Metrics for ex ante environmental assessment of eco-innovation projects

Can we measure possible environmental impacts of an eco-innovation project proposal in a quantitative way?

How can we give a weight to different environmental issues of relevance?

Software and Tools for LCA

ECO-INNOVERA

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Outlines

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I. Introduction

II. Requirements for the calculation of ex ante environmental impacts of eco-innovation projects

III. LCA software use for measurement of ex ante environmental impacts of eco-innovation projects

I. Introduction: Specificities of Eco-innovation Projects

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Some specificities of Eco-innovation projects when coming down to the practice with LCA software

- "Ex ante": **specific LC inventory data** regarding the innovation **are not fully available**, data gathering or modeling has to be done before software use
- The innovation is assessed through a **pilot**, a specific case... which environmental impacts are, most often, different from what they will be after industrialization
- The innovation should provide a (significant) improvement*: **a reference scenario** has to be defined and implemented in the software, and therefore chosen
- LCA is assisting the Eco-innovation project making, all along the project: the LCA practitioner will have to provide deliverables with the software *when requested* by the other work packages... the LCA work is therefore **subject to time constraints**

* Example: agro-based innovations are not "Eco-innovations" (from the LCA point of view) as long as the demonstration of the environment improvement (with no pollution transfer) has not been made

I. Introduction: Consequence for the LCA Practice

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LC inventory data regarding the studied innovation are not fully available, at pilot level and within time constraints

- **Accurate modeling** has to be made to generate useful inventory data, taking into account uncertainties

- An **iterative approach** has to be followed by the LCA practitioner (thanks to the LCA software flexibility) to validate the modeling along the project, integrating the progressively available results within the modeling and providing feedback to researchers

- **"Selection criteria"** will not be too high (e.g. 80% in mass) – decision making has to be relevant within this context where uncertainty is high

I. Introduction: Consequence for the LCA Practice

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Definition of a **reference scenario** – a "base-lining" work – which provides the same service

- Average existing technology
- BAT
- Local average existing technology

The choice depend on the « market » which is targeted by the Eco-innovation

Within a situation where data are uncertain regarding the Eco-innovation...

- Only **significant** (> 20-30% at least!) improvements are relevant to notice

Having this limitation in mind assists to make relevant simplification choices for the modeling, adapting the study requirements to the goal and scope, as mentioned in ISO 14040

II. Useful Features of **LCA Software**

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Ability to

- **Model** the specific studied systems, including end of life, and assist modeling
- Implement **specific** environmental information regarding the studied processes
- Handle and make available updated and required **generic** environmental information – **inventory data**
- Handle and make available updated and recommended **impact assessment** reference data
- **Analyze** the results, including contribution analysis (to process stages, to impacts...) through graphic and tabular means
- Make **interpretation**, including sensitivity and scenario analyzes (Monte Carlo)
- Generate **deliverables** within different formats, such as reports, EPD...
- Provide **feedback** to the user at each of the step of the work, for validation purposes
- Assist the **management** of LCA projects

II. Useful Features of **Software** (as such)

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Ability to

- Be easily **updated**: inventory data, impact assessment methods...
- Be easily **maintained** through upgrades
- Be used through **different functioning modes** (Standalone, Client-Server, Web based...)
- Be used with different **operating systems** (all recent MSWindows, Apple, Linux...)
- Inter-operate with other LCA software: import / export of LCA data
- **Inter-operate** with other software: upstream data gathering / downstream use of results
- Be **improved**: source code documentation, IT solutions continuity (C++, PHP...), modularity of the code
- Provide **productive functions**
- Be **documented**: help, use of local languages...
- … and be "**attractive**": ergonomic, nice look and feel...

III. LCA Software Use
"Practice by the Practitioner"

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Training

- The LCA practice **requests training**; nobody (even researchers, PhD, Engineers!) is able to use a LCA software *in order to get useful results* without training!

Practice

- **Regular –** it is not recommended to use a LCA software « from time to time »
- **Deep –** it not recommended to use a LCA software during short period of time and have an alternative work to do

Consequences within Eco-innovation projects

- Time (and budget!) has to be scheduled for LCA software appropriation and use, right from the beginning of the project (not at the end only!) – or a partner has to provide the relevant expertise within that field

III. LCA Software Use
LCA Practice within Eco-innovation Projects

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Specific implemented data are key to the success of the project

- The LCA software does not provide, embedded, data regarding the innovations, since it is an *innovation*!
- The LCA software does not provide, embedded, the full modeling of the reference scenario that you will choose for your project

Consequences within Eco-innovation projects

- Significant time (and budget!) has to be scheduled for **LCA data gathering, modeling and implementation** within the LCA software
- **Technical expertise** requirement is high concerning the studied processes in order to provide useful results and recommendations, the LCA practitioner cannot work « alone »

III. LCA Software Use
Impact Assessment within Eco-innovation Projects

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It is important to make no confusion between goal and method

- A mono-criteria approach is most often not adapted to be sure that an environmental improvement will be reached – pollution transfers cannot be assessed in that case!

- The target *may* be to reduce one impact only – the calculation of selected complementary environmental impacts will be done in order to check that no pollution transfer is done

Consequences within Eco-innovation projects

- The software has to **include the major impact assessment methods**, e.g. DG JRC recommended ones
- The practitioner will calculate impact assessment for a panel of selected impacts

III. LCA Software Use
LC Inventory Data within Eco-innovation Projects

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The use of LCA all along the Eco-innovation project will assist to define areas where to improve / optimize the innovative solution

The knowledge of the **origin** of the environmental impacts, i.e. the nature of the main inputs and outputs of the studied system which contribute to the impacts, will drive the definition of alternative options to reduce these consumptions or emissions

Consequences within Eco-innovation projects

- The LCA software should include the **details of the flows** which contribute to the environmental impacts
- The practitioner will calculate and analyze the impact assessment results, then identify the key contributing flows, and collaborate with the process experts to define innovative alternatives dedicated to reduce the selected environmental impacts

III. LCA Software Use
Work-plan & Conclusion

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Stage 1: Inception

- Define and implement in the LCA software the base-line, calculate a first LCA
- Define the **requirements** that the Eco-innovation solution shall fulfill to provide a significant improvement as far as environment is concerned
- Start the modeling in the LCA software of the Eco-innovative solution (with available information) and determine its potential to meet the requirements

Stage 2: Deployment, **assistance** of the researchers during the Eco-innovation project

- Evaluate options and provide answers "in due time", thanks to the flexibility of the LCA software and the ability of the practitioner to do it
- Improve progressively the modeling of the Eco-innovative solution in the LCA software

Stage 3: Validation and **dissemination**

- Compare the finally defined Eco-innovation with the base-line
- Prepare deliverables with the LCA software to communicate and disseminate

Thank you for your attention!

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