Quality management and quality aspects in LCA projects & software

How making a peer review efficient

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Nature of uncertainties

- **Uncertainty**   Level of decision
  There is no „exact or true" value

- **Vagueness**   Level of systems, models, data
  Perhaps there is an "exact or true" value, but it is not to determine because of the complexity or the dynamics of the system.

- **Inaccuracy**   Level of data (systems, models)
  There exists a "exact or true" value. It is "only" a question of expenditure to determine the value.

- **Uncertainty about uncertainties**
 Is it possible to determine the uncertainty?

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Sources of uncertainty in LCA

Step		Nature of uncertainty	How to deal with
Goal definition and system boundaries	Functional unit, allocation System boundaries: geographic, life cycle, time, chosen aspects	Uncertainty, vagueness	Reviewing
Inventory	System boundaries Variability: space, time, process specific lack of data Errors of measure	vagueness inaccuracy	Reviewing, documentation of errors
Impact assessment	System boundaries, selection of impacts, vagueness of impact factors	uncertainty, vagueness, inaccuracy	Reviewing, documentation of errors
Valuation	socio-politic decision	uncertainty	Reviewing

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Example rape methyl ester

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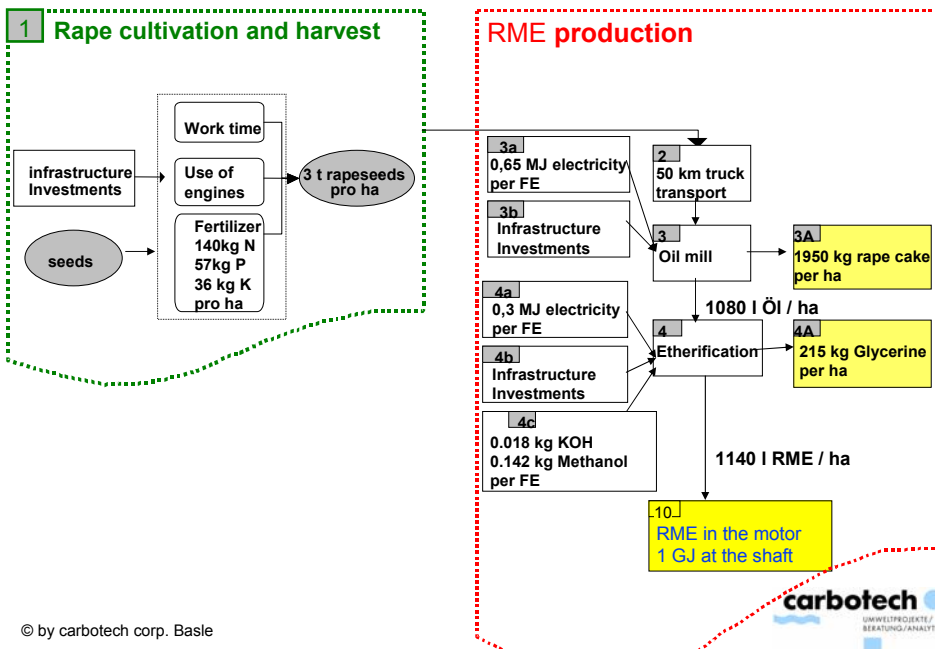
The energetic balance of rapeseed methyl ester RME in two different studies

	Study 1	Study 2	remarks
Cultivation Input	19.74 GJ/ha	16 GJ / ha	
Oil mill	5.5 GJ/ha	4.2 GJ electricity = *15.83 GJ pr. Energy*	Used energy – primary energy
Allocation: oil - cake	*no*	*70 : 30*	economic allocation: 81 : 19 Energetic allocation: 70 : 30
Etherification methanol process energy	2.05 GJ 0.75 GJ	*6.8 GJ (175 l methanol)* *7.6 GJ (electricity as primary energy)*	Taking into account the energy for production used energy – primary energy
Allocation Glycerine	96 : 4	no	No economic value (2)
Output: oil animal feed glycerine	44.85 GJ / ha 26.48 GJ / ha 1.56 GJ / ha 72.89 GJ / ha	35.75 GJ / ha allocated 35.75 GJ / ha	Differences in the yield 1.21 t (1) 0.96 t (2)
Energy input agriculture oil estrification Total	19.74 GJ 5.5 GJ 4.85 GJ 30.3 GJ /ha	11.2 GJ / ha 11.1 GJ / ha 7.6 GJ / ha 29.9 GJ / ha	
Output to input	2.4	1.2	

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The choice of the adequate impact categories:

Rapeseed methyl ester as fuel

Legend:
- ■ Energy non renewable
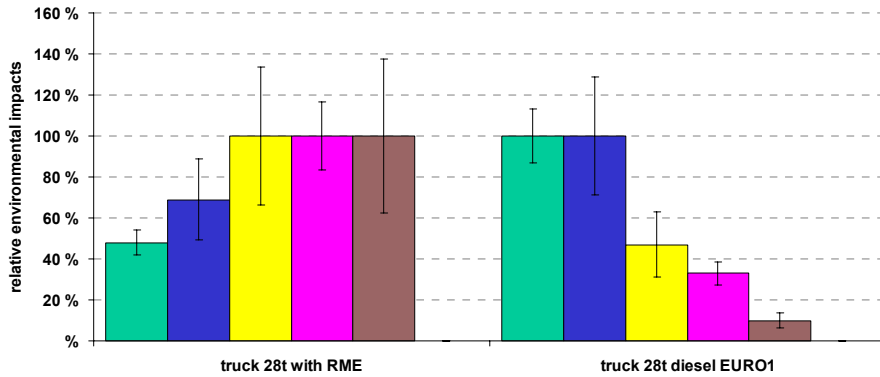- ■ Global warming
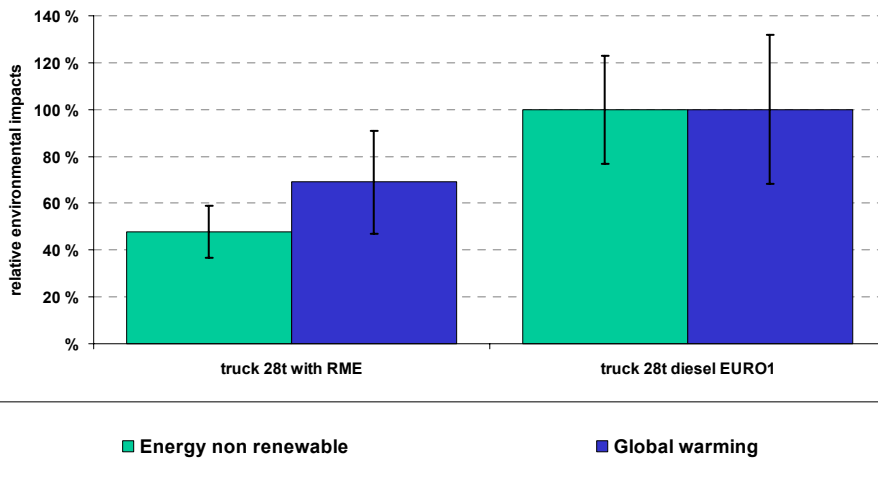
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The picture changes looking at other impact categories

Rape methyl ester
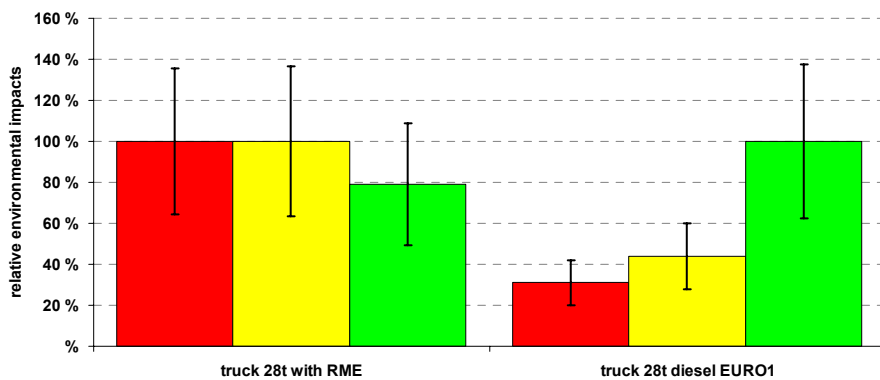

Legend: ■ Energy non renewable ■ Global warming □ Ozonformation ■ Acidification ■ Nutrification □ **

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Valuation

Legend: ■ Ecol. Scarcity □ Ecoindicator 95 ■ Eco Indicator 99 HA

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What is needed to deal with uncertainties?

- **A critical peer review to discuss vague and uncertain decisions**
- **Taking into account the errors**

- **A software enable to calculate**
  - **Errors**
  - **Scenarios**

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Declaration and calculation of errors in the software

Inputs of the process: Laundry towels (average) E

Art	S	C	Input	amount	error	min.	max.	F
7	✓	✓	Abwasser (häussliches) in ARA RER	0.0400 m3	30.0	0.40	1.60	✓
7	✓	✓	electricity, medium voltage, at grid CH	0.5000 kWh	30.0	0.40	1.60	✓
7	✓	✓	natural gas, burned in industrial fu RER	10.8000 MJ	30.0	0.40	1.60	✓
7	✓	✓	oil el. in heating 100 kW RER	9.0000 MJ	30.0	0.40	1.60	✓
7	✓	✓	transport truck 16t CH EURO2 Pkm RER	0.2000 tkm	20.0	0.60	1.40	✓

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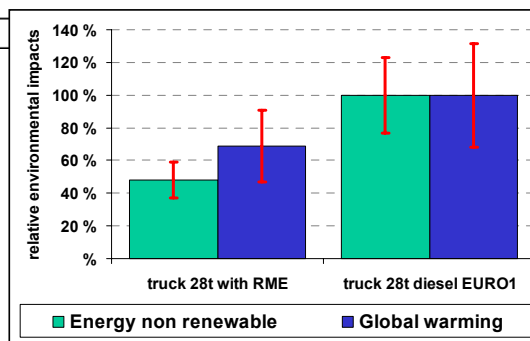
Peer Review as Carbotech does it in their projects

It is an on going process:

- **Starting when the order is given to perform an LCA**
- **When the first rough results are calculated**
- **When the results are calculated**
- **On the report and documentation**

Review process in LCA projects by Carbotech

1.   preliminary discussion

Reviewer:	
Date :	
Time used Reviewer:	

Checklist	remarks:
System boundaries:	☐ OK →
Functional unit:	☐ OK →
Allocation:	☐ OK. →
General conditions:	☐ OK. →
Procedure data acquisition:	☐ OK →
Selection of processes:	☐ OK →
Discussion of the quick LCA:	☐ OK →

2. Review Calculations

Documents for the LCA-review given to the reviewer:
☐ **Input data and calculations**
☐ **Printout analysis**
☐ **Printout graphs**
☐ **Printout main processes**
☐ **Printout current LCA quality test**
The review can be done together with the performer of the study.

	estimated time use Reviewer	Time used	Short review und remarks:
Re-check check list preliminary discussion:			☐ OK →
Understanding of the calculations:			☐ OK →
Check the plausibility of the input data:			☐ OK →
Plausibility check, results:			☐ OK →
Current print out of the test LCA:			☐ OK →
Expenditure total:			

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Some typical questions of the reviewer

- **What is the relevance of your decisions?**
- **Will the results be opposite, choosing other allocation factors or methods?**
- **In a comparative LCA:**
  Would you choose the same assumptions, making the study for a competitor?
- **Are the chosen processes appropriate?**
- **Are the relevant impacts taken into account?**

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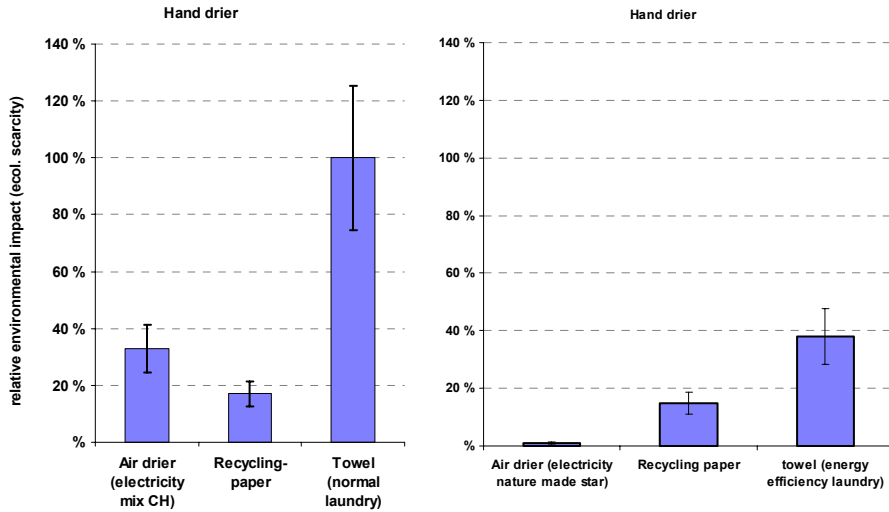
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Scenario analysis

Scenario calculation in EMIS

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3. Review report

Reviewer:	
Date review-discussion:	

Documents for the LCA-Review given to the reviewer:
- ☐ Copy of the report
- ☐ Copy of proposal / order
- ☐ Printout analysis
- ☐ Printout main processes
- ☐ Documentation changes since last review

	Estimated time use reviewer	Time used	Short review und remarks:
Consistency of report and order:			☐ OK →
Check the report on consistency and orthography			☐ OK →
Re-check previous review remarks especially changes in the LCA			☐ OK →
Critical test of conclusions and recommendations			☐ OK →
Expenditure Total			

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4.   Final review

Reviewer:	
Date review-discussion:	

Documents for the LCA-Review given to the Reviewer:
☐ **Copy final document**
☐ **Documentation of the changes since last review**

Re-check previous review remarks especially changes in the LCA	☐ OK →
Review-signature on the original document:	☐ OK →

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Expenditure

Peer Reviews

documenttation and report

further data acquisition and valuation

nalysis of the relevance and evidence: if necessary revise the goals

in deep data acquisition

analysis of the relevance and evidence: if necessary revise the goals

first data acquisition and coarse results

scoping

time

Coarse estimation   *in deep investigation*   *documentation*

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Conclusions

- **A one step peer review at the end of the study**
  - **is related to extra costs of about 10%**
  - **can result in unexpected additional expenditure and costs**
  - **the improve in quality is normally not very high**

- **An on going peer review**
  - **has a high improvement of quality of the study**
  - **is not related to extra costs**
  - **the overall costs can often be reduced**

Thank You for your attention

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