TITLE

Subtitle

Version

date

TABLE OF CONTENT

1. Introduction

2. Goal and scope definition

2.1. Goal definition

In the CIRCE2020 project the following generic goals can be defined:

- *to compare costs of existing "business as usual" (BAU) and new „circular economy" (CE) solutions,*
- *to identify costs and benefits of waste donors and/or recipients when applying CE solutions,*
- *to upscale the potential economic benefits of the CE solution to regional or national levels.*

In the LCC studies of the CIRCE2020 project the above mentioned goals should be specified, considering that the following issues need to be clear before conducting the study:

- *what is the intended application,*
- *what is the reason for carrying out the study,*
- *what is the intended audience and whether the results of comparative assertions intended to be disclosed to the public.*

Clear goal definition is important when costs are analysed as different actors of the life cycle chain view the costs from different perspective. In the CIRCE2020 project, the circular solutions may involve more stakeholders such as the waste donor, the waste recipient and others. When goals of the LCC study are defined it must be indicated whose perspectives are considered.

2.2. Scope definition

When scope of a LCC study is defined the following items can be described:

- *the systems to be studied,*
- *the functions of the systems studied,*
- *the functional unit that is consistent with the functional unit of the associated LCA,*
- *the system boundary that satisfies the objectives of both the LCC and the associated LCA,*
- *allocation procedures,*
- *the way the interpretation will be conducted,*
- *data sources and data quality requirements,*
- *main assumptions,*
- *type of critical review, if any.*

2.2.1. Functional unit

The functional unit (FU) is the quantified performance of a product system, to be used as a reference unit. Functional unit and related reference flow are important elements of the LCC study. The BAU and the CE solutions can be compared only if their costs are calculated to the same FU.

To guarantee full consistency of the LCC and LCA studies, the same functional unit must be applied.

2.2.2. System boundaries

LCC should be based on the same system boundaries as the complementary LCA.

List all product life-cycle stages and processes that are part of the product system shall be described together with a diagram of the system boundaries!

Are there cost relevant activities that may be included in the LCC but excluded in the LCA study? (laboratory and testing work, marketing activities, infrastructure, machinery)

Are there identical processes of the BaU and CE solutions or other cost issues that are excluded?

Time factor is an issue to consider when you perform the cost assessment?

3. Economic Life Cycle Inventory

3.1. Data collection

The following cost categories are recommended to be included in the CIRCE2020 studies:

- *materials, water, energy (electricity, thermal)*
- *transports*
- *administration, commercialisation*
- *depreciation*
- *labour*
- *other cost types, identified as significant in the specific case.*

Reference time and reference currency of the LCC study have to defined.

The crucial issue is to document the quality of the data applied in the LCC study such as source, reference year and potential uncertainties.

Allocation method needs to be accurately documented. In the complementary LCA study the allocation method should be as consistent as possible with the allocation applied in the LCC study. Potential inconsistencies needs to be documented and considered when final LCA and LCC results are compared.

The LCC data collection should result a Cost Breakdown Structure (CBS) including each life cycle stage considered and the different cost types.

3.2. Externalities

Describe external costs, expressed in monetary units that are not directly borne by an actor of the life cycle chain!

If relevant cost externality factors are identified in the LCC case study than the selected cost assessment method has to be documented in detail considering its uncertainty when results are interpreted.

If an analyst of the CIRCE2020 project wants to avoid uncertainties deriving from quantitative literature data then a clear and detailed qualitative description of significant externalities might suffice.

4. Interpretation

4.1. Comparison of BAU and CE systems

Results should support the identification of the most relevant costs within the analysed systems and the decision about the most preferable solution from a cost perspective.

Describe separate cost breakdown of the actors whose perspective is considered: these are usually the waste donor and potentially the waste recipient and other actors.

Any inconsistencies between LCA and LCC due the potential differences in system boundaries or allocation procedures must be declared and considered for accurate interpretation of results.

4.2. Upscaling

A circular solution developed in the CIRCE2020 project may potentially have a wider application in future, so an additional useful result can be the upscaling of its cost benefits to regional/national level. Such extrapolation has to be done with great care based on realistic and well documented quantities of the reference waste flow.

4.3. Consistency, completeness and sensitivity checks

Consistency and completeness have to checked and described in a qualitative way. Any significant inconsistencies or incompleteness have to be clearly stated for the correct understanding of the results.

Additional focus needs to be applied on cost data which might contain the highest uncertainties due to the involvement of assumptions and expected variations. A sensitivity analysis has to be carried out to identify the potential change in the life cycle cost result as a function of variation in the input cost data and whether changes in assumptions or data alter the ranking of results of the life cycle alternatives compared. It is recommended to make these sensitivity calculation in a quantitative way or otherwise describe the highest uncertainties and their possible effects on the results in a qualitative manner.

5. Conclusions

6. References