How could consequential LCA provide added value to industrial decision makers and practitioners: a proposal.

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Session 2.b. LCA methodologies: issues, development and perspectives
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Setting the problem

**LCA scholars**

Consequential LCA in theory

- “… activities are included in the product system to the extent that they are expected to change as a consequence of a change in demand for the functional unit” (UNEP, 2011)
- “..quantification of the environmental consequences of a specific decision and of the related actions” (Ekvall & Weidema, 2002)
- “link micro-economic actions to macro-economic consequences” (Daalgard, 2008)

**LCA practitioners (industry and governmental organizations)**

Consequential LCA in practice

- **When** is cLCA necessary?
- **How do I perform** a cLCA? (where do I find data, how do I perform calculations, costs, needs for competences,..)
- **How do I check** the results? (comprehensiveness, validation, uncertainty, repeatability, ..)
- **How do I communicate** the results? (internally, externally)?
Setting the problem

LCA scholars

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Provide transparent and consistent methodology and tools
Point out key aspects which need to be further researched for operationability
Collaborative research

Industry association funding collaborative research and fostering LCA development

Research and Technology Organization (RTO) working at the interface between academia and industry

- How to choose the most appropriate one?
- Are these complementary or compatible perspectives to answer a large decision context?
- What are the boundaries of each approach?
Collaborative research

Research deliverables:

- Insights in current cLCA practice and limitations, as compared to other LCA approaches, and identification of research challenges
  - Literature state of the art regarding different industrial sectors.
  - Interview with international LCA experts with different backgrounds: Industrial – Academic – Consultant – Institutional

- Decision tree (MindMap) supporting the choice of the right LCA modeling perspective for a given decision context
  - Identification of methodological “nodes” leading to the most appropriate LCA approach regarding the question to be addressed.
  - Application examples for the targeted industrial sectors.

Platform presentation at SETAC2013 Conference, May 2013, Glasgow

Platform presentation at LCM2013 Conference, August 2013, Gothenburg
Completeness of the question to be addressed

**What are the environmental impacts of first-generation biofuel production from Brazil?**

- To fulfil the rising demand for private vehicles
- Induced by the implementation of a national policy providing subsides to households
LCA modeling perspectives

What are the environmental impacts of first-generation biofuel production from Brazil, in order to fulfil the rising demand for private vehicles, induced by the implementation of a national policy providing subsidies to households?

- Assess the environmental consequences of the change(s) affecting a system at meso or macro scale, especially the ones related to socio-economic developments, strategic industrial decisions and policy making.

- The Functional Unit quantifies a change relative to a technological system, which occurs in a given socio-economic context.

- The actual scale of implementation of the change is considered.
cLCI modeling preparatory steps (1/4)

Methodological locks to be solved

(1) Define the magnitude of the change/actions (temporal and spatial scales)
(2) Establish the tree of consequences generated by the actions
(3) Quantify the consequences
cLCI modeling preparatory steps (2/4)

Methodological locks to be solved

(1) Define the consequential scenarios including **temporal** and **spatial** scales.

- **Definition of magnitude of change**: 20% national production rise
- **Definition of the time-period**: Prospective approach
  - The national policy set a production rise objective for 2025, based on 2012 production level
- **Definition of the spatial context** should cover all technologies and resources directly or indirectly affected by the change(s).
  - The national policy would generate (indirect) consequences outside Brazil
  (To be confirmed by step 2 and 3)
cLCI modeling preparatory steps (3/4)

Methodological locks to be solved

(2) Establish the tree of consequences generated by the actions

Regarding the spatial-temporal scale and the magnitude of change:

○ What are the direct consequences?
Affected technologies / processes / resources which are directly linked to the FU

○ What are the indirect consequences?
Other affected systems that do not directly contribute to the achievement of the FU.
cLCI modeling preparatory steps (4/4)

Methodological locks to be solved

(3) Quantify the consequences

Regarding the spatial-temporal scale and the magnitude of change:

- What is the magnitude of consequences?

Weak (unconstrained system)

*The average existing technologies allow to face the change*

Large (constrained system)

*In order to respond to the demanded variations, the existing capacity of the average reference system is insufficient*
cLCI modeling choices

Operational approaches to identify and quantify the affected processes:
- Economic equilibrium (Vázquez-Rowe et al. 2013) and social modeling tools (Marvuglia et al. 2013, Querini et al. 2013).

Need for sectorial competences and knowledge outside the LCA domain


Conclusions

Decision tree
- Decision question (and intended use of results) has to be precisely defined and contextualized
  - Focus on the choice of the right approach to respond to a given decision context.
- cLCA is adapted to support large-scale decision making process
  - There is not a unique C-LCA approach.
  - LCI modeling approaches are complementary (not competitors)
- Case studies on mobility, construction, water treatment, waste treatment

Recommendations for harmonization and required developments
- In the revision of ISO14040 the inclusion of methodological elements and guidelines for cLCA could be considered.
- Test phase on selected relevant case-study, supported by public institutions, to elaborate good practice guidelines.
- Smart combination of (computational) LCA modeling approaches (“mutual contamination” between research fields).
Thank you for your attention!

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