA using the software SimaPro. The aim of the project is to put theory from lectures and the course litterature into practice, and to give practical experience of LCA modelling with a state-of-the-art LCA software.

Select topics

LCA can be applied to technical product or service systems, for a range of different purposes. Students are encouraged to select their own topics, depending on their own area of expertise and interest. We will help in delimiting the question to something which is meaningful and manageable within the scope of the project.

Form project groups

Projects are performed in groups of 4 students, formed by students depending on interest. Suggestions of possible topics are introduced at Lecture 1. Groups are formed and topics selected at Lecture 3.

Project supervision (PS) meetings

You will meet with a teacher four times throughout the course for project supervision (PS) meetings.

- Your supervisor will pass around a list to sign up for meeting times. Select a time that suits all your project group members.

- Details on what to prepare before meetings are listed in *"Instructions for project meetings in AG2800"*. It is important that you come well prepared, according to these instructions.

- Each group member must act as "project coordinator" at one meeting, with responsibility to present the work of the group to that date, questions, or any other issues. By rotating this responsibility among the members of the group, we make sure that all group members share the responsibility of the project as evenly as possible.

- The entire group is required to attend each meeting!

- A professional attitude, ie. coming well-prepared to every meeting, can improve your final grade, since the work process as such is also assessed.

Course requirement – Project supervision meetings (1)

You are required to attend each supervision meeting. Failing to show up for supervision, for whatever reason, without having made a sincere effort to contact your group and supervisor to reschedule the meeting, is not acceptable.

Course requirement – Project supervision meetings (2)

Each group member must act as "coordinator" at one meeting, with responsibility to present the work of the group to that date, questions, or any other issues.

Project log book

Each group has a project Log book at Bilda (Communication/Log book). Before each supervision meeting, short notes should be prepared according to the instructions in *"Instructions for project meetings in AG2800"*, uploaded to the Log book in Bilda, and brought on a paper copy to the meeting. This will help you plan and follow up your own work, it gives your teacher insight in the progress of your project, and provides a possibility for back-tracking events if problems arise.

Course requirement – Project log book

Before each supervision meeting, each group should prepare notes in a log book.

REPORTS

Each group writes a report (15-20 pages). Detailed instructions of required content are found in the document *"Instructions for report & critical review in AG2800"*.

Draft report

Draft reports are submitted at Bilda (Assignments/Draft report) <u>one week before the final seminar</u>. It will be automatically checked for plagiarism.

A preliminary grade, based on current status and expected improvements after revision, is decided based on the draft report. A final grade is decided when the revised report is handed in.

Course requirement – Submitting draft reports

Draft reports shall be handed in at Bilda <u>one week</u> before the final seminar.

Revision of draft reports

After the final seminar, each group will be noticed by e-mail whether your report has been accepted, or if revisions are required. Revised final draft reports shall be handed in at Bilda (Assignments/Final draft) within <u>three days</u> from receiving comments from your teacher. Along with the final draft the list of corrections and answers to reviewer's comments should be provided.

Course requirement – Revision of draft reports

Revised final draft reports and list of corrections and answers to comments shall be handed in at Bilda within <u>three days</u> from receiving comments.

SEMINARS

Pre-seminar

Each group will present its draft project report at a pre-seminar that is attended only by students. The presentation is made at a stage when projects are not yet complete, hence it should only cover

- Goal & scope,
- Life cycle inventory analysis, and
- Brief outline of expected results and interpretation.

The purpose is to give you the opportunity to get feedback on your own project and to learn from the work of other students. It has been appreciated by students as a way to help improve their reports before the final seminar. Prepare a "draft" presentation that you can re-use for the final seminar.

- Sign up for pre-seminar times at Bilda (Tools/Invitations). Select a time that suits all your project group members. If there are no times available that works for all of you, please contact course coordinator.

- Each group has 20 min at it's disposal, including about 15 min presentation and 5 min discussion.

- All group members should be involved in the presentation.

- You do NOT need to submit a draft report before the pre-seminar.

- You are required to attend the entire pre-seminar when your project is presented. You are welcome to attend other seminars than your own.

- A teacher will be present at the beginning of the seminar to get you started, and at the end to answer any remaining questions from the presentations. Take notes of unresolved questions.

- A projector will be provided at the pre-seminar, but the groups need to <u>make sure that one student brings a computer</u>.

Course requirement – Pre-seminar

You are required to attend the entire pre-seminar when your project is presented.

Final seminar

Project reports are presented at a final seminar. Comments on your report will be presented at the seminar by a critical review group. After the seminar, your teacher will send comments and required revisions of the report by email.

- **-** One week before the final seminar: hand in a draft report at Bilda (Assignments/Draft report). It will be automatically checked for plagiarism.
- **-** To the final seminar: prepare a critical review (see instructions below) of the project report of another group.
- **-** At the final seminar: each group has 45 min at it's disposal (25 min presentation, 20 min critical review, comments and questions). All group members should be able to present the entire project and be prepared to answer questions.
- **-** A projector and computer will be provided. Bring your slides on a USB memory stick.

Course requirement – Final seminar

You are required to attend the entire final seminar when your project is presented, and to participate in the presentation.

CRITICAL REVIEW OF PROJECTS

Critical review is an important procedure for quality assurance of LCA. By reading thoroughly the report of another group and making a critical review, you will gain deeper insights in LCA methodology and application.

Each project group shall prepare a critical review of the project report of another group.

- One week before the final seminar, your teacher will email the report that you should review.

- The review should be prepared and presented according to the instructions in *"Instructions for report and critical review in AG2800"*.

- Bring two copies to the final seminar (one to the group that you are criticising, and one to your teacher).

- Hand in at Bilda (Assignments/Critical review) after the final seminar.

Course requirement – Critical review

Each group shall prepare a written critical review of the project report of another group.

Litterature for critical review:

- *Hitch Hiker's Guide*, chapter 7

- *"Instructions for report & critical review in AG2800"* (Download from Bilda)

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DECLARATION OF CO-OPERATION AND PLAGIARSIM STATEMENT

You may already have experienced that co-operating in a course project is sometimes challangeing. Please contact your group supervisor at an early stage if you experience problems of co-operating in your group that you don't know how to resolve yourselves, so that we can find a way to help you solve it. After the report is handed in, it is too late.

After the final seminar, each student must hand in a "Declaration of co-operation". Its aim is to enable the teachers and examiner to assess the work part of a single student as greater or less than the other group members' performance.

Together with this declaration, you are also asked to sign a statement about plagiarism.

The Declaration can be downloaded from Bilda (Documents/Declaration of co-operation).

Course requirement – Declaration of co-operation and Plagiarism statement

A signed Declaration of co-operation and Plagiarism statement should be handed in by each student at the final seminar.

COURSE REQUIREMENTS IN SUMMARY

Course requirements, as highlighted throughout this document, are summarised below.

Computer exercises

80% attendance at the computer exercises (4 out of 5) is required.

Mid-term exam

To pass the course, you need to acquire the grade E or higher on the exam.

Project supervision meetings (1)

You are required to attend each supervision meeting. Failing to show up for supervision, for whatever reason, without having made a sincere effort to contact your group and supervisor to reschedule the meeting, is not acceptable.

Project supervision meetings (2)

Each group member must act as "coordinator" at one meeting, with responsibility to present the work of the group to that date, questions, or any other issues.

Project log book

Before each supervision meeting, each group should prepare notes in a log book according to the instructions.

Pre-seminar

You are required to attend the entire pre-seminar when your project is presented.

Final seminar

You are required to attend the entire final seminar when your project is presented, and participate in the presentation.

Submitting draft reports

Draft reports shall be handed in at Bilda <u>one week</u> before the final seminar.

Revision of final draft reports

Revised final draft reports shall be handed in at Bilda within <u>three days</u> from receiving comments.

Critical review

Each group shall prepare a written critical review of the project report of another group

Declaration of co-operation and Plagiarism statement

A Declaration of co-operation should be handed in after the final seminar.

GRADING

The course is graded A-F. Examination of course goals includes a written exam (graded A-F), a group project assignment (graded A-F), and a critical review assignment (graded P/F). The final grade is a weighted average of the written exam and the group project assignment. In order to receive a final grade, the requirements for an "E" for the written exam and project assignment must fulfilled, and "Pass" grade on the critical review is required.

A grade denoted Fx is also included in the scale. It represents a failing grade which lies on the boundary between pass/fail, and can be complemented to reach the grade E.

Written mid-term exam

The written exam is graded A-F. Fx denotes a failed grade, but with the possibility to pass the written exam by oral eaxmination. After oral examination, the student can only receive the grade E.

Critical review

The Critical review is assessed as pass or fail (P/F). To pass this assignment, it should be prepared and presented according to the instructions. A student who apparently was not involved in the preparation and presentation of the critical review will fail.

Group project assignment

The project assignment is the most important part of this course. It is graded A-F (see grading criteria below). The grade of the project assignment is based on the following factors:

- The written report, considering its:
  - *content* (your understanding of LCA methodology, and ability to design and perform an LCA study)
  - *formal qualities* (outline, clarity, language, referencing).
- The student's performance at supervision meetings and at the final seminar.
- Fulfilment of course requirements, regarding e.g. attendance.
- The student's contribution to the final report, if not divided equally among group members (stated in the Declaration of cooperation).

Content of the report is the most important out of those three. A preliminary grade on the report, based on current status and expected improvements after revision, is decided based on the draft report as handed in before the final seminar. A final grade is decided when the revised report is handed in.

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Evaluation criteria for group project assignment

Grade	Criteria
A	Besides the demands for a B • The report is well-written and easy to follow. • The content of the report meets all the report instructions. It contains a relevant and self-dependantly developed critical analysis and discussion. • The student shows good ability to meet the opposition at the final seminar, with clear argumentation and reflection based on the course literature and other literature used in the project.
B	Besides the demands for a C • The student shows initiative and participates actively in the dicsussion at supervision meetings and seminars. • References are used in a way that would be acceptable in a scientific context (see report instructions).
C	Besides the demands for a D • The student comes prepared to the supervision meetings, according to the instructions (see meeting instructions). • The student is open to supervision and critique and able to incorporate this in it's own work. • Key aspects of LCA and methodolgical choices are correctly defined and documented in in the report (see report instructions). • The results relate clearly to the goal and scope of the study.
D	Besides the demands for an E • Fulfillment of course requirements and time-constraints concerning project log book and submission of report drafts and critical review. • Shows understanding of own project, and is able to answer questions directly related to own subject.
E	• The student can identify and explain, in word and in writing, the main life cycle stages related to the studied product or service. • Fulfillment of required attendance supervision meetings, computer exercises, pre-seminar, and final seminar. • The report outline follows the assignment instructions, including each of the indicated headings. • The report is readible, ie not too difficult to follow and not containing too many language errors. • The report is written in a way so that it is clear what parts of the report are the writers' own thoughts, and what parts are taken from other sources, what those sources are, where they can be found. • A signed Declaration of cooperation is handed in.
Fx	Failing grade, on the boundary between pass/fail. Possibility to supplement the grade to pass the project assignment, receiving at most the grade E. This should be done by showing that the failed course goals have been achieved. The examinor will design a relevant examination task in each case. The additional examination should be performed within six weeks (scheduled) of receiving the grade Fx.
F	Failed

COMPUTER ACCESS

Access to computer labs

You need access to the computer labs MacLean, Bure and Fagott. For this, you need a valid access card for L, V, or S. If you don't already have one, we need your personal details to help you get one. This will be arranged at the first lecture. If you miss this lecture, please contact the course coordinator.

When done, cards can be picked up at the card office, Osquldas väg 6 (open 10-11.30 & 12.20-13.30).

Access to SimaPro and Bilda

To have access to SimaPro and Bilda, you need valid KTH login credentials (user ID and password). If you don't have this, we need your personal details to help you get it from the IT SupportCenter. This will be arranged at the first lecture. If you miss this lecture, please contact the course coordinator.

When done, your KTH user ID and password can be picked up at the IT SupportCenter (Mimer's Bar) at the Student Union Building (Kårhuset) Drottning Kristinas väg 19 (open 8.00-16.30). Bring your ID.

HOW TO USE BILDA

All registered students have access to Bilda, KTH's web-based tool for netbased learning. This is where course material is available, and assignments are handed in. Check in on Bilda regularly during the course, to keep updated for course news!!!

IMPORTANT!!!

Make sure that the e-mail address registered in Bilda, is the one that you use regularly. If not, you will miss important information sent by your teachers from Bilda. You can change the registered e-mail address by changing your personal settings in Bilda.

The address is http://bilda.kth.se. You enter the course page in Bilda by selecting "AG2800 Life cycle assessment" from "My events". You can choose among the following:

1. Overview
An overview of all functions available to students in Bilda in this course.

2. Documents
Event documents

Students can download documents from here. It includes course material (course memo, instructions, lecture notes, scientific papers etc.) that are either posted from the start of the course, or will be posted by your teachers as the course proceeds.

My documents

Here you may upload personal documents. They are only visible and available to you.

Group documents

Each project group will have access to a group folder of their own, that is only visible and available to the members of that group.

3. Assignments
This is where you hand in answers to the mid-term exam, draft reports before the final seminar, final revised report after the final seminar, and your critical review.

4. FAQ
If there are any frequently asked questions, they will be posted here by your teachers.

5. Participants
A list of all participants and their email addresses.

6. Message board
- Teachers can post messages to the entire course, or to selected project groups. The Home exam will be posted as a message, available from Nov 12.

7. Discussion
- A discussion forum is available for the entire course (Course café). This is where you ask questions to all other students of the LCA course, or tell everyone about remarkable LCA experiences that you have made!

- A special discussion forum will be open during the home exam, to pose questions to your teachers.

- A discussion forum is also available for every project group. Only members of that group have access to these forums.

8. Project groups
A project group account is set upp for all groups. From here, you can view everything that your group has access to in Bilda.

Help in Bilda: If you want to learn more about the features of Bilda, there is an animated "Guide". "Help" is also available for each section of Bilda that you visit. You find "Help" and the "Guide" under the menu "Support" in your Bilda window.

LITTERATURE

Book

- Baumann, H. and Tillman, A.-M. (2005) *The Hitch Hiker's Guide to LCA. An orientation in life cycle assessment methodology and application.* Studentlitteratur.

You can order this book from AdLibris (www.adlibris.se), Bokus (www.bokus.se), or Studentlitteratur (www.studentlitteratur.se). It will not be available at the student book store, simply because it would be much more expensive.

Scientific papers

Scientific papers are available at Bilda (http://bilda.kth.se).

- Rebitzer, G., Ekvall, T., Frischknecht, R., Hunkeler, D., Norris, G., Rydberg, T., Schmidt, W.-P., Suh, S., Weidema, B.P., Pennington, D.W. (2004) Life cycle assessment. Part 1: Framework, goal and scope definition, inventory analysis, and applications. *Environment International*, 30, 701-720.

- Pennington, D.W., Potting, J., Finnveden, G., Lindeijer, E., Jolliete, O., Rydberg, T., Rebitzer, G. (2004) Life cycle assessment Part 2: Current impact assessment practice. *Environment International*, 721-739.

- Bare, J. C. and Gloria, T. P. (2006) Critical analysis of the matematical relationships and comprehensiveness of life cycle impact assessment approaches. *Environmental Science and Technology,* 40(4), 1104-1113.

- Benoît, C., Norris, G.A., Valdivia, S., Ciroth, A., Moberg, A., Bos, U. et al (2010) The guidelines for social life cycle assessment of products: just in time! *Int J Life Cycle Assessment* 15(2):156–163

- Ekener-Petersen, E. and Finnveden, G. Potential hotspots identified by social LCA—part 1: a case study of a laptop computer. *Int J Life Cycle Assessment*

- Ekener-Petersen, E. and Moberg, Å. (2012) Potential hotspots identified by social LCA–Part 2: Reflections on a study of a complex product. *Int J Life Cycle Assessment*

SimaPro manuals

Manuals are available at Bilda (http://bilda.kth.se) and at the PRé website (http://www.pre.nl/simapro/manuals)

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*

- PRé Consultants (2008) *SimaPro 7 Tutorial*

Other

Available at Bilda/Documents.

- *Suggested topics for LCA projects in AG2800*

- *Instructions for project meetings in AG2800*

- *List of usefull LCA data sources in AG2800*

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- *Instructions for report & critical review in AG2800*
- *Instructions to SimaPro demo in AG2800*