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AGENZIA NAZIONALE
PER LE NUOVE TECNOLOGIE, L'ENERGIA
E LO SVILUPPO ECONOMICO SOSTENIBILE

Life Cycle Sustainability Assessment and new technologies

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Today's menu



- Problem definition:
 - Application of the LCSA framework to a new technology
- Approach:
 - Definition of what a (sustainable) technology is
 - Case study
- LCSA framework (Kloepffer 2008)
- Discussion

- Is the Life Cycle Sustainability Assessment (LCSA) framework *applicable to and suitable for* a new technology?
 - Can the “consistency requirement” required by LCSA be always fulfilled? If not, under what circumstances?
 - What are the main challenges for each method used in the framework? (focus on S-LCA)

Approach: definition of what a sustainable technology is



- Kranzberg's proposition (Kranzberger 1997):
"[...] technology is neither good nor bad; nor is it neutral: technology's interaction with the social world is such that technical developments frequently have environmental, social and human consequences that go far beyond the immediate purposes of the technical devices themselves, and the same technology has quite different results when introduced into different contexts or under different circumstances."
- technology \neq product
- ISO 14040 introduces "product" as a collective term, which in principle includes also technology but actually a distinction is necessary

Approach: sustainability assessment of (new) technology



- The sustainability assessment of a technology is the assessment of a complex system (Mulder et al. 2011):
 - How the technology is perceived and used in a social context;
 - How it affects this context;
 - How it interacts with the technological systems, ecological landscape, etc.
- Such an assessment is challenging for three main reasons:
 - Level of applicability
 - Status of development of the technology
 - Complex system: non-linear relationships, feedback loops, emergent phenomena, and tangled connections among the parts.

Application of the LCSA framework



- $LCSA = LCA + LCC + S-LCA$
- The framework has been applied to a new tyre-recycling technology, which produces SiC;
- Consistency requirement: equivalent system boundary for LCA, LCC and S-LCA (Kloepffer 2008)
- We broadened it so to include the whole goal and scope phase
 - Target audience

Target audience - 1



- Target audience: public decision-maker
 - Defined by the project
 - Defined by the type of problem to be dealt with (management of end-of-life tyres)
- The study is thus set in terms of comparison of different scenarios
 - End-of-life tyres used to produce SiC
 - Another end-of life tyres solution represented by the use of tyres as fuel in the cement kiln.
- Is the first consistency requirement fulfilled?

Target audience - 2



- LCA and S-LCA studies can be carried out keeping consistency about the target audience
- Main problems with eLCC:
 - eLCC: all the costs covered by one or more of the actors in the life cycle
 - The perspective of the public decision maker would include a larger set of costs → externalities.
 - A societal LCC would thus be necessary, and not an eLCC
- If we adopt a societal LCC, the applicability of the LCSA framework is questioned.

Open questions of the methods in LCSA



- Different degree of developments;
- Most urgent developments in **S-LCA**;
- In S-LCA, linearity assumption becomes tight and could be more questionable than in the other methods;
 - In some situation a threshold exists which defines the relevance of a social aspect
- A broader FU would be necessary for technology assessment:
 - Context Unit: socio-sphere in which relationships take place, i.e. geographical area and/or organisation itself (Parent et al. 2010).

- When the object of the analysis is not a well-defined product, but a technology still in development, different considerations are needed;
- The application of LCSA framework is strictly dependent on the target audience of the study
- When the perspective of the public decision-maker is adopted, the application of eLCC is not consistent but a S-LCC would be necessary → the applicability of LCSA is questioned.
- Contrast between the complexity of the system analysed and the strong assumptions made in applying the LCSA framework.

- The LCSA shows its strengths in forcing practitioners to think about the different options and to detect important aspects that at a first sight could be neglected;
- Developments in S-LCA should focus on the non-linearity of the impacts;
- To explore the feasibility of adopting the "context unit";
- The role of societal LCC within the framework should be further investigated.

Should the sustainability assessment of technologies adopt a different framework than LCSA?

Thank you for your attention

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