SCORELCA

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SOCIAL LCA, SUSTAINABLE DEVELOPMENT, CSR: STATE OF RESEARCH? WHAT ARE THE METHODOLOGICAL NEEDS?

ACV SOCIALE, DEVELOPPEMENT DURABLE, RSE : QUELS BESOINS METHODOLOGIQUES ? OÙ EN EST LA RECHERCHE ?

EXECUTIVE SUMMARY

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SCORE LCA is an association that has been created to financially support collaborative research on LCA and related topics. It aims to promote and organize cooperation between companies, institutional and scientists in order to support the evolution of LCA methods and its practical implementation at European and international level.

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- ✓ The information and conclusions presented in this document were established on the basis of scientific and technical data and regulatory and normative framework in force at the date of the drafting of documents.

1. Introduction

The aim of this report is to provide a comprehensive overview of the current developments in the field of Social Life Cycle Assessment (S-LCA) and its perspectives, both from the methodology and applications points of view.
The final objective of the study is to obtain a clear vision of the developments in S-LCA and to be able to argue on the means and interests to quantify today the social impact of a product, by adopting a life cycle approach. This vision will be reinforced by a roadmap of practical recommendations, which will identify the essential steps to be taken for further developing the methodology and its uptake, as a decision-support tool.
In addition, the findings will allow identifying the methodological gaps and the complementary work needed to ensure the practical use and evolution of S-LCA in a broader global context, such as a framework for Life Cycle Sustainability Assessment.

2. Reason-why for S-LCA

The ultimate objective for conducting a S-LCA is to promote improvement of social conditions and of the overall socio-economic performance of a product throughout its life cycle for all of its stakeholders.

Traceability and control of the value chain are among the major challenges currently faced by companies in terms of environmental and socio-economic impacts. In this context, the S-LCA could be an effective methodology for measuring social impacts. S-LCA is a multi-criteria, multi-stakeholder and multi-step analysis that provides useful, transparent and science-based information on social and socio-economic performance of a product throughout its entire life cycle. The benefits of conducting such an analysis are many. S-LCA results enables an evidence-based decision-making process which may be very useful in highlighting trade-offs between different alternatives (UNEP/SETAC). Indeed, S-LCA can be used to compare two or more products, services or organizations, by highlighting not only which one is better but how each performance outdo the other regarding the assessed criteria and the local context. Furthermore, by identifying the social hotspots, S-LCA highlights the life cycle stages in which the potential improvements are critical.
As the international context becomes increasingly demanding on social issues, S-LCA may be a good way helping the companies to be compliant with ONU's Sustainable Development Goals. Thus, thanks to its complementarity with other CSR reporting tools and standards, S-LCA can be used in combination with other techniques or tools, to provide further information and help linking social impacts and performances at the company level to the product's life cycle stages.
Finally, S-LCA may be an effective way to communicate with the company's stakeholders on social impacts providing that the results are tailored to the target audience.

3. Definition and scope of Social Life Cycle Assessment

The scope of a methodology refers to the extent of the subject matter that it deals with, which in this case means the depth and breadth of S-LCA. The scope is defined in terms of paradigm and framework.

With reference to S-LCA, there is a variety of paradigms adopted. This tell us that there is not one paradigm preferable over the others, but it is important to state clearly which one is adopted, taking into account that a key concept of any paradigm for S-LCA is the life cycle perspective.

Together with the paradigm, another important aspect for the definition of the scope is the ***framework***. It is the skeleton that accommodates values and concepts of the paradigm in a consistent way, and it is made operational by means of several methodologies. The framework is defined by the following elements:

Modelling principles

Currently a framework for S-LCA has been developed by the UNEP/SETAC Life Cycle Initiative (2009) mirroring the LCA framework, as described in the ISO 14040 and 14044. From the practical point of view, this means that in principle the S-LCA methodology:

- is structured along four main phases, namely Goal and scope, Life Cycle Inventory, Life Cycle Impact Assessment, Interpretation;
- is based on the concept of functional unit, i.e. product, service, and organisation systems are defined based on the function they deliver. As a consequence, on the basis of the function it is possible to compare different systems;
- adopts the same modelling principles as LCA, namely: i) linearity (the double the quantity considered, the double the impact; ii) “ceteris paribus assumption”, i.e., other things being equal or held constant. According to the latter, the product, service, or organisation system is considered to work under the hypothesis of isolation, without reacting to the effects of the surrounding context in which it is embedded;
- focuses on routine functioning, i.e., exceptional situations that might occur in the functioning of the product, service, or organisation system are not accounted for;
- facts and values are both present and part of the assessment.

However, some of these aspects do not fully apply to S-LCA, as can be seen for the linearity concept. The adoption of the life cycle concept has several implications, which makes S-LCA unique compared to other methodologies for assessing the social aspects and performances namely:

- Any (product, service, and organisation) system analysed (e.g., electricity production) is made of interconnected activities (e.g., extraction and processing of fossil fuel, fossil fuel transportation) affected by the behaviour of stakeholders (e.g., workers in the power plant but also in the upstream process of the fuel production and in the pipeline construction; local community at the different life cycle stages);

- All the actors along the value chain are responsible for the performance of the system at hand, at different levels that should be reflected also by the power of contractual relationship and by the remunerability;

Thus, as far as the system boundaries are concerned, given that stakeholders are the key characteristic of S-LCA, and they behave driven by the activities carried out in the life cycle of the product, service, or organisation system and according to their values, which in turn are affected by the context in which they live, the theoretical system boundaries of S-LCA can be revised and simplified considering two main aspects (Zanchi et al., 2017):

- technological relations (effect-oriented approach), which are linked to the several physical units present in the product, service, or organisation system, and define the production cycle and the entire life cycle phases;
- social relations (technology-oriented approach), which are related to the level of interest and influence, and thus take into account the affected stakeholders and the related effects.

Object of the assessment

The object of the assessment is defined in terms of types of impacts accounted for and of targeted system. As far as the impacts are concerned, S-LCA takes into account social and socio-economic impacts generated along the life cycle of the product, service, or organisation system under investigation. Social impacts are consequences of positive or negative pressures on social areas of protection (i.e. well-being of stakeholders), due to: (i) a specific behaviour held by one or more stakeholders (e.g., social interactions in the context of an activity and/or stimulated by it and/or by preventive or reinforcing stakeholders' actions such as enforcing safety measures in a facility); (ii) downstream effect of socio-economic decisions; (iii) the original context (attributes possessed by an individual, a group, a society (e.g., education level.).

In addition to impacts, whose quantification is acknowledged as a complex issue still under study, S-LCA assess also social performance, effects and risks. While social "**impacts**" are caused by changes in the context, which originate effects related to e.g., changes in life expectancy, health, social status, social "**effects**" measure the effect of an activity on stakeholders but an intermediate level, as the entire causal relationship is not identified. "Social "**performances"** are neither social effects nor social impacts of changes, but "[…] features of a situation in a relevant organization (or features of the value chain of organizations shaping the life cycle), referring more or less to social issues" (Macombe et al., 2013, p. 205).
Finally, a social "**risk"** measures the likelihood of negative effects only (damage, injury, loss) that may be avoided through pre-emptive action. S-LCA considers also positive impacts, which are the basis of any social-related policy and intervention, and their quantification can play a major role in S-LCA (Benoît et al., 2010). Moreover, positive impacts are meant to encourage performance beyond compliance (with laws, international agreements, certification standards, etc.) as, for example, in the sustainable development goals (UN 2015a, b).

Level of the assessment and coverage

S-LCA can in principle be carried out at different ***levels***, namely:

- Micro: products/services/technologies;
- Meso: it may include "groups of related products and technologies, baskets of commodities, a municipality, a household" (Guinée et al., 2011: 93), a territory;
- Macro: This level of assessment considers the life cycle stages in interaction with the society where they are embedded.

In addition, as far as the ***geographical coverage*** is concerned, S-LCA is context-driven, i.e. social impacts/performances are intrinsically related to the specific geographic and cultural context where they unfold, even if culture can cross geography. Culture in particular is of paramount importance, and by some authors is recognized as an additional pillar of sustainability (Pizzirani et al., 2016). Cultural indicators are also present in S-LCA subcategories (e.g., cultural heritage, respect of indigenous rights), however performing an S-LCA does not always guarantee the inclusion of cultural values because the supporting data are often associated only with the presence or absence of national and international policies, agreements, standards and reports.

Regarding the ***temporal coverage***, current S-LCA is not prospective yet, but it captures current and past effects; in addition, also the temporal horizon at which the impacts are assessed is not defined yet. Overall, the time issue is not well defined in S-LCA for three main reasons:

- The impact assessment is still poorly developed, when the causal relationships that describes social impacts are concerned;
- In S-LCA, the urgencies of the issues evaluated is at stake, and the risks and social performances evaluated in the case studies available in literature are traced in current times, because the impacts – besides being potential – are also real, and as such already experienced by actors;
- Value changes over time, and this can strongly affect the validity through time of S-LCA results, depending on the reference context for the study.

Any prospective evaluation should be carried out with caution, and, most importantly, shall specify the reference values considered, as a support to the interpretation of the robustness of the results.

4. The social dimension outside Life Cycle Assessment

Many standards and methodologies are already available for addressing social issues. The following table summarizes the links between the main subcategories of the UNEP SETAC guidelines, and existing standards.

Stakeholders	Sub-categories	[UNEP-SETAC09]	[GRI4]	[ISO26000]	Fair Trade Small Producer	Fair Trade Hired Labour	Fair Trade Ecocert (Responsible)	SDGs
Employee/Worker	Freedom of association and collective bargaining							
	Child labour							
	Fair salary / Wages							
	Working hours							
	Forced labour							
	Equal opportunities and discrimination / Diversity							
	Health and Safety							
	Social benefits and social security							
Consumer	Health & safety							
	Feedback mechanism							
	Consumer privacy							
	Transparency							
	End of life responsibility							
Local community	Access to material resources							
	Access to immaterial resources							
	Access to tangible resources							
	Delocalization and migration							
	Cultural heritage							
	Safe & healthy living conditions							
	Respect of indigenous rights							
	Community engagement							
	Local employment							
	Secure living conditions							
Society	Public commitments to sustainability issues							
	Contribution to economic development							
	Prevention & mitigation of armed conflicts							
	Technology development							
	Corruption							
Value chain actors not including consumers	Fair competition							
	Promoting social responsibility							
	Supplier relationships							
	Respect of intellectual property rights							

This exercise allowed for the exploration of possible links between CSR reporting methods and tools and S-LCA. This analysis is particularly relevant for companies that seek to undertake a S-LCA of their product, but have trouble understanding what type of information is sought. Indeed, companies that already report with the GRI Standard may already have crucial information required to undertake a S-LCA. This result highlights that a promising way forward is to harmonize the S-LCA model with the GRI Standard indicators.

As the use of the GRI Standard will become more and more ubiquitous, standardizing and harmonizing S-LCA indicators based on the GRI indicators would be a useful undertaking. Furthermore, the SDGs indicators, although new, can be used as generic proxy indicators at a national level for S-LCA methodological sheets, and should be explored how they can be integrated into the S-LCA model. At the same time SDG indicators can enhance the categorization of these indicators on business thematic related to social topic. Thus, based on a materiality assessment of SDGs and which SDG are of high priority for the organization, social topics can be selected and thus the associated indicators. In addition, SDGs and social topics can be related to GRI4 indicators or ISO 26000:2010 framework in order to provide a holistic view between all these standards. Even if the GRI or ISO 26000 standards apply to “a company” and not a product they still mandate for companies to investigate the most “material” or “impactful” business relationships may they be direct or indirect and identify the issues at stake as well as their locations. This can be considered in LCA terms as a “hotspot” assessment process within their supply chains.

While stakeholder engagement and surveys are necessary components of a materiality assessment and due diligence process, a science based process is also needed in order to bring consistency and comprehensiveness to the results. S-LCA as a tool can support to fulfil these requirements on materiality assessment and due diligence on three different levels [Benoit Norris and al, 2014]:

- **Methods**: Methods are needed to enable the assessment of risks and performances throughout the value chain in a comprehensive, consistent but manageable way. The Life Cycle Inventory (LCI) and Impact Assessment (IA) methods developed within the field of S-LCA have the potential to bring structure, credibility and consistency to supply chain materiality assessment.
- **Models**: Models are needed to inform about the supply chain activities, linkages and location. While a large number of companies have still very limited information on their suppliers, let alone second or third tiers suppliers, S-LCA models enable to by-pass this information gap by using trade or process models.
- **Data**: Data are needed to support assessments by providing generic and site-specific information that will allow identifying hotspots and assessing performances. S-LCA requires its own data addressing relevant social issues. The UNEP/SETAC Guidelines on S-LCA include a flexible list of impact subcategories that cover issues mandated by most standards. With a first comprehensive S-LCA data source, the Social Hotspots Database (Benoit Norris et al., 2013), together with the PSILCA database, can deliver extensive hotspots assessment at the level of the company, a company division or a product category.

5. The state of the art of Social Life Cycle Assessment

5.1. Literature review

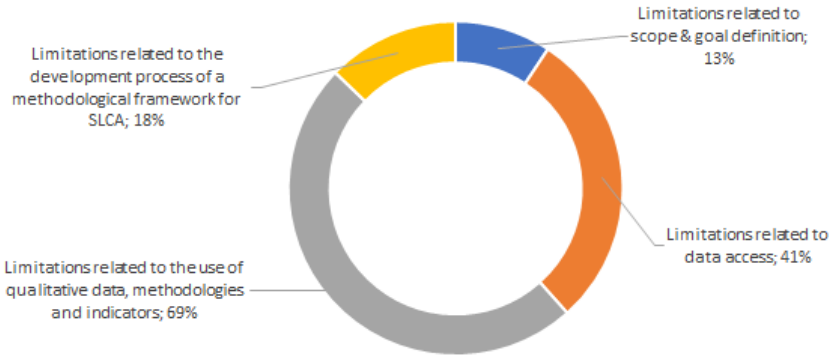
To assess the state of the art of S-LCA, a systematic literature review was performed, covering both methodological and practical aspects. While the former focused on the impact assessment approaches, and presented an overview of what is currently available and applicable, the analysis of the case studies was aimed at identifying current uses and main drivers for the application of S-LCA: Overall, 65 articles on case studies were selected and analysed, building upon previous review articles (Di Cesare et al. 2014; Petti et al. 2014; Di Cesare et al. 2016; Petti et al. 2016). For the 65 case studies analysed in this report, even though they do not deviate from the 40 identified by the previous processing, they are still significantly different in terms of outcome delivered:

- **Object of study:** 60 % regard a product (the analysed products are in 26 % of cases in the "food" category), 25 % studied a service, and 15 % analyse a process.

- **Sector of application:** 38 % of the case studies explored the manufacturing sector, 22% in the energy sector, and biofuel; 22% in the agri-food sector; 21 % in the waste management sector; and one study dealt with tourism. A thorough reading of this data shows an unforeseen perspective; it was expected that the scope of the most interested sectors would be of high-risk social and socioeconomic problems, while the sectors analysed appear to be the areas with a strong environmental aspect. This is probably due to the fact that S-LCA was born as part of a broader assessment of goods and services with a view to sustainable development.

- **Geographical area:** 48 % of case studies are implemented in "developing economies" while the 46 % in "developed economies", probably because countries with elevate social hotspots. Europe can be certainly regarded as the continent in which most of the studies are concentrated. Perhaps because, according to Mattioda et al. (2015), the highest concentration of researchers is located in the Old Continent (Denmark, Sweden, Netherlands, and Germany). Another valid reason may be the difficulty in finding certain types of data (especially qualitative and those being socially sensitive) in developing countries.

- **Limits:** The development of S-LCA for products is still an emerging methodology. Some hindrances have been identified and categorized in 4 types:



Specifically, in 22 % of the cases, the functional unit is not specified as well as the system boundaries, whereas the reference flow is not specified in 79 % of cases. In 68 % of the selected papers, the system boundaries (SB) were divided into and restricted to single phases of the life cycle. Nevertheless, the predominant trend remains that of SB “from gate-to-gate” (24 %) and “from cradle-to-gate” (41 %). The Impact Assessment (IA) is definitely the most fragmented phase; as shown in the paper of Wu et al. (2014), there are many different IA methods, which can use type I and type II impact categories. This may be due to the fact that the S-LCA method was only drafted and not standardized (Zamagni 2012). This has caused a proliferation of models and/or different techniques, also by the same author, which can be deemed useful as the demand for S-LCA impact assessment methods could no longer wait for a scientific and shared method (Macombe et al. 2013).

- **Use in Social Life Cycle Assessment (product, service or organization):** S-LCA provides information on social and socio-economic aspects for decision making, promoting dialogue on the social and socio-economic aspects of production and consumption, in the prospect to improve performance of organizations and ultimately the well-being of stakeholders. This bibliographic study has enabled the identification of the main trends in the use of S-LCA. **The review revealed that most of the cases (64%) are currently lead in a research aim. However, 20% of them mentioned socio-design as one of their main goals and 18% of the case studies were carried out in the aim of facilitating decision-making. Finally, the optimization of the supply chain represents a main goal in only 5% of the cases, followed by Risk management in 2% of the cases.**[1]

[1] It is important to note that for the same case study, several uses for S-LCA have been identified, which explains why the distribution according to the different types of uses is higher than 100%.

6. Experimentation

In order to provide operational recommendations that are relevant and applicable during S-LCA, an experimentation was conducted through a practical case study based on literature. No additional data collection, elaboration or setting of the system under analysis has been performed.

The main goals of this case study conducted on a Photovoltaic module are: (1) to show the applicability and practicability of S-LCA; (2) to highlight the social hotspots raised by the analysis regarding production and end of life phases; (3) to show how those results may complete classical LCA and other social approaches (GRI reporting, ISO 26000…); (4) and how it may support decision-making.

The details of the case study are available in the final report of the study.

Conclusion of the experimentation

The present study shows that there is a need for broad improvements of labour conditions (Ciroth et Franze, 2015) regarding employees' health and safety but also wage levels, working hours and social benefits. **Those results could enhance social performance of the concerned companies by helping them to build a targeted strategy for future development of social policies. It's also a way to manage social risk thanks to the identification of the social hotspots.**

As illustrated in this case study, while other social approaches allow companies to collect social information through social KPI's, **S-LCA goes further by allowing them to quantify and qualify their performance**: is it a good or a bad performance? Which are the social issues the company should be worried about? Which one can the company improve?

Another advantage of S-LCA results is that they can be considered a **valuable information to support decision-making processes** that involve different stakeholders with different knowledge and background (Traverso et al., 2012). **The results of S-LCA can be presented in various ways, allowing to: adapt the communication meanings to the targets (decision makers, civil society, researchers…); simplify and/or aggregate the results per stakeholder/category/life cycle phase.**

7. Perspectives and conclusions

Through the UNEP-SETAC Guidelines for S-LCA of products and the complementary methodological sheets (UNEP-SETAC, 2013) the field of S-LCA started establishing a framework building on the ISO 14040 and 14044 LCA standards. Through conferences, published journal articles, seminars and industry group publications (Pre, 2014), the methods are spreading, evolving and gaining in maturity. However, the analysis carried out clearly pointed out that it is an evolving field, and main developments are envisaged, both at the level of methodology and results 'interpretation and communication.

We have identified the following main areas of developments, together with recommendations for moving forward S-LCA.

- **Criteria and indicators for S-LCA**.

Several and different sets of social indicators exist, developed within different methodological frameworks, for different purposes and with a different resolution. Besides, the identification of a universally accepted list of social indicators does not seem to be the right approach, if not misleading, because "[…] no fundamental theory exists that allows us to delineate social indicators from a coherent theory of what matters in society" (Carrera and Mack 2010).

Thus, the challenge is to select the most appropriate indicators for a given situation, considering that, for the social aspects, the following aspects need to be addressed:

- social aspects can be weighted in highly different ways by different stakeholders, in different geographic contexts;
- social evaluations change very quickly over time;
- data availability is quite poor and its reliability is questionable;
- ambiguity exists in terminology (social impacts, social sustainability, social aspects, social indicators), data (qualitative, quantitative, semi-quantitative) and methods of measurement (S-LCA, Social Impact Assessment, etc.) (Parris and Kates 2003).

The indicators selection is a key aspect for S-LCA, as they define what is being measured, and as such, affect the results of the assessment. Common and structured approaches for selecting them have not been developed yet, and the different applications available in literature present different approaches, most of which are driven by data availability and not by the relevance of the social aspect at hand.

Recommendation 1

- Clarify in the application the rational for the choice of indicators (Iofrida et al., 2016; Sureau et al., 2017; Zanchi et al., 2017);
- Use selection criteria and techniques that reflect the values of the stakeholders, such as participatory approaches (Sureau et al., 2017)

- **Impact assessment**

As discussed throughout the report, currently with S-LCA it is possible to measure social performances and not social impacts, due to the lack of valid impact pathways and the challenges that exist in developing them. Despite the ambition to be objective in the impact assessment, the process is nevertheless limited by the knowledge and information available to those performing the assessment. Because of the issues raised about subjectivity, incompleteness and representativeness and lack of causal relationship models, transparency in documentation of inventory and impact assessment is the key to the credibility and usefulness of S-LCA results (Umair et al. 2015).

Impact pathways are currently under development, both for specific applications and also more general, which might be implemented on many different grounds. However, the lack of (a broad coverage of) impact pathways shall not be a reason for not using S-LCA, as also the information provided by the assessment of social performances is valuable for supporting the decision-making process.

As far as social performances are concerned, their assessment also need to be structured. Currently, several approaches exist that differ for the data collected and their positioning along the impact pathway, the scaling of inventory data on the functional unit, characterization and weighting steps. In addition, in most of the cases the authors develop their own approach for the characterisation step, without testing – if not in a few cases – previously developed methods.

Recommendation 2

- Encourage the development of social impact pathways, trying to build up approaches that can cover a large number of applications;
- Further strengthen the assessment of social performances, by means of:
    - Clarify the positioning of indicators on the impact pathway as midpoint/endpoint impacts or as stressors (Sureau et al., 2017);
    - Integrate stressor variables in the assessment, i.e., reasons for midpoint impacts.
    - Focus on approaches that include a concern for norms, geographical location, and stakeholders' input for the characterization and weighting steps.

- **System boundary definition**

So far, most if not all of the S-LCA applications do not cover the full life cycle, due mainly to the difficulties in collecting data and information on upstream and downstream processes out of the control of the organisation. In addition, currently the definition of the system boundaries is carried out considering only the technological system, i.e., the system made of the technical processes, without properly considering the different stakeholders positioned at the different level of the life cycle.

Furthermore, within the technological system, the production stage has been the main focus of S-LCA applications, and workers has been the most addressed stakeholders. Assessing the consumption and use phase also remains a great challenge. Indeed, in S-LCA, the use phase has been acknowledged as so specific that it demands a special approach that is still not clearly defined. A car is a good example of where the use phase can be complex in that a local community can be affected in terms of health and safety during the use of the car as well as by how plants are managed.

Recommendation 3

- In SLCA applications, broaden the scope of the assessment so as to include the whole life cycle;
- Develop and select criteria and indicators able to cover consumption and use stage;
- When defining system boundary, consider both causal relationships (as currently done in LCA) and social relations too, the latter driven by stakeholders

- **Positive impacts**

Regarding the assessment of positive impacts, it would be necessary to dwell more on conceptualisation of theoretical roots and, subsequently, to test these through the development of case studies.

It is recognised in the scientific literature that indicator for positive aspects are needed. Besides, current discussion on indicators for measuring sustainable development goals (UN 2015b) may benefit from a more structured, rigorous and agreed approach to the assessment of positive impacts along supply chains.

The real question is: “what does S-LCA and more in general LCT represent?” The answer lies in the winning logic to manage the production of goods and services (especially in an era of globalization) is to open up and create “alliances” with the other stakeholders involved in the value chain, while respecting and protecting the identity of each one. By doing so, S-LCA, as all LC-based methodologies, educates and instils the systemic logic of relationship and mutuality.

Recommendation 4

- Identify social evaluation criteria to establish what is to be considered as “positive”, together with a deep analysis of the context: in what way might the context evolve after an improvement has occurred? These interrogatives are of fundamental importance especially considering possible application of SLCA in contexts such as policy impact assessment.
- Jointly discuss on how S-LCA can be used to promote collaboration along the supply chain for the benefits of all the actors, while guaranteeing a fair competition.

- **Improvement of S-LCA databases and software tools**

The data currently available in S-LCA databases support mainly in identifying social hotspots at the country and sector level while lacking specificity (Fan et al., 2016). However, as S-LCA is mainly a site-specific practice, it also demands location-specific data for modelling the system because of the significant cultural and economic differences between countries that can affect social impacts (Benoît Norris 2013). Suitable high spatial and temporal resolution data are scarce and are not found in many LCA databases and collecting such data can be quite resource-consuming. Then, in turn, the limited availability of site-specific data restricts the number of impact subcategories that can be used for S-LCA (Agyekum et al., 2016). Furthermore, as suggested by Rugani et al. (2014), future life cycle oriented databases that are intended for use in consequential assessments, should systematically include information about anticipatory experiences, if they exist. This is particularly true for S-LCA, which can use those databases for prospective analysis of new or emergent technologies in market systems.

Recommendation 5

- Improve database's specificity by increasing the granularity of data at regional and sector level;
- Improve the development of tools and assessment software for S-LCA (Zamagni, 2012). Ideally these tools should be compatible with available E-LCA tools which could lead to an expansion of research and applications combining (environmental) LCA, LCC and S-LCA (Valvidia et al., 2012) for a life cycle-based sustainability assessment

- **Practice in S-LCA**

Another main research issue regarding S-LCA field is that more experiences and case studies need to be carried out. As mentioned in a study by Baumann et al. (2013), the method development within the field of LCA is more efficient and effective when it is based on case studies, as history has shown and the systems theory literature suggests. Indeed, case studies can support to develop a guidance in an important manner and enable practitioners to work out meaningful results, by pushing companies, NGOs, and research institute to collect data and build relative database (Traverso et al., 2016). This would help improving the exploitability of the S-LCA approach and highlighting operational needs.

Recommendation 6

- Perform S-LCA studies with a critical attitude, addressing current limitations and testing different approaches, especially in relation to the type I characterization and weighting step.

- **Communicating S-LCA results**

The creation of models for the presentation and communication of S-LCA results is also an important perspective to be developed, as it can influence and facilitate decision-making as previously mentioned. S-LCA is first and foremost a multi-criteria and multi-step assessment, a balance between completeness, and the need for communicating the results in a clear way needs to be found. Based on the multiple initiatives launched on LCA and associated communication (French environmental labelling, Product Environmental Footprint…), the feedbacks from the experimentations need to be transposed to S-LCA. And in a long-term, the objective will be to find a consensus on the framework and on the best way to present the results according the targets and the stakeholders.

Recommendation 7

- S-LCA is a complex multi-criteria and multi-phase analysis, whose outcome could be difficult to be interpreted. Therefore, it is very important to manage the balance between scientific rigor and transparency and a clear communication.
- To ensure transparency, and to drive socio-conception choice, the qualitative & quantitatively displays of the score by theme (stakeholders/impact categories) should be used;
- Unique quantitative & qualitative score are not recommended by current guidelines; therefore, they should be used only for external communication when a more understandable result is needed.

- **Creation of a label based on social criteria**

As the range of labels widens, the need for simple and unique communication between stakeholders is increasingly felt. In this context, the development of S-LCA could open up the opportunity to create a multi-criterion, multi-stakeholder social label that takes into account the whole life cycle of the product. Currently, the development and use of environmental labels and declarations are governed by the ISO 14020 series. ISO 14024 provides advice on how to develop criteria, compliance systems and procedures for the development of eco-labels by independent bodies; and ISO 14025 regulates Type III environmental declarations on the life cycle of a product to enable comparisons between products fulfilling the same function. It will be possible to adapt these requirements for S-LCA. Social display throughout a single social label has 3 main goals: (i) for consumers: provide information to drive their choices and behaviour; (ii) for companies: enhance responsible-conception and promote their social performance; (iii) for all stakeholders: avoid social washing practices; and provide information based on a robust methodology.

Recommendation 8

- Following the format provided by Environmental labels and declarations, S-LCA could be used as a methodological framework to develop social labelling and declaration. For instance, an annex addressing social issues could be added to ISO 14025, following the example of what is done in France regarding health and comfort information which are added to Environmental Product Declarations.
- Thus, the standardization of the methodology and the communication of the social display would make it possible to provide comprehensible, comparable, truthful and robust science-based information on the the whole life cycle of the product.

- **Interdisciplinary approach for S-LCA**

The available methodologies are not yet fully aligned with other ongoing global initiatives. Overall, social metrics are considered to be a new and evolving area in which all companies are attempting to develop (Fontes et al., 2014). Therefore, cooperation of S-LCA approaches with other initiatives should be an important research field for the next years and can be used as a tool for other approaches.

Recommendation 9

- Social aspects can be assessed through a variety of tools – analytical tools, procedural and management tools, monitoring, reporting and communication tools. Although various tools cannot replace one another, they can be complementary.
- S-LCA can be coupled to GRI or ISO 26000 standards as they can be considered in LCA terms as a “hotspot” assessment process within their supply chains;
- S-LCA as a methodology can support to fulfil the requirements on materiality assessment and due diligence;
- S-LCA models enable to by-pass the information gap suffered by many companies regarding the supply chain activities, linkages and location by using trade or process models;