Definition of social indicators: a case study of an innovative technology

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1. Introduction

Social life cycle assessment (S-LCA), as defined in the UNEP/SETAC Guidelines [1], is increasingly emerging as a method for evaluating social performance of products/systems. Much has been done at the methodological level, as testified by publications in the last years. Questions related to relevance and feasibility of S-LCA [2], scope of the analysis [3], selection and formulation of indicators [4], and data collection [5] have been the most debated topics. However, still a few applications exist, and none of them related to a technology.

The authors dealt with the problem of applying the S-LCA framework to an innovative technology. They identified the following critical points: i) the perspective to be adopted; ii) the representativeness and appropriateness of indicators among those defined in the methodological sheets [6]. Regarding the first aspect, scientific papers published so far demonstrate that a company perspective is at the core of the methodology: social impacts are mainly related to the way a particular company interacts with its stakeholders. Social impacts in terms of consequences on the system in which the technology is embedded are evaluated only to a less extent. Regarding the second point, the indicators defined in the methodological sheets, for both specific and generic analysis, are not always applicable. In fact, those for a specific analysis consider the company perspective, and those for a generic analysis do not allow catching the peculiarity of the technology. The paper focuses on this second aspect, and it is aimed at presenting and discussing a preliminary selection of indicators for an innovative technology.

2. Materials and methods

The technology under study is innovative and consists of a gasification treatment of waste tyres with the utilisation of the carbon-rich chair fraction obtained – together with a source of silica – for the synthesis of ceramic materials (silicon carbide – SiC) via carbo-thermal process. The syngas obtained from the gasification process is used for energy production. This technology is not pervasive, i.e. it does not supersede the alternative way of delivering the final product. Moreover, it is not yet on the market and consequently, primary data are not available. For the purpose of the assessment, the S-LCA of the system under study is evaluated relatively to another end-of-life (EOL) tyres solution represented by the usage of tyres as fuel in cement kiln. This solution has been selected because it represents the commonest EOL treatment of energy recovery presently applied to tyres.

In the process of applying the S-LCA framework, it has been noticed that two main perspectives can be identified: i) the way the technology affects the society as a whole; ii) the extent to which the company that holds the technology is capable to manage the social aspects arising along the whole supply chain. Even if in principle both perspectives are possible, the indicators presented in the methodological sheets are mainly suited for the second approach. Only a societal perspective could take into account social impacts arising whenever a product interacts with the surrounding system and gives rise to positive or negative consequences. This point of view is considered relevant by the authors and it is also common in the literature on technology assessment. In particular, there is a long tradition in the Social Impact Assessment (SIA), in which concepts like social acceptance [7] and social compatibility are at the core of the analysis.

Thus, for the technology under study, the challenge is to find the most appropriate indicators to be used within the S-LCA framework, taking into account also a societal perspective.

To this purpose, the indicators proposed in the methodological sheets have been analysed, for all the stakeholders, together with those developed with other approaches in the scientific literature. The criteria for selecting indicators were [8]: scientific, functional and pragmatic. Moreover, they should also catch the essential characteristics of technologies (current and innovative) and enable differentiation among them.

3. Results and discussion

Among the stakeholders' categories, the following have been considered relevant: workers, local community and society.

The category "*workers*" is important because an innovative technology might require new competences and thus give rise to professional development. At the same time it might affect also health and safety conditions, aspects that need to be taken into account. The effects on *local community* are equally important. In this case the analysis should focus on aspects that could undermine or improve the main elements on which this category is built on, i.e. common values and social cohesion. Finally the *society* is the place where humanity lives and where its members can achieve their needs and realize their wishes. This stakeholder is the most relevant one for the assessment of new technologies because their development and introduction on the market generate multiples dynamics that might have important effects on the whole society, contributing for example to the creation of employment, to the economic development, to knowledge generation.

An example of indicators selected and proposed for these stakeholders' categories are shown in Table 1.

Stakeholder	**Subcategory**	**Indicator**
Worker	Health and safety	Number of recognised occupational disease and reports on elevated health risks
Local community	Local employment	% Workers hired locally
Society	Contribution to economic development	Under evaluation
	Technology development	Under evaluation

Table 1: Some indicators selected for the S-LCA of an innovative technology

Even if the relevant stakeholders have been identified, some indicators still need to be defined, in particular for the stakeholder society.

4. Conclusions

The analysis conducted so far demonstrates that the framework for S-LCA raises some issues when applied to an innovative technology, because the social effects are investigated mainly from the perspective of the company that holds the technology. The stakeholder society has been identified as the most relevant. However appropriate indicators able to measure social performances at macro level still need to be identified, together with those related to the impact on internal (e.g. employment, capacity development) and external population (e.g. human capital, community capital) [9].

5. References

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