# Social Sustainability and Supply Chain Management: methods and tools

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# Social Sustainability and Supply Chain Management: methods and tools

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## Abstract

Nowadays, organisations need to be socially responsible by assessing their social impacts and/or performances and those of their supply chain actors in order to achieve competitive advantages. In this perspective, they should be aware of the different available methods and tools that can be used to take socially responsible decisions. The aim of this study is to provide a useful toolbox within Supply Chain Management in order to help decision makers to assess systematically the social sustainability of organisations. For this reason, an analysis of existing methods and tools was performed by following the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines" (PRISMA). A combination of the emerged methods and tools within the SCM is desirable in order to obtain a common vision amongst the social sustainability actors of the organisation and its supply chain. Furthermore, the results draw attention to the need for further development towards social assessment approaches in terms of Life Cycle Thinking.


**Keywords:** Social Sustainability, Toolbox, Life Cycle Thinking, Social Performance, Social Assessment.

## 1. Introduction

The adoption in 2015 of the Sustainability Development Goals (SDGs) for Agenda 2030 has encouraged the decision makers (i.e. Policy makers, Organisations, Non-Governmental Organisations-NGOs) to implement the social, economic and environmental strategy to reach the 17 sustainability goals by 2030. The objective of reaching the Sustainable Development (i.e. guarantee the future for the next generation without compromising those of today, (Brundtland, 1987)) has also been pursued by other international and national programmes such as the European Strategies 2020 (European Commission, 2010) and Factories of the Future (Romero et al., 2017). These programmes show the essential role of the sustainability dimensions in organisation management activities in order to create a solid and synergistic partnership along the whole supply chain. The emerged role of the sustainable, feasible and versatile industry is also outlined in Industry 4.0, that is recognised as the fourth Industrial Revolution (Hermann et al., 2016; Liao et al., 2017). Industry 4.0 suggests adopting a life cycle perspective of the organisation (Gabriel and Pessl, 2016) to support investments, digitalise production processes, promote worker productivity, training skills and develop new products and processes, in order to improve the competitiveness of the entire supply chain. Sustainability must be able to embrace a wider audience and permeate the entire socio-economic system, beginning with companies up to the final consumer (D'Eusanio et al., 2017). Therefore, it is not enough for an organisation to develop innovative and sustainable products, but further interventions must concern the whole way of doing business. In this context, individual companies no longer compete as independent entities but are considered within the entire supply chain (Hutchins and Sutherland, 2008; Vachon and Mao, 2008).

The Supply Chain relies primarily on the physical activities related to the transformation of the organisation assets and the raw material flow from the extraction phase up to final consumption, in addition to activities associated with information, material and financial flows. Therefore, the supply chain is identified as an organization network involved in "upstream" and "downstream" processes to produce value in the form of products and services (Christopher, 2011, Mentzer et al., 2001; Seuring and Müller, 2008; Martínez-Blanco et al., 2015; Resta et al., 2016). Indeed, the actors of the supply chain design their behaviour creating a decisional system to integrate the processes of procurement,

production, delivery and customer services. The organisations, within the same supply chain, depend on each other and underlines that the value created is not for the organisation itself but for all the actors involved in the supply chain (Christopher, 1998). Supply Chain Management (SCM) addresses this network of relations (Christopher, 2011) which may be considered as an integrated and unitary connection system built and implemented by several actors. By so doing, SCM focuses on the entire supply chain, along with all its underlying processes, integrated through a systematic approach. In this perspective, the organisations are aware that the involvement of the supply chain actors is a crucial factor to achieve sustainability (Ageron et al., 2012, Sancha et al., 2016) as well as the economic benefits. Indeed, the cooperation of the management activities throughout the supply chain can meet long-term corporate objectives in terms of economic, environmental and social sustainability (Mentzer et al., 2001; Seuring and Müllller, 2008; Lin and Tseng, 2016; Fallahpour et al., 2017).

During recent years, the sustainability dimensions are being considered in the decision-making processes, but at different levels. Even though, the development of social sustainability has been less considered in literature (Hutchins and Sutherland, 2008; Vachon and Mao, 2008; Fallahpour et al., 2017; Yawar and Seuring, 2017), it covers an essential role in achieving the economic performances of companies (Carter e Rogers 2008, Krause et al., 2009; Yawar and Seuring, 2017). Social sustainability addresses human well-being not only for current but also for future generations. In this perspective, social sustainability is “the management of practices, capabilities, stakeholders and resources to address human potential and welfare both within and outside the communities of the supply chain” (Nakamba et al. 2017:527). Social sustainability within the supply chain management can be related to products and processes assessed in order to identify socio-economic conditions (i.e. safety, health, hygiene, wages, and labour rights, education and housing, etc.) of the people who are part of the supply chain (Mani et al. 2016).

For this reason, companies are held responsible for the social and environmental impacts of their products (Govindan et al., 2013) as well as being responsible for their suppliers regarding stakeholders (i.e. consumers, local community, NGOs, etc.) (Koplin et al., 2007; Seuring and Mullers, 2008; Sancha et al. 2016). In fact, a supplier's behaviour can influence the social sustainability performance of the

purchasing organisation (Faruk et al., 2001). For example, companies such as Nike and Apple have been damaged by the employment of child labour of their suppliers (Sancha et al., 2016). It is crucial to help companies to activate sustainable practices so as to reduce the social and socio-economic impacts of products and processes by focusing their entire supply chain on sustainability (D'Eusanio et al., 2017).

To improve the collective social status, organisations need to address social initiatives within their own boundaries, along with the entire supply chain. Indeed, the business activities of companies involve and condition various stakeholders which consequently affect their decision-making processes (UNEP/SETAC, 2009; Huq et al., 2016; Govindan et al., 2013).

For this reason, the social aspects (e.g. employment, wages, accidents, working conditions and human rights) should be taken into consideration by the organisations and a specific process of assessment which analyses, monitors, measures and ranks the social aspects of the analysed object (IAIA, 2015) is needed. The results of the assessment process can then be the definition of social performance and social impacts of organisations[1].

Organisations should be more socially responsible as well as assess their social impacts and/or performances and those of their supply chain actors in order to reach competitive advantages (Qorri, 2018). To take socially responsible decisions, the organisations has to know the different methods and tools available to achieve their sustainability goals. To the best of the author's knowledge, a helpful toolbox for the decision makers to assess the social sustainability of the supply chain from an integrated management perspective, has not yet been provided.

The aim of this study is to provide a toolbox for the decision makers in order to take informed decisions to manage their supply chain in terms of social sustainability. To achieve this objective, a systematic literature review has been pursued to identify the tools and methods proposed and/or implemented in the literature so as to assess the social aspects and social performance of the supply chain. Starting from this result, the emphasis will be on the definition and discussion of the role in the decision-making

[1] Social performance is the transformation of the social themes of an organisation into practice. Instead, social impacts represent "consequences of positive or negative pressures on the well-being of stakeholders" (UNEP/SETAC, 2009:43

process of the methods and tools of organisations towards the assessment of their social performances from a systemic approach.

This study is structured as follows: section two describes the method used to define the toolbox starting from the conducted systematic literature review. Section three explains the main research findings of the literature review first by showing a descriptive analysis of the results and then by discussing the role of the identified methods and tools within the decision-making process of the evaluation of social sustainability. Finally, section 4 summarises the conclusions and outlooks for future researches.

## 2. Methods

A systematic literature review has been carried out following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines to ensure methodological consistency, robustness and transparency in the analysis process (Popovic et al., 2019). PRISMA uses systematic and explicit approach to identify, select and critically evaluate the research and data of the studies included in the review (Liberati et al., 2009). The systematic literature review has been implemented as it is a complete research method able to answer a specific research question minimising errors and distortions (Jesson and Lacey 2006; Petti et al. 2018) and helps to identify, assess and summarise the most advanced ideas and methods (Petticrew and Roberts, 2006; Denyer and Tranfield, 2009) on the investigated topic.

The research questions tackle the entire process of systematic literature review by identifying the involved studies, the search strategy implemented and the required data to be extracted from each publication (Denyer and Tranfied, 2009). The following research question is addressed in this study: "What are the methods, tools and approaches used in the literature to assess the social dimension of sustainability within the Supply Chain Management?". The main research question is modelled to be quite general and broad in order to include as many results as possible (Tarne et al., 2017).

PRISMA Statement provides a flow diagram to support the practitioner in the identification, screening, eligibility and inclusion steps of the systematic literature review process.

The identification of the records was pursued through two search engines: Scopus Database and Web of Science, accessed from the "G. d'Annunzio" University (Italy) up to 14th March, 2019. The search was conducted in accordance with a keywords combination and the use of the "AND" operator for the abstract, title and keywords fields. In order for the several methods/tools or methodologies proposed for the evaluation of social and socio-economic issues to be identified, different keywords were taken into consideration: social aspects, social impacts, social sustainability, social performance, social benefits, social indicators, social issues and social assessment, combined with the terms "supply chain" and "supply chain management". Only publications in English and appearing in peer-reviewed Journals were taken into account, whose results are shown in Table 2. One should observe that "*" was applied at the end of three keywords (i.e. impact; aspect; issue) to cover both plural that singular of the word.

**Table 1**. Keywords used and results

| *Keywords* | *Scopus Database* | *Web of Science* |
|---|---|---|
| "supply chain" AND "social sustainability " | 158 | 135 |
| "supply chain" AND "social evaluation" | 3 | 2 |
| "supply chain" AND " social assessment " | 13 | 9 |
| "supply chain" AND " social indicators" | 26 | 26 |
| "supply chain" AND " social aspect*" | 252 | 84 |
| "supply chain" AND " social performance" | 111 | 116 |
| "supply chain" AND " social issue*" | 96 | 69 |
| "supply chain*" AND " social impact*" | 173 | 116 |
| | | |
| "supply chain management" AND "social sustainability" | 82 | 80 |
| "supply chain management" AND "social evaluation" | 2 | 2 |
| "supply chain management" AND " social assessment" | 3 | 1 |
| "supply chain management" AND " social indicators" | 5 | 4 |
| "supply chain management" AND " social aspect*" | 98 | 37 |
| "supply chain management" AND " social performance" | 66 | 116 |
| "supply chain management" AND " social issue*" | 50 | 69 |
| "supply chain management" AND " social impact*" | 52 | 30 |
| **Total of articles** | **1190** | **896** |

The PRISMA flow diagram conducted in this study is shown in Figure 1. A total of 2,086 studies emerged from the literature review and subsequently, the duplicated studies were deleted - by checking each title, author and year of publications- resulting in 809 ones. A screening process was then defined in order to identify the relevant publications for the research question. The inclusion criteria are essential

for identifying the relevant publications required to answer the questions under study (Petti et al., 2018) and to prevent distraction towards irrelevant studies. The first screening was conducted among the abstracts, resulting in the elimination of the papers which discussed only the selection of the suppliers or the operation strategies from a social sustainability perspective. Thus, those not contributing to proposing methods or tools for the assessment of the social performance or impacts of the supply chain of an organisation, were excluded.

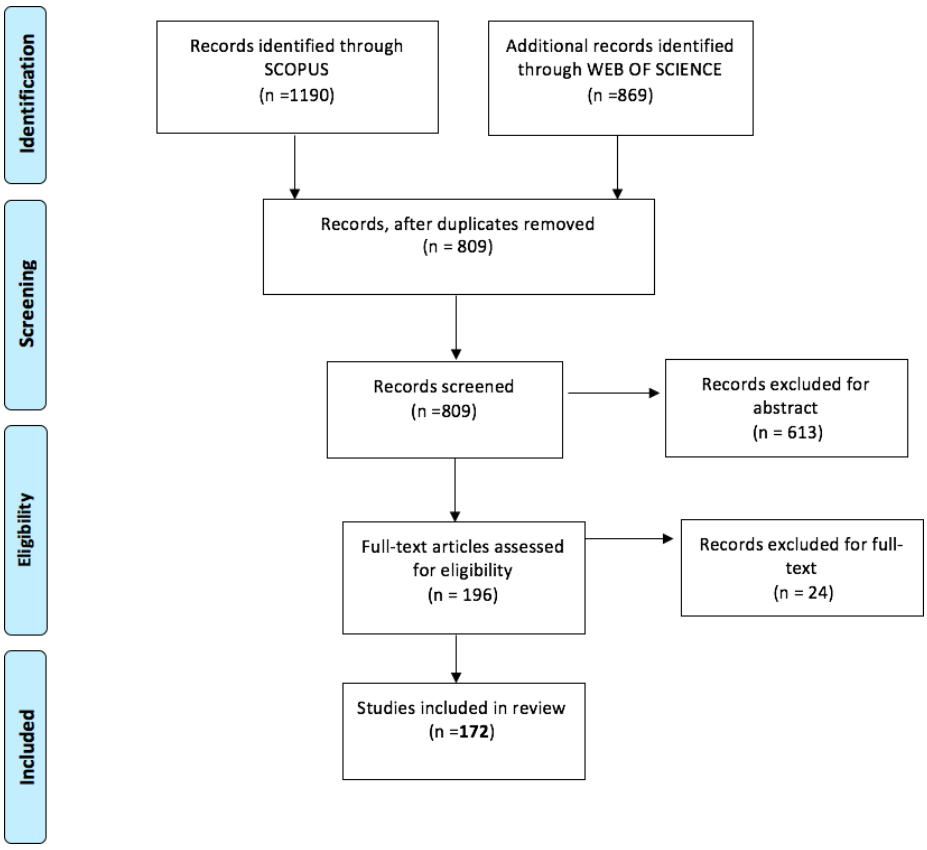


**Figure 1.**

The selected (196) articles were analysed in full-text and only those which matched the following criteria were considered for the analysis:

- Papers presenting a specific section for the discussion of social sustainability.
- Papers assessing the social impacts, social performance and/or social risks of an organisation from a systematic perspective.

- Papers proposing and/or implementing methods, tools or approaches for the assessment of social sustainability in quantitative and qualitative terms.

By doing so, 172 relevant publications were selected for the review and were analysed in detail. Indeed, each publication was classified according to the type of study: Empirical (i.e. which employ qualitative and quantitative methods and contain empirical data (Köksal, 2017)); Case-Study (those that show empirical data implemented in a specific case and defined as such by the authors of the papers); Theoretical (i.e., conceptual development of a model (Yawar and Seuring, 2017)). Even though the case studies can be regarded as empirical publications, the authors preferred to examine them separately in order to verify how the social sustainability was assessed or analysed within SCM.

The method implemented to perform the systematic literature review presents some limitations. Indeed, restrictions on the criteria, such as publications only in English as well as peer-review Journals, may neglect potential relevant publications. Furthermore, the reproducibility of the results could be affected since the screening (critical selection and evaluation) of the resulting articles was performed by the authors.

## 3. Results and Discussion

This section illustrates first the main research findings of the literature review by showing a descriptive analysis of the results (3.1) and then, the role of the identified methods and tools (3.2) within the decision-making process in terms of social sustainability.

### 3.1. Descriptive results of the systematic literature review

A descriptive analysis of the results was carried out for the description of the current scenario of the topic under study. Indeed, an initial evaluation of the literature was performed to gain insights from the formal characteristics of the collected material under analysis (Seuring and Gold, 2012). In order to give an understanding of the evolution of this research topic over the years, Figure 2 outlines the distribution of publications and the identified temporal domain. It shows a fluctuating trend from 2006 to 2019 and a constant increase in the number of registered publications from 2014 onwards. According to Rider (1994), De Solla Prince (1974) and Nakamba et al. (2017), a research area receives an acknowledgment from the scientific community when its publications double in 10 to 20 years (Rider, 1994; De Solla

Prince, 1974, Nakamba et al. 2017). The literature on social sustainability and SCM overcomes this measure, which demonstrates a growing interest in the analysis and assessment of the social performance of the organisations, as an essential component of the sustainable management.

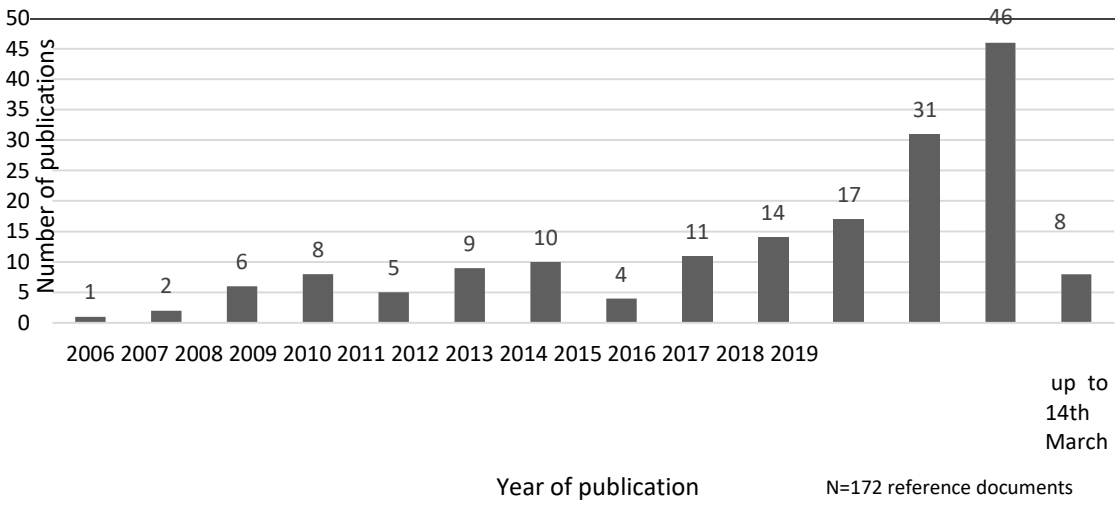


**Figure 2**. Time distribution of the publications

According to Bradford (1985), the number of articles in core Journals (i.e., Journals where most publications are published (Beske-Janssen et al. 2015)) should be the same as the number of publications in the "next related" Journals. Table 2 provides the names of the reviewed Journals as well as their frequency of publication. In total, 172 papers were published in 74 different scientific Journals, which focused on the SCM and the sustainability fields; out of these, most Journals (54) have just 1 paper on the investigated topic with respect to the goal of this research. The "main Journals" in this field are: Journal of Cleaner Production, Sustainability, International Journal of Life Cycle Assessment, Supply Chain Management: An International Journal, and The International Journal of Production Economics. In fact, they number 61publications that represent 35.46% of all analysed publications (172), while 33.14% refer to the "next related" Journals and 31.40% to Journals that comprise just 1 paper.

**Table 2.** Frequency of publications in various Journals

| Type/No. | Journal | Frequency of the papers |
|---|---|---|
| **Core Journal** | | |
| 1 | Journal of Cleaner Production | 23 |
| 2 | Sustainability | 20 |
| 3 | The International Journal of Life Cycle Assessment | 18 |

| | | |
|---|---|---|
| **Total number of publications in core Journals** | | **61** |
| | | |
| **Next related Journals** | | |
| 4 | International Journal of Production Economics | 8 |
| 5 | Computer and Industrial Engineering | 6 |
| 6 | European Journal of Operational Research | 6 |
| 7 | Supply chain Management: An International Journal | 5 |
| 8 | Computer Aided Chemical Engineering | 4 |
| 9 | Resources, Conservation and Recycling | 4 |
| 10 | Journal of Business Ethics | 3 |
| 11 | Sustainable Production and Consumption | 3 |
| 12 | Biomass and Bioenergy | 2 |
| 13 | Environmental, Development and Sustainability | 2 |
| 14 | Impact Assessment and Project Appraisal | 2 |
| 15 | International Journal of Operations and Production Management | 2 |
| 16 | International Journal of Physical Distribution and Logistics Management | 2 |
| 17 | Journal of Industrial Ecology | 2 |
| 18 | Journal of Industrial Engineering and Management | 2 |
| 19 | Journal of Operations Management | 2 |
| 20 | Renewable and Sustainable Energy Reviews | 2 |
| **Total number of publications in next related Journals** | | **57** |
| **Other** | **54 Journals (with 1 entries)** | **54** |
| **Total** | | **172** |

The number of the Journals involved in the assessment of social sustainability within the SCM demonstrates that this is an interdisciplinary topic. A predominance of publications emerged, which propose a sustainability assessment from a life cycle thinking perspective.

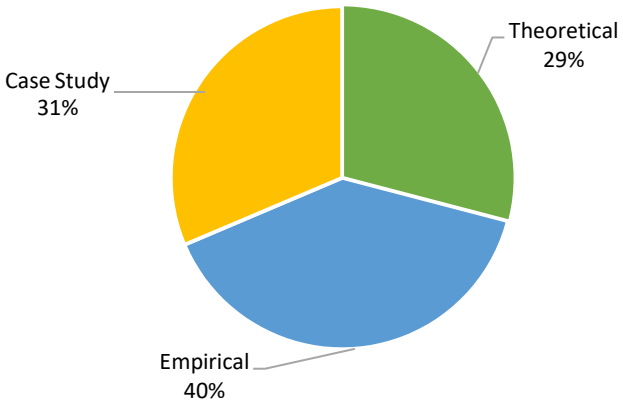


**Figure 3.** Type-related distribution of the publications

Figure 3 outlines the characteristics of the analysed set of publications with regard to the type of study. The main analysed publications are: 68 empirical, while 54 are case studies and 50 theoretical.

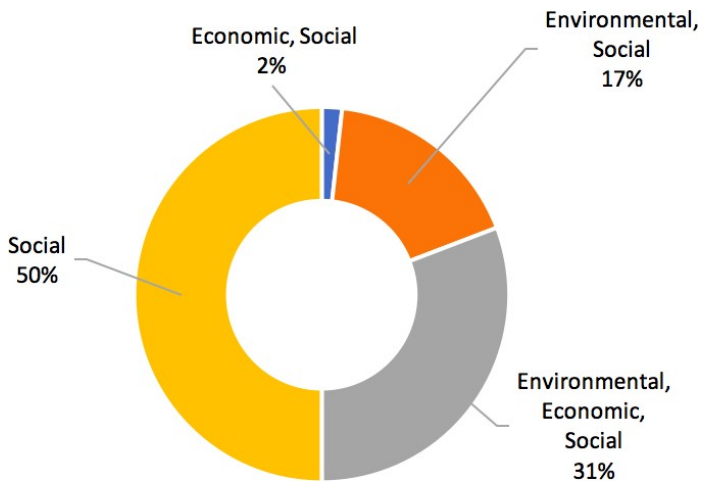


**Figure 4.** Distribution of the analysed dimensions sustainability

Figure 4 shows the dimensions of sustainability in the investigated papers. The articles that focused only on the social dimension of sustainability are 86, followed by the papers that analysed the sustainability in its completeness (53). Furthermore, the Social and Environmental dimensions are discussed in 30 papers, while the social and economic dimensions only in 3.

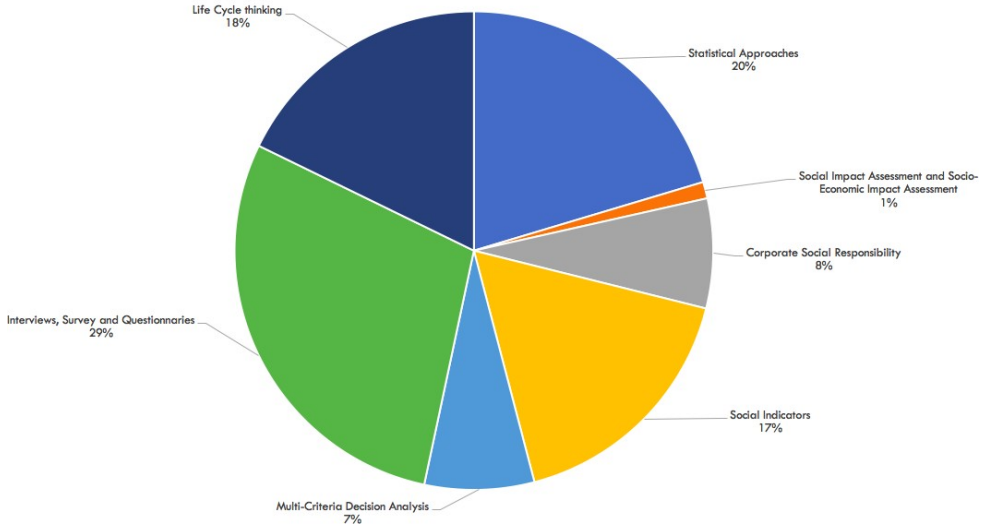


**Figure 5** Distribution of the main social sustainability approaches

Figure 5 shows the distribution of methods and tools as they emerged from the systematic literature review, which will be discussed separately in the following sections.

### 3.2. Discussion on Social Sustainability in the Supply Chain Management

Most of the publications that emerged via the literature review do not focus on the entire supply chain, (Fritz et al. 2017), but only on a single process (i.e., Van der Horst and Vermeylen, 2011; Pimentel et al 2016) or a specific function (e.g., the procurement (Esteves and Barclay, 2011) or logistic (Vega-Mejia et al., 2016)). Furthermore, Seuring (2013) discusses the modelling approaches for supply chain management on all dimensions of sustainability but with a main focus on the environmental perspective (e.g. Equilibrium Models - EM, Analytical Hierarchy Process - AHP). Hutchins and Sutherland (2008) outline that companies cover an institutional role within the community as a reference point, which enhances health and safety, philanthropic activities and educational opportunities. These ethical issues in business strategies and in commercial operations and relations with stakeholders are the basis for Corporate Social Responsibility (CSR) (European Commission, 2002; UNEP/SETAC, 2009). Indeed, the process of globalisation has spread the inclusion of social and socio-economic aspects of the decision-making process through companies (Mathivathana et al., 2016), in compliance with market requirements, it helped to provide superior operational outcomes and improved competitiveness (Parmigiani et al., 2011) for companies. From this perspective, it is necessary to move beyond the organisation boundaries and consider the continuing achievement of ordinary practices of social sustainability at the multi-tier of suppliers more in depth. Indeed, the achievement of management goals such as customer satisfaction, cost savings, and supply chain quality can be led by an effective integrated network of all suppliers (Hadrawi, 2019). Furthermore, the organisation performance should be measured in terms of quality, cost, innovation, and social aspects, respectively (Bai and Sarkis, 2014).

Nevertheless, the major social management tools used by them are usually limited within their boundaries (Gold, 2010), thus lacking a systemic approach that would be able to involve the entire supply chain actors in a cultural change. Therefore, a greater traceability of the supply chain (O'Rourke, 2014) through appropriate methodologies is necessary in order to understand how to address social sustainability from a system point of view (Kogg and Mont, 2012).

This systematic literature review confirmed that the social aspects are still neglected in the discussion on sustainability issues (Pullman et al., 2009; Freise and Seuring, 2015; Lee et al., 2016; Koksal et al.,

2017). Indeed, Brandenburg et al. (2014) discuss that the main publications, which address the social sustainability, focus on specific social aspects such as employees, wages, forced labour; these are considered by taking into account external influences by stakeholders.

The social sustainability issues have been addressed in the literature but without reaching an assessment of social aspects from a systemic perspective. In this way, a multi-tier supply chain approach is performed, where the suppliers from higher to lower-tier, are involved. From this viewpoint, several researchers have suggested that such strategic information sharing with other actors of the supply chain may become a driver for the performance of the organisation (Novack et al., 1995) from a practical point of view as well as from its logistics activities leaning towards market and customers-related information (Mentzer et al., 2001). This explains how the social and socio-economic aspects and principles are being employed with respect to a systematic approach that considers each actor of the supply chain as an intrinsic element of the system. How supply chain relationships affect the extent to which an organisation engages in social sustainability practices, is crucial (Nakamba et al., 2017). In this perspective, the integration of the social decision support tools and methods within the same methodological framework, allows sharing vital and proprietary information which is transferred to the supply chain actors (Monczka et al., 1998).

The next subsections attempt to discuss the methods and tools that emerged from the literature with regard to the role covered by them in the toolbox, which can be used by the decision-makers to implement socially sustainable supply chain practices.

### 3.3. Toolbox: methods and tools for socially informed decisions

This study builds a toolbox composed by different decision support tools and methods for the evaluation of the social sustainability performance in order to identify the role that is played by each one of them in a systematic process of social sustainability assessment.

Figure 6 shows the toolbox containing the methods and the tools that emerged from literature and that have been organised following a systematic process of social sustainability assessment comprising three main phases (i.e., Data Collection, Data Analysis and Data Interpretation). The

methods and tools identified for each phase, depending on their role, can help the decision-makers to implement the involved phase from a systematic and integrational perspective. Indeed, the toolbox contributes to support the decision makers on the evaluation of the social issues that could affect the supply chain.

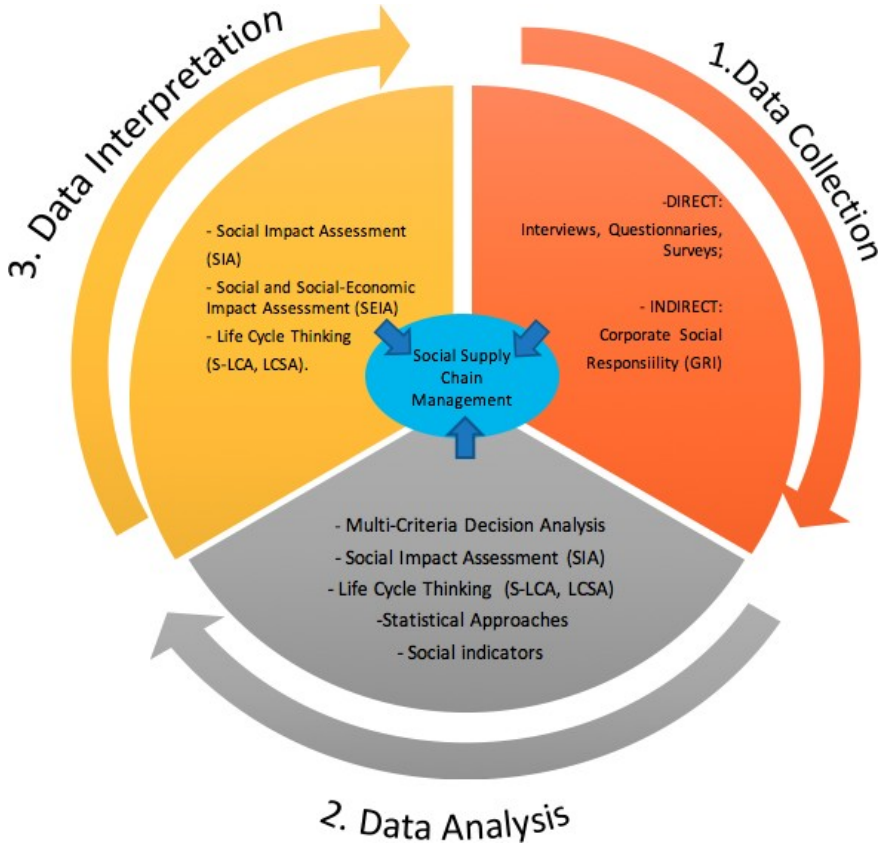


**Figure 6.** Toolbox of social decision support tools and methods

### 3.3.1. Data Collection

The Data Collection is the phase of the decision-making process, characterised by gathering information, which affects the object under study. This collection can be conducted directly (i.e., on-site data collection) or indirectly (i.e., data collection obtained by the reporting consultations of the organisation).

#### 3.3.1.1. Interviews, Surveys and Questionnaires

The social science approaches allow to analyse the behaviours of people and society and their relations (May, 2001). Most of the research on social sciences is carried out through surveys, participant

observations, experiments, focus groups, interviews and questionnaires. These tools are a core part of social sciences (May, 2001) and their choice of application depends on the investigated objective and resources available (William and May, 1996). These tools collect data directly on a specific aspect by investigating those affected by the object under study. The interviews collect the information on the argument of the research by interviewing them, while Surveys allow collecting primary data by asking questions to the respondents. In this case, the population, format and questions need to be identified. Moreover, questionnaires are a data collection method, characterised by specific questions and a lack of personal contact between respondents and researchers (Corbetta, 2003).

Pagell and Wu (2009) analysed ten innovative organisations to conduct a case-study for defining a model composed by specific elements necessary to create a sustainable supply chain. The conducted semi-structured interviews showed that the organisational innovation capability can be a precursor to a sustainable management of supply chain. On the other hand, Pullman et al. (2009) conducted interviews and surveys, within the food and beverage sector, for understanding different social practices and perceptions concerning the performance outcomes. Then, the triangulation of data allowed to guarantee the consistency of the results. The food sector is also analysed by Chkanikova (2016) that based her interviews on the identification of the relationships between retailers and their suppliers from a sustainability perspective. Similarly, Saunders et al., (2015) applied semi-structured interviews and face-to-face interviews for gathering data on the decision-making process in the supply chain. Furthermore, the specification of the possible alternatives and motivations of the final choice are taken into account. In this perspective, the final aim was to define the procurement strategies.

In the empirical study of Ageron et al. (2012) a conceptual framework was elaborated for sustainable SCM and applied questionnaires to collect data on sustainable business issues and supplier selection criteria. The final goal was to identify the enabling conditions and critical elements for defining a sustainable supply management of organisations. On the other hand, Lee et al. (2016) defined a sample size and distributed surveys to investigate on cumulative capability (i.e., the laggard, environmental-focused, social-cautious, and all-round) of suppliers and buyers by outlining the relations between economic, social and environmental aspects.

#### 3.3.1.2. Corporate Social Responsibility

The Commission of the European Communities defined Corporate Social Sustainability as a voluntary commitment of companies (Tarquinio, 2009) to contribute to the improvement of social and environmental issues into business practices (Sutherland et al., 2016). Regarding CSR, there are several indices and auditing frameworks that compare different companies (Sutherland et al., 2016); one of these is the Global Reporting Initiative (GRI). The GRI has evolved incrementally since 2007 (Dienes et al., 2016) and it consists in communicating and engaging the responsibility towards stakeholders in relation to the performance of organisations from a sustainability point of view (GRI, 2011). GRI framework aims at becoming a universal model for the economic, environmental and social performance reporting of the companies.

This can be considered a source of data indirectly collected since the GRI contains some socially useful information that can be reprocessed for the purposes of the social performance evaluation. Indeed, GRI is used by companies for reporting their economic, environmental and social practices without requiring an assessment of impacts (Chen et al. 2015). Specifically, the social dimension is analysed in four main protocols of social indicators (i.e., Labour Practices and Decent Work, Human Rights, Local Society and Product Responsibility) (Zhu and Hu, 2017; GRI, 2011). Kaur and Sharma (2017) adopted the GRI framework for the identification of the four social categories as the basis of their analysis. Likewise, Zhu and Hu, 2017 stated that they have been using GRI for measuring the social performance based on the four social aspects. On the other hand, through the literature review conducted by Ahmand et al., (2016), a lack in the presence of guide and assistance emerged for the measurement and communication of the sustainability practices of the companies related to the supply chain. Indeed, Ahi et al. (2016) argued that only 15 out of a total of 91 indicators address the supply chain issues. Furthermore, most of the sustainability indicators address a single entity within the supply chain (Ahi et al. 2016).

### 3.3.2. Data Analysis and Interpretation

The Data Analysis phase can be implemented via several methods according to the assessment framework that would be implemented. This phase comprises several sub-phases, which include the

prioritisation, the measurement, the assessment of the social issues under study respect to the object analysed. The decision makers can decide to focus on parts of the toolbox and modify it to their specific circumstance and focus.

The Data Interpretation phase can be implemented via several approaches that allow to describe the results obtained from the assessment and to check the consistency, transparency and completeness of the analysed data. Some ideas on how to implement the various methods and tools, which the toolbox comprises, are provided in the following sub-sections.

#### 3.3.2.1. Multi-Criteria Decision Analysis

The Multi-Criteria Decision Analysis (MCDA) involves several tools and techniques that can be integrated with other approaches and methodologies in order to evaluate conflicting criteria in decision-making. Indeed, these approaches may be used by decision makers for the identification of the potential perspectives of stakeholders on social themes. MCDA considers a range of methods for evaluating several alternatives on the basis of a set of multiple criteria in order to support the organisation in the decision-making process (Marttunen et al., 2015; De Brito and Evers, 2016). These multilevel criteria allow to provide a preference between different analysed options. MCDA can be classified in different problems and methods with regard to whether the solutions are explicitly or implicitly defined. The Multiple-criteria evaluation problems are based on a finite number of alternatives, explicitly known in the beginning of the solution process and the goal is to find the best alternative for the decision-maker. One may also be interested in "sorting" or "classifying" alternatives. Moreover, the Multiple-criteria design problems are based on the evaluation of alternatives that are not explicitly known. A mathematical model (i.e., a discrete-time algorithm, Nonstructural Fuzzy Decision Support System) can be used to find the best alternative.

Cruz and Liu (2011) applied MCDM in order to identify the relation effects within a supply chain among different levels and actors (i.e., suppliers, manufactures, retailers). Seuring (2013) conducted a review of some approaches for sustainable SCM. Between these approaches, MCDM is one of the identified approaches, which was used as an optimisation model of trade-offs (Cruz and Liu, 2011) or to identify

optimal solutions. Furthermore, a multi-objective optimisation model was implemented by Devika et al. (2014) in order to maximise the social benefits and minimise the total costs and total environmental impacts of a closed-loop supply chain network.

MCDM enabled the achievement of different objectives at the same time (e.g., economic and social goals simultaneously), by providing a prioritisation of the goals to build a unique model (i.e., MCDM) (Seuring, 2013). Furthermore, Brandenburg et al. (2014) highlighted the role of MCDM to analyse the multi-dimension of sustainable issues by integrating factors and objectives simultaneously. Bai et al. (2010) applied Rough Set Analysis to help the managers to identify which characteristics contribute to the evaluation of the sustainability performance of the suppliers. On the other hand, Carvalho and Barbosa-Povoa (2013) applied the Value Stream Analysis to highlight the main bottlenecks of the supply chain by focusing the analysis on the sustainable factors. Furthermore, a multi-attribute decision model is implemented to assess the impacts of corporate social responsibility for the decision-making process (Liu, 2018).

On the other hand, the Analytic Hierarchy Process (AHP) method introduced by Saaty (1990), is based on the pairwise comparison of elements on a common property or criterion to multi-objectives ((Jayant, 2016; Zimmer et al., 2017). Furthermore, this tool compares several alternatives and evaluates specialised decisions (Seuring, 2013), by emphasising the influence of stakeholders on their opinions. In this context, Fallahpour et al. (2017) highlighted that AHP is one of the most applied tools for selecting suppliers. Moreover, Vivas et al. (2019) combined AHP and the preference ranking organisation method for enrichment evaluations (to identify the parameters for achieving sustainability).

#### 3.3.2.2. Social indicators

The sustainability performance can be assessed through social and socio-economic indicators, which allow to identify relevant information (Lamberton, 2005) and highlight a condition of something (Merriem-Webster, 2016; Kühnen et al., 2018). The social and socio-economic indicators are effective analytical tools, which allow the analysis of different social issues related to different stakeholders. In this perspective, the indicators allow to manage complex sustainable development issues in the areas of socio-economic management. The emerged results show that social indicators are often used to assess

the social performance of production processes. Hutchins and Sutherland (2008) suggested quantifiable indicators (such as labour equity, health and safety), which can be used in decision-making related to supply chains even though they do not cover all dimensions of social sustainability. Husgafvel et al. (2015) applied the social indicators to measure the sustainability performance in metal production. Furthermore, Tirado et al. (2015) proposed social indicators for government programmes-related supply chains, which are not sufficient for measuring the social sustainability of a product.

Moreover, Gaviglio et al., (2016) identified a framework based on a set of 15 indicators that allow to assess five main social elements (i.e., quality of the region and the products, short supply chain and related activities, work, ethical and human development and society, culture and ecology). Likewise, Popovic et al. (2016) proposed a framework of social indicators to assess the social sustainability for supporting the associated decisions on the supply chain by taking into account the different echelons of supply chain. Finally, Schwarz et al. (2016) defined a range of indicators for all the dimensions of sustainability in order to analyse the contribution of the supply chains to economic development, distribution of added value, labour relations and governance issues.

#### 3.3.2.3. Statistical Approaches

The statistical approaches include several applied statistical methods from a sustainability perspective. These approaches are mainly used to define the relations between two features of the same analysed aspect. They can be classified in two types of statistical approaches: - Descriptive statistics, which summarise the data of the sample and provide information about the sample; - Inferential statistics, which allow a generalisation with regard to the population. The statistical approaches are able to summarise and to investigate a set of data that can appraise decision-making (CLES, 2011). In the analysed publications, many papers use statistical methods for identifying the correlation (if any) between a set of statistical data with regard to different perspectives. Vachon and Mao (2008) analysed the potential relation between SCM elements and sustainable development at a country level. In order for the degree of social sustainability to be analysed, three indicators are used, i.e., fair labour practices, corporate social involvement and the Gini Index. Then, the ordinary least square (OLS) method was

applied to identify the same between social sustainability and supply chain strength. In the same way, Cross et al. (2009) conducted a study to identify the health and safety aspects of farm workers. The data were collected at a country level and they were analysed through the multiple regression analysis to allow the investigation of the connection between the self-declared health status and a set of demographical and socio-economic aspects. On the other hand, a factorial and a regression analysis were conducted by Zailani et al., (2012) in order to investigate how the sustainable SCM practices affect the supply chain performance in social and economic terms. Kaur and Sharma (2017) used a multiple linear regression analysis to assess the decision criteria for achieving the social sustainability and for verifying the correlation of the social factors (i.e., Labour Practices and Decent Work, Human Rights, Local Society and Product Responsibility). When the sample size is small, data are non-normally distributed, and many indicators can be estimated through the variance-based partial least square method. The latter approach has been applied by Freise and Seuring (2015) in the context of the clothing industry in order to investigate the management of social risks (considering the internal and external pressures) in the supply chain of the organisation.

#### 3.3.2.4. Social Impact Assessment and Social and Socio-Economic Impact Assessment

Social and Socio-economic Impact assessment (SEIA) is an integrated approach used to identify and to manage the social and economic issues associated with good practices with regard to the local procurement project. SEIA is developed to enhance the investment effect of activities developed in the sectors such as transport, mining, oil and infrastructure. It accommodates the perceptions, interests and needs of the target community and other involved stakeholders (Arora, 2007) in order to improve the responsiveness of local procurement planning. Esteves and Barclay (2011) applied SEIA within the mining sector for the improvement of the social benefits that affected the projects, and, which involve the local community. This approach can be integrated with the sourcing strategy considering the local community and the small-to-medium enterprises into supply chains of multinational companies. On the other hand, Esteves et al., (2012) analysed the state of the art with regard to the Social Impact Assessment (SIA), which they define as a methodological approach to analyse, verify and manage the social consequences of planned interventions or activities of projects across the life cycle (Esteves et al.,

2012). The SIA practices are participatory; they allow to support local community, society, stakeholders and to understand how changes may occur, and to improve the possibility to answer to changes (Esteves et al., 2012; IAIA, 2015). The main difference between these two methodologies is that SIA is widely practiced as a part of the approval process of infrastructure and resource extraction projects, while SEIA is practiced in the decision-making processes regarding local procurement.

#### 3.3.2.5. Life Cycle Thinking methods

One of the major approaches identified in the literature review is based on the Life Cycle Thinking (LCT), which is "a qualitative concept" (Finkbeiner et al., 2010:3311), which takes into account the entire life cycle of a product system (good, service, or process) from cradle to grave (i.e., from raw materials extraction to the end of life). Life Cycle Assessment (LCA) is a method that is internationally standardised by the International Organization for Standardization (ISO) through the 14040 series of standards (i.e., ISO 14040:2006; ISO 14044:2006) for assessing the potential environmental impacts of products and services (Agyekum et al., 2017). On the other hand, Life Cycle Costing (LCC) covers the economic dimension of sustainability through the analysis of costs, which are involved and bore along the life cycle of the analysed product (Parent et al., 2013). In the end, the Social Life Cycle Assessment (S-LCA) is a methodology that can be used to assess the social and socio-economic aspects (both positive and negative) of products or processes from a life cycle point of view (UNEP/SETAC, 2009). S-LCA allows for the social and socio-economic themes to be assessed (i.e., subcategories (UNEP/SETAC, 2009)) of the product through the involvement of stakeholders (i.e., workers, local community, consumers, society, value chain actors), who are asked to provide their opinions and/or information on specific topics. This methodology allows to assess the social performance and aspect of the product/service or technology through the ISO 14040:2006 technical framework (i.e. Goal and Scope Definition, Life Cycle Inventory, Life Cycle Impact Assessment and Life Cycle Interpretation). In recent times, a new perspective of the LCT tools that considers the organisations as the system under analysis (i.e., Organisation LCA), has been introduced.

Several case studies have been implemented to assess the social performance of organisations through S-LCA. D'Eusanio et al. (2018) assessed the social and socioeconomic aspects by taking into account 31

subcategories, which affected five stakeholder categories (i.e., Workers, Consumers, Local Community, Value chain Actors and Society). On the other hand, Wang et al. (2017) analysed only the social aspects addressed to workers stakeholders, while Smith and Barling (2014) assessed the social performance of Small and Medium Enterprises in the European food and drink sector by taking into account the social issues related to the workers and local community stakeholders.

Different papers conducted an S-LCA to identify the social hotspots of the analysed supply chain. For example, Ekener-Petersen et al. (2013) identified the social hotspots of a laptop supply chain; Wilhelm et al. (2015) provided an overview of social potential hotspots of a mobile phone life cycle. Moreover, Zimmer et al. (2017) used S-LCA to assess the social risks of the global supply chain of the German automotive industry by conducting a case-study.

Some papers assessed all three dimensions of sustainability through Life Cycle Thinking methodologies. Cambero and Sowlati (2014) conducted a literature review in order to consider the assessment of economic, social and environmental perspectives in the biomass sector. They identified that S-LCA is a promising methodology for the evaluation of the social impacts of forest biomass usage. Andrews et al. (2009) performed a case-study, contextualised in Quebec, in order to define the value chain actors that contribute with the highest number of working hours to the supply chain of the analysed organisation. A status and challenges on social sustainability assessment methods were analysed by Wognum et al. (2011). They investigated the status of information systems to sustain the food supply chain and relations with essential stakeholders. On the other hand, Lagarde and Macombe (2013) highlighted that S-LCA describes the product system by determining its boundaries in order to identify the organisations involved in the social life cycle of a product in the context of competition. Indeed, S-LCA is a management tool of supply chain that identifies relations in the supply chain (during the inventory phase) and assesses the social impacts in order to obtain the required information for indicating the social sustainability critical points along the supply chain.

### 3.4. Summary of the identified tools and methods

The analysis showed the different roles covered by the decision support tools and methods within the supply chain from a social sustainability perspective. A summary of the findings for each tool and method is provided in Table 3.

**Table 3**. Summary of role covered by the tools and methods collected in the toolbox

| Method/ Tool | Phase | Role | Brief Description |
|---|---|---|---|
| **Interviews, Surveys and Questionnaires** | T C | Direct data collection | To explain the current social status of the organisation from a sustainability perspective through the collection of the information on the factors involved in the sustainability practices. |
| **Corporate Social Responsibility** | M C | Indirect data collection | To provide social indicators which support the assessment of the social performance of an organisation regarding some social aspects (i.e., Labour Practices and Decent Work, Human Rights, Local Society and Product Responsibility). |
| **Multi-Criteria Decision Analysis** | M A | Prioritisation of social factors | To consider different social factors and objectives, giving them a priority in order to reach a common view of social sustainability without compromising the economic benefits and taking into account the potential different perspectives of stakeholders in social issues. Furthermore, it possible to create an optimisation algorithm in order to identify the better solution between different social objectives. |
| **Social indicators** | T A | Measurement of quantities | To measure a specific social issue through the collection of data in order to achieve a sustainability performance assessment. |
| **Social (and Socio-Economic) Impact Assessment** | M A + I | Assessment of projects | To improve the social benefits of local community and society generated by the planning and development of public or private projects. |
| **Life Cycle Thinking (S-LCA, LCSA)** | M A + I | Assessment of products/ organisations/ Technologies | To provide an assessment of the social and socio-economic impacts of a product through the analysis of the behaviour of the companies involved in its life cycle. |
| **Statistical Approaches** | T A | Evaluation and estimation of the social phenomena | Statistical approaches are mathematical formulas, models, and tools that are used in the statistical analysis of raw research data. The implementation of statistical approaches provides information from research data and provides several ways to evaluate the robustness of research outputs. |

**Elaborated by the Authors. Legend: T= Tool; M=Method; C= Data Collection; A= Data Analysis; I= Data Interpretation.**

## 4. Conclusions

The social dimension of sustainability has not yet been fully treated in the SCM field, even though papers on social sustainability have increased in number in the last years. Indeed, the majority of implementations, concern the environmental dimension of sustainability by leaving the others (i.e., social and economic) behind. From this perspective, social sustainability within the supply chain in terms of integrated management of social aspects, needs to be considered. A lack of suitable performance

methods and/or approaches that provide a complete social assessment of the supply chain, is evident. For this reason, a toolbox of methods and tools was developed. Decision-makers can decide to focus on parts of the toolbox and adjust it to their needs. Each method can be applied to reach a specific goal which can integrate an ampler one. In this way, a suitable integration of the decision support tools and methods allows guaranteeing the reliability and validity of the social issues evaluation. By integrating different tools, it is possible to obtain a complete approach to evaluate the social performance of a wide supply chain from a sustainability perspective.

Moreover, it is necessary to include within the decision support tools, a specific process to collect the opinions, perceptions and information from the local community, society, workers, consumers and Non-Governmental-Organisations. Indeed, stakeholders have a high impact on company practices, thus an upstream and downstream connection of the supply chain allows the transfer of positive social practices towards the involved value chain actors. This evaluation increases the decision-maker's awareness of socially sustainable life cycle stages by providing a guide for the assessment of the social performance of the involved stakeholders. Starting from these results, future developments should be oriented towards the implementation of the toolbox within the LCT framework in order to verify and identify potential limitations and advantages, which may lead to a complete assessment of the social performance of organisations within SCM.

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