GreenDeltaTC

sustainability consulting + software

Perspectives in Life Cycle Inventory Modeling

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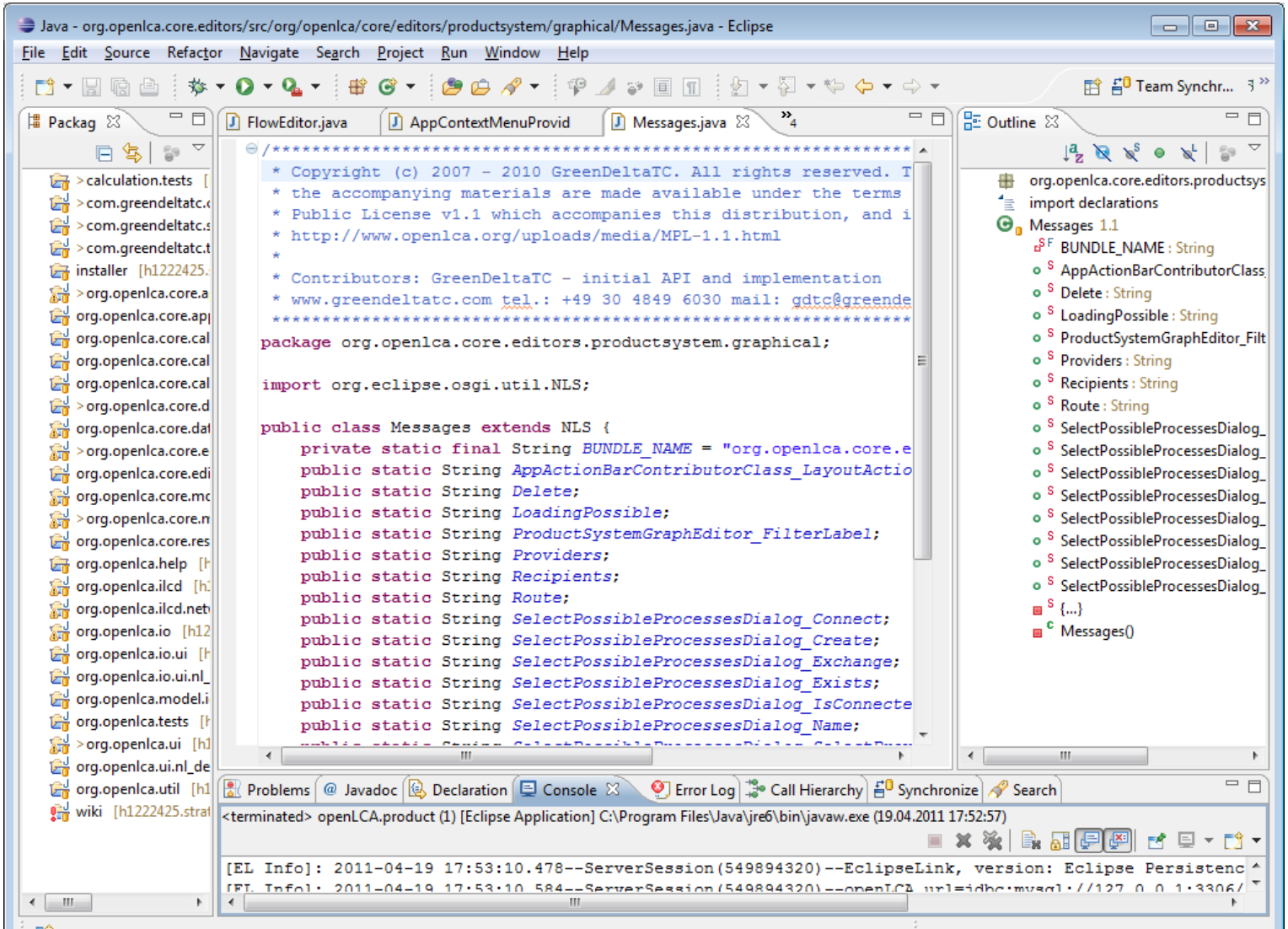
Outline

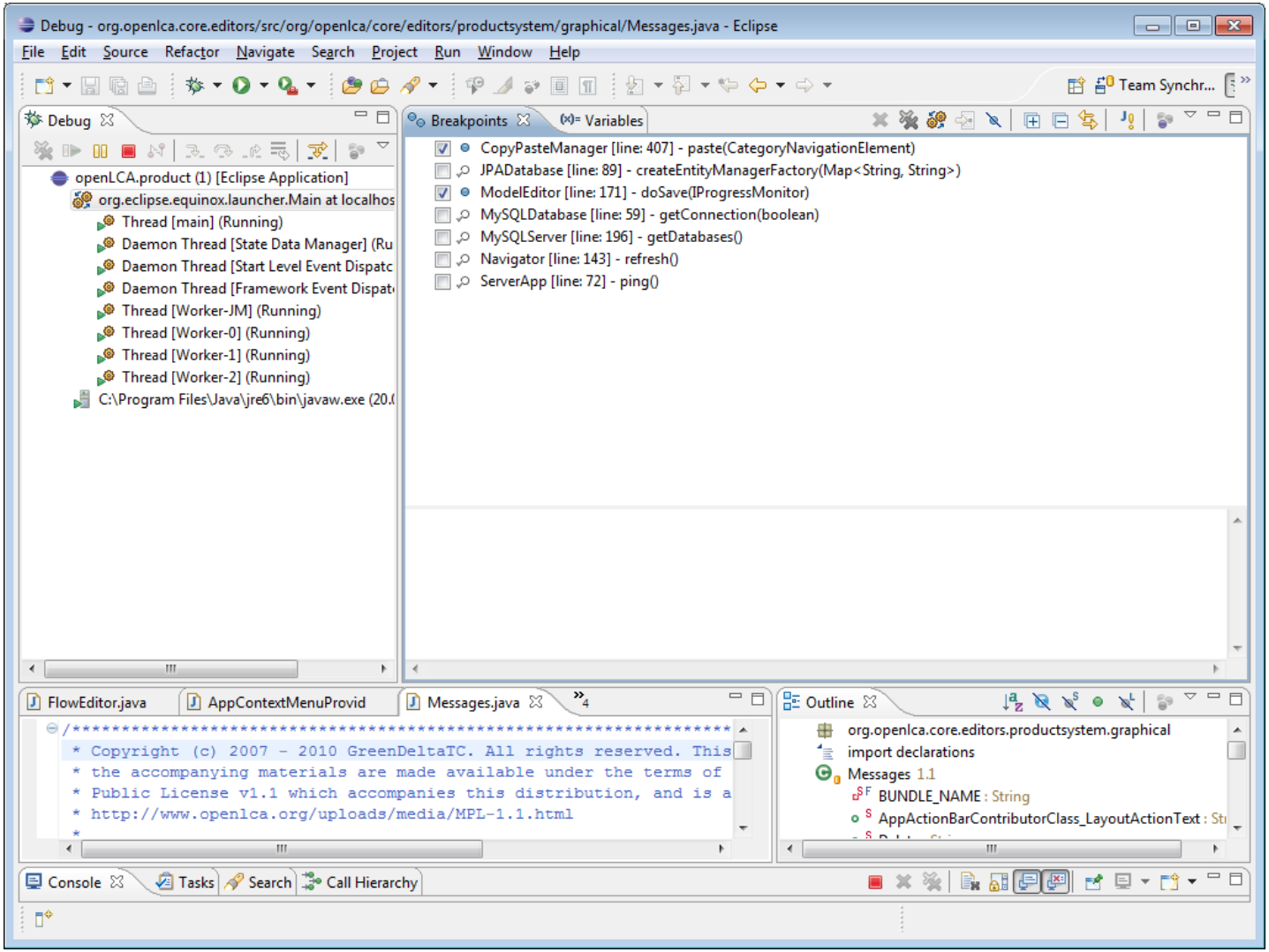
1. Perspectives in modeling
2. Perspectives in Life Cycle Inventory
3. An example from a German bioenergy project
4. Conclusions & Outlook

1. Perspectives in Modeling

„Java“ perspective in Eclipse



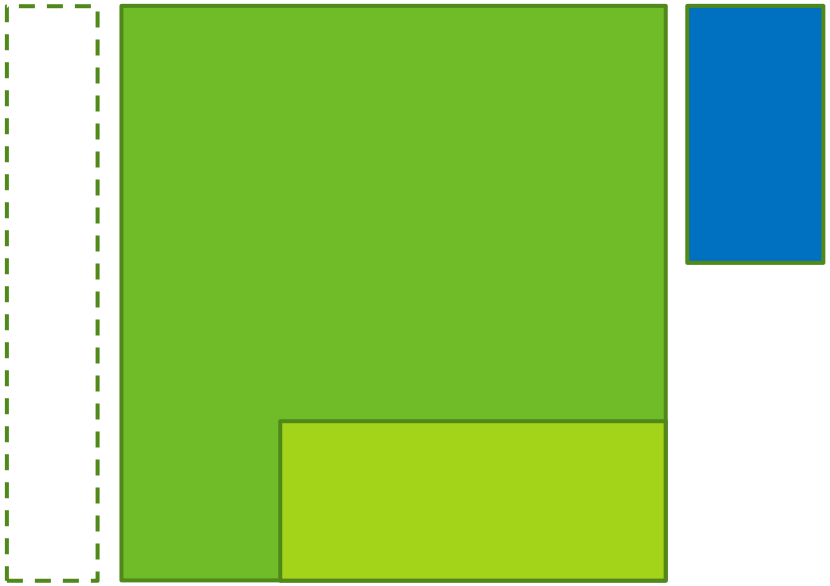
„Debugging“ perspective in Eclipse



→ Perspectives, in general

- Different ways to look at one given object
- Although the object remains the same, the view is different.

2. Perspectives in Life Cycle Inventory modeling



Perspectives in Life Cycle Inventory (LCI)

When modeling LCI data sets, a number of decisions need to be taken; for many of these, there is not one best practice and therefore decision:

- nomenclature (roughly, the naming of the flows, units, and of other elements used in a data set),
- allocation,
- biogenic carbon
- …

This makes the modeling difficult.

Perspectives in Life Cycle Inventory (LCI)

On the other side, a practitioner using inventory data sets needs to “live with” the decisions taken in the modeling process.

These decisions may or may not fit for the specific case.

This is not ideal.

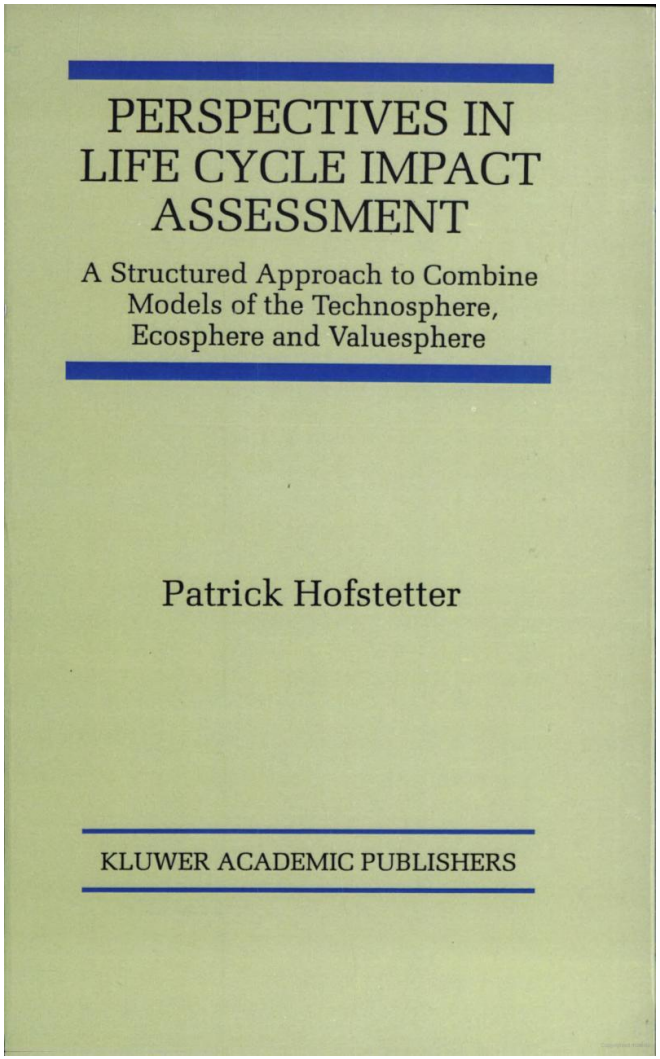
Perspectives in Life Cycle Inventory (LCI)

→ we propose ‘perspectives’ in inventory modeling.

Perspectives specify application contexts for data sets; within one perspective, there is usually one best answer to the various modeling questions, and this “best answer”, e.g. an allocation procedure, is part of the perspective.

Perspectives in LCIA: Hofstetter 1998 (!)

Dissertation, ETH Zurich



Perspectives in LCIA: Hofstetter 1998 (!)

- → Introduced perspectives based on social sciences (cultural theory);
- → each perspective is a state of mind, leading to a different assessment / valuation of impacts
- → End result (summarised): The hierarchist, egalitarian, individualist perspective used in e.g. EcoIndicator and ReCiPe

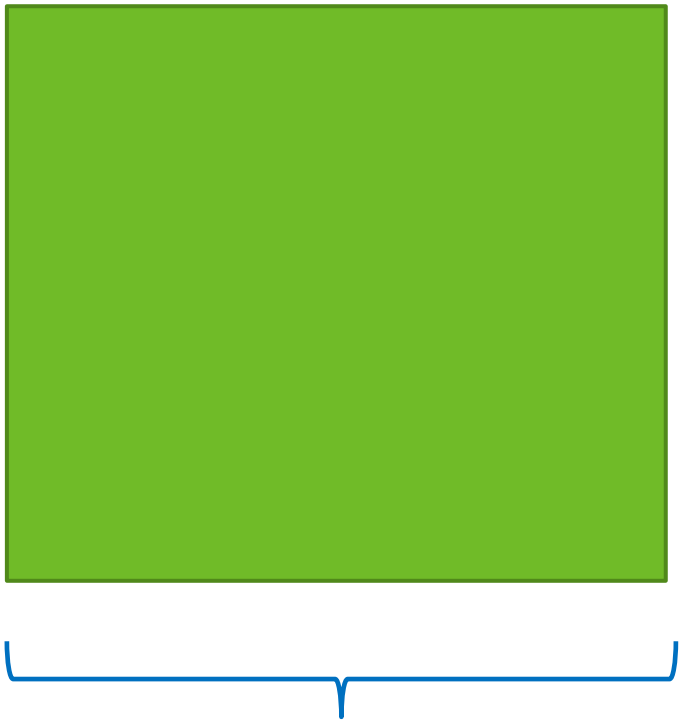
→ Perspectives in LCI

Very pragmatic approach:

- Each data set has a methodological core (contains aspects required by almost all perspectives)
- Perspectives introduce
  - Deltas (additions or omissions from the core)
  - Mods (modifications of aspects in the core), as exceptions

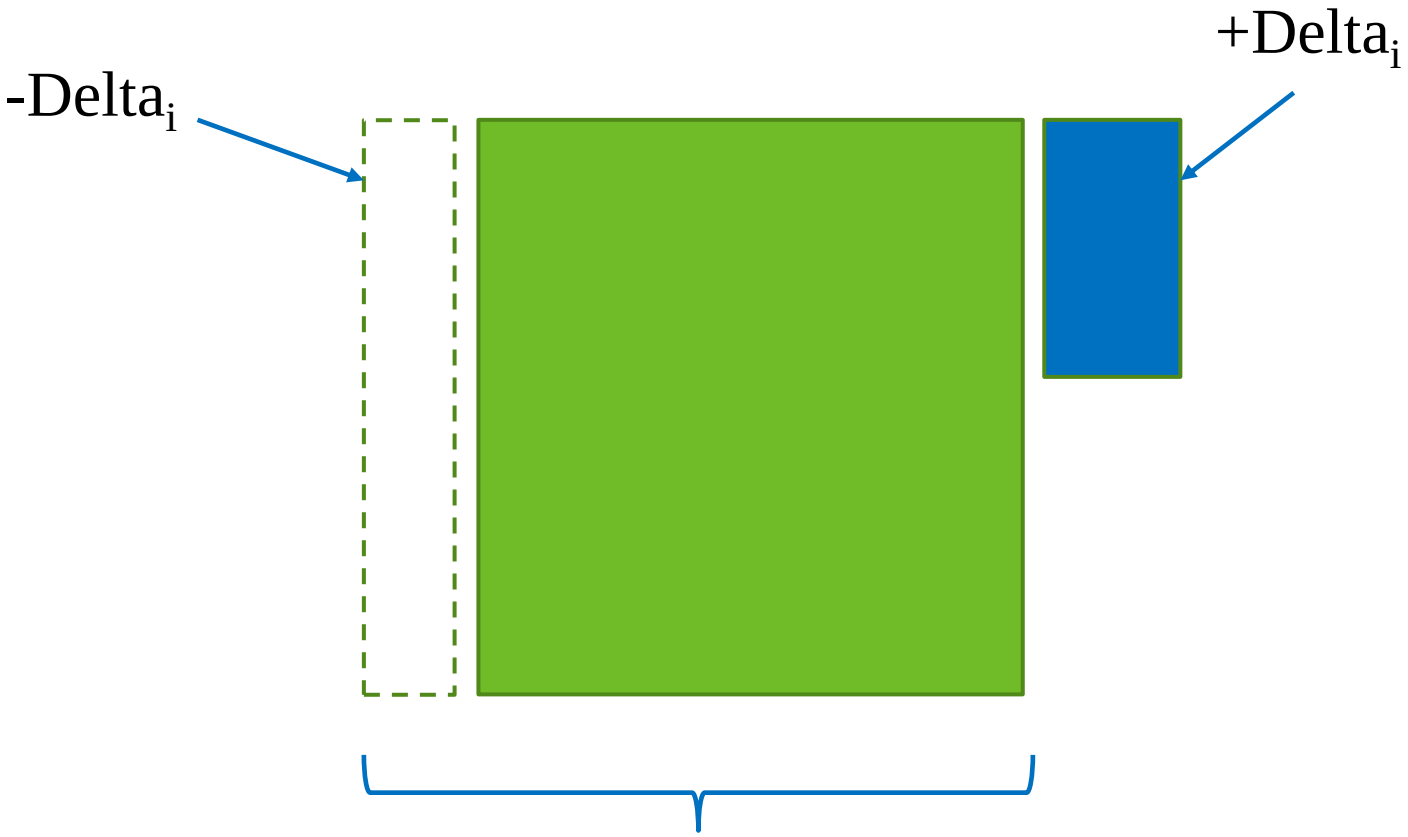
→ core

(Supported / required by almost all perspectives)



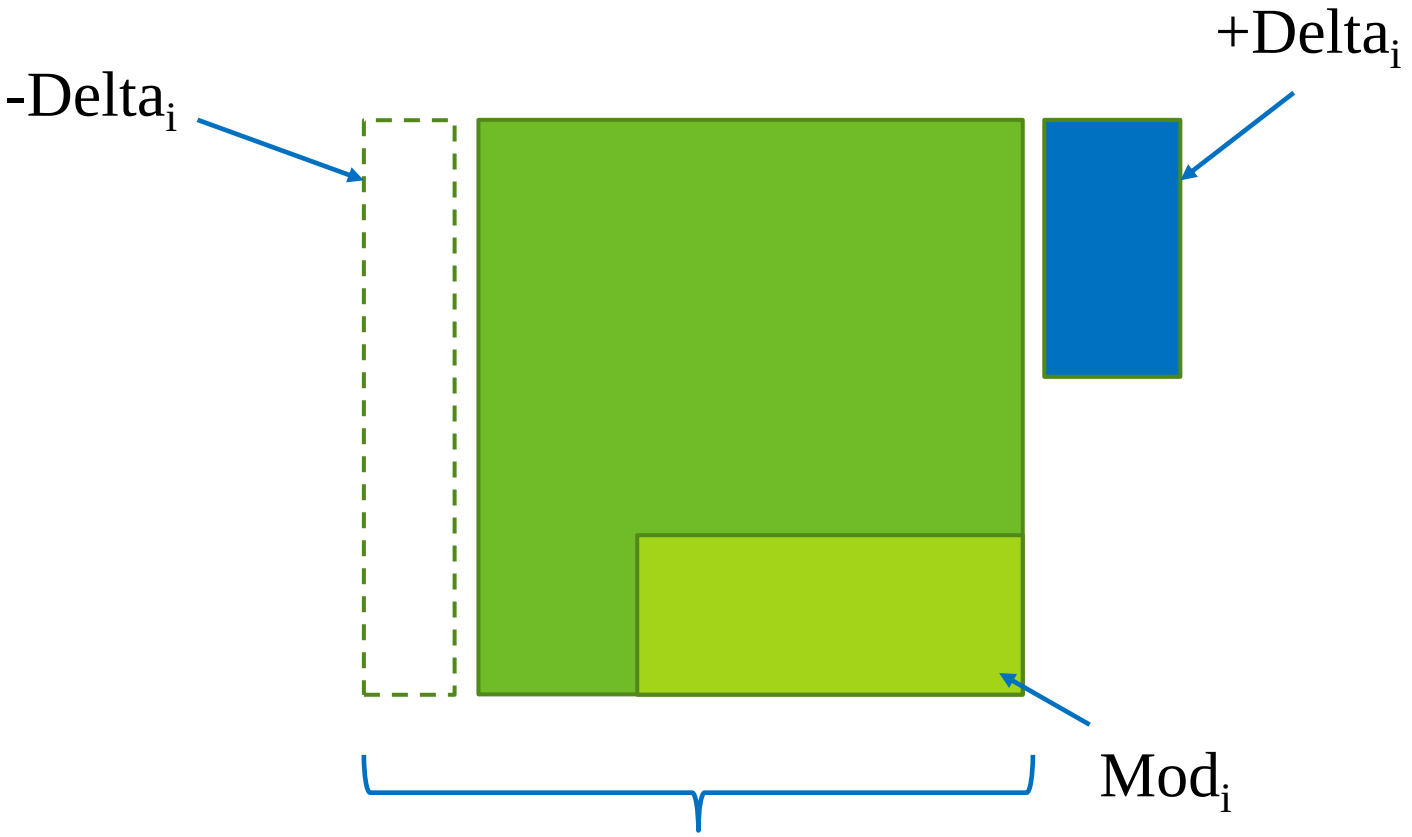
Methodological Core

→ deltas



for perspective i

→ deltas, mods



Methodological Core

for perspective i

3. Application in a German research project BioEnergieDat

The BioEnergieDat project

www.bioenergiedat.de

The BioEnergieDat project

- 2010 – 2012, funded by German ministry of the environment

Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit

Klima schutz

DIE BMU KLIMASCHUTZ-INITIATIVE

- Aim is to develop an IT infrastructure (Modeling software & database) and harmonized methodology, and also to create data sets following the method, for bioenergy data sets in Germany
- GreenDeltaTC leads WP methodology and is involved in WP IT (modeling software, openLCA)

Application to a dataset with three perspectives

- Dataset: Production of corn
- Perspectives:
  - PAS2050
  - ILCD
  - Life Cycle Costing

Methodological core: principles

- LCA according to ISO 14040/14044
- Processes are unit processes
- Processes are transparent, providing as much documentation as required for understanding the dataset
- Documentation must include also indication of goal and scope for the dataset, and **perspectives that the data set is meant to support**
- Data sets use a specifically developed reference nomenclature (English and German); mainly a combination of ecoinvent and ELCD

→ PAS 2050 perspective (some examples)

- +Delta:
  - Time (new aspect; time coverage of each process, and input and output over time – if process is not completely stationary – is required as additional information)
- -Delta:
  - In Impact Assessment, only GHG emissions according to IPCC
- Mod:
  - Airplane emissions not different from close-to-surface emissions

→ ILCD perspective (some examples)

- +Delta:
  - Several points more sophisticated than we initially thought, e.g. modeling of particles, of ions → yet to be decided whether these aspects move to the methodological core or not
- -Delta:
  - Nothing so far (!)

→ ILCD perspective (some examples)

Remark: ILCD considers itself three decision situations that in turn can be seen as perspectives

Table 2 Combination of two main aspects of the decision-context: decision orientation and kind of consequences in background system or other systems.

Decision support?		Kind of process-changes in background system / other systems	
		None or small-scale	Large-scale
	Yes	Situation A "Micro-level decision support"	Situation B "Meso/macro-level decision support"
	No	Situation C "Accounting" (with C1: including interactions with other systems, C2: excluding interactions with other systems)	

→ LCC*

- +Delta:
  - Every flow needs cost information
  - Cost types are required (similar to LC impact categories)
  - Time is required as information for each process if discounting is supported
- -Delta:
  - nothing
- Mod:
  - nothing

*based on Environmental Life Cycle Costing, Hunkeler et al. 2008, and Code of Practice for Environmental Life Cycle Costing, Hunkeler et al. 2011

4. Conclusion & Outlook

Conclusions

- Perspectives are a very flexible way to deal with, and satisfy, different possible applications for LCA data sets
- They allow addressing different methodological choices in a transparent manner

Conclusions, 2

- On the other side, establishing and maintaining the perspectives is effort
- „method conversion“ as next step (starting from format conversion)
- Perspectives are currently tested in a German research project on bioenergy data

Many thanks.

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About GreenDeltaTC: We provide leading services for Life Cycle Assessment, Social LCA, LCC, as well as software development and data collection related to sustainability.