

# Innovating the management of supply chains for social sustainability: from the state of the art to an integrated framework

Gabriele Zangara and Luigino Filice  
*University of Calabria, Rende, Italy*

## Abstract

**Purpose** – This paper focuses on managerial practices in the context of supply chain. It focuses on the innovation of monitoring and control practices and proposes a holistic approach to managing social sustainability in the supply chain, extending the point of view beyond the traditional boundaries of individual factories or their immediate suppliers.

**Design/methodology/approach** – The analysis is based on a systematic review of scientific literature on managerial practices in supply chains, with a specific focus on social sustainability. The primary goal is to identify essential measurement strategies and key indicator factors within this domain.

**Findings** – Our findings highlight that most of scientific literature focuses on qualitative approaches, though quantitative approaches are also used. Despite the extensive research, an under-investigated area is the use of hybrid models for measuring social sustainability in the supply chain.

**Social implications** – This framework is designed to identify the main categories of measurement and relative indicators for assessing social sustainability in supply chains.

**Originality/value** – This research proposes an innovative and integrated framework, leveraging a hybrid approach that addresses the limitations observed in existing management practices. Additionally, it provides directions for future research.

**Keywords** Social sustainability, Supply chain, Organizational innovation, Hybrid measurement method, Corporate social responsibility, Ethics

**Paper type** Research paper

## 1. Introduction

The challenge for the future is to develop business models that focus not only on the economic and individual growth of the supply chain but also on a positive impact on the community.

Companies that invest in sustainability achieve important results. There is growing awareness that voluntary compliance with environmental, social and economic sustainability policies is not only ethical issues but also opportunities for companies. Some studies claim that socially oriented companies perform better in the short and long run (Guo and Wu, 2022).

The concept of sustainability evolves through “corporate social responsibility” (CSR) and one of the key milestones in its definition was marked by Archie B. Carroll in 1991, with his “pyramid of corporate social responsibility” (Carroll, 1991). This was subsequently repowered by the European Commission in 2011 through the document “Communication on a Renewed EU Strategy 2011–2014 for CSR” (Mulej *et al.*, 2012), which emphasized the critical role that CSR plays in business management.



Building on this progression, the integration of CSR into the framework of sustainable development, especially as articulated by the United Nations Global Agenda for Sustainable Development (Agenda 2030) and the related Sustainable Development Goals (SDGs), underscores how CSR serves not only as a foundational element but also as a dynamic mechanism encouraging companies to adopt guidelines and pursue objectives that are aligned with broader European strategies. Indeed, the Sustainable Development framework allows for the incorporation of Social Sustainability through a holistic approach, thus considering not only economic and profit considerations but also the well-being of all stakeholders.

However, to achieve the above mentioned goal, a systematic effort to innovate management practices is required. As a consequence, this study focuses on management innovation in a social sustainability perspective (Gloet and Samson, 2022), that is, how the principles and practices of management should be changed in order to espouse the principles of sustainability.

In particular, a report by McKinsey (Bové and Swartz, 2016) suggests that much of the environmental impact arises throughout the supply chain.

To reduce this negative impact, collaboration is needed among all actors involved in the supply chain, ranging from raw material suppliers and packaging to transport agencies responsible for distribution. All parties must work together to promote concrete actions, such as the use of sustainably sourced raw materials or resource rationalization (Morais and Silvestre, 2018).

Thomas *et al.* (2022) highlight the crucial role of small and medium-sized enterprises (SMEs) in embracing sustainable practices, emphasizing the significant impact stakeholders have on this process.

The perspective of sustainable supply chain management (SSCM) emphasizes that examining individual organizations is not sufficient to fully understand and describe sustainability. The complexity of supply chains implies that sustainability issues can only be effectively addressed through a comprehensive analysis of the entire supply chain. Focal companies, for instance, may conceal unsustainable practices in remote areas of the supply chain to avoid negative public attention and reputational damage. As supply chains become more intricate and challenging to manage, researchers are striving to find practical and effective approaches to tackle this complexity (Morais and Silvestre, 2018).

Reflecting the increasing focus on supply chain management, various studies have been examining the significant effects of integrating innovation within the supply chain, particularly on diverse stakeholder groups. These analyses highlight the extensive influence that innovative practices in supply chain management can have across different stakeholders (De Pieri *et al.*, 2023; Lii and Kuo, 2016).

In order to align with sustainability principles and adopt a wider or socially responsible approach to CSR, it is not sufficient to solely focus on the links that fall within the company's own legal responsibility. To effectively address sustainability and CSR, which are commonly defined as environmental, economic and social impacts, it is necessary to consider these factors throughout the entire product lifecycle (Hutchins and Sutherland, 2008). A principle of CSR is to conduct the business in a way that aligns with the ethics and values of society, even if it is not necessarily mandatory by law (McWilliams *et al.*, 2006).

This growing pressure underscores the shift from viewing CSR solely through the lens of profit generation (Bausch *et al.*, 2023), to recognizing the multifaceted benefits of supply chain social sustainability (SCSS). It can result in improvement of well-being for individuals and the community, as well as on the second level, in a strengthening of brand image, increased competitive advantage, reduced costs, labor conflicts and supply chain risks. The SCSS concept covers the management of both products and processes, which can affect the safety and well-being of those involved in both upstream and downstream supply chains (Guo and Wu, 2022; Hutchins and Sutherland, 2008).

For instance, Cruz's research emphasizes the critical balance between managing risks in global supply chains and making decisions that uphold social responsibility, illustrating the complex dynamics at play when aligning business operations with ethical standards (Cruz, 2013).

Thus, measuring social sustainability becomes of fundamental importance. Measures should be developed because when something can be measured and can be more effectively managed. If companies aim to enhance their social sustainability, they need to evaluate their performance. However, as previously mentioned, social sustainability is the most challenging and modern aspect to measure. This is because it is hard to define which impacts should be taken into account and how to measure them (Popovic *et al.*, 2018).

One of the first sustainability measurement frameworks, developed by Carroll (1979), outlines four distinct responsibilities for corporations: economic, legal, ethical and voluntary or discretionary responsibilities.

Different authors, such as Cruz (2013), have developed models that take into account multi-criteria decision-making and different decision-makers. The existing literature focuses on various analyses, certifications and methods for calculating sustainability that exclusively refer to the company as a "stand alone" entity or focus on relationships with first-tier suppliers.

The literature review underscores a substantial focus on environmental sustainability, while simultaneously revealing a scarcity of studies dedicated to the measurement of social sustainability aspects. This observation points to a significant gap in research that aligns with the reviewed literature, emphasizing the critical need for more comprehensive investigations into the metrics and assessment methods of social sustainability (Nakamba *et al.*, 2017; Sodhi and Tang, 2018; Govindan *et al.*, 2021).

Consequently, companies may find it considerably more challenging to identify best practices for measuring social sustainability in comparison to environmental sustainability (Marshall *et al.*, 2015).

Desiderio *et al.* highlight a significant research gap in social sustainability measurement within food supply chains, noting that existing tools and indicators predominantly focus on environmental and economic aspects, with social dimensions being less explored. They conclude by emphasizing the crucial role of SMEs in adopting sustainable practices, highlighting a notable research gap in the measurement of social sustainability (Desiderio *et al.*, 2022).

The observations by Morais and Silvestre, highlighting the insufficient investigation into the social dimension of SSCM (Morais and Silvestre, 2018), directly align with Mani and Guo's assertion that research on the measurement of SCSS is scant. The economic and environmental aspects of SSCM have been studied extensively, yet research on social sustainability is still in its early stages (Guo and Wu, 2022; Mani *et al.*, 2016). Mani *et al.* underline the need of further efforts for developing sustainability measures (Mani *et al.*, 2018).

It is necessary, then, to address social sustainability not only within an organization but also throughout the supply chain at an inter-organizational level. A reliable and efficient performance measurement system for a reputable supply chain is crucial (Guo and Wu, 2022).

There is still a significant gap in our understanding of what defines social supply chain sustainability and how to measure it.

Taking into account the above considerations, this study aims to fill the above gap by

- (1) analyzing the existing models and indicators for measuring social sustainability in the supply chain and
- (2) defining an integrated framework for the measurement of social sustainability across the entire supply chain.

The review and framework will lead future research on the main topic.

To achieve these goals, the authors carried out a systematic literature review of peer reviewed papers extracted from Web of Science (WoS); the papers have been subsequently processed through the bibliometric tool Biblioshiny (Aria and Cuccurullo, 2017). Finally, the full text of most representative was analyzed.

The results can be summarized as in the following:

- (1) Bibliometric analysis with a description of the trend and main characteristics of the topic addressed
- (2) Classification of indicators for measuring social sustainability along the supply chain, differentiated by the approach used, quantitative or qualitative
- (3) Proposal of an original framework based on a mixed qualitative/quantitative approach for measuring social sustainability at the supply chain level.

Compared to current studies, the originality of this work lies in analyzing the measurement of social sustainability, not only with reference to a single company or a single buyer/supplier relation but in the context of the entire supply chain. This means extending the analyzed system in both directions: toward the end customer, who shares part of the responsibility for the sustainability process as a demand generator, and toward the upstream, till the raw materials suppliers. Besides, authors propose a framework based on a hybrid approach, both qualitative and quantitative, that identifies key measurement categories and corresponding indicators.

The work contributes to promote sustainability measurement as a driver to build agile, digitally autonomous and sustainable supply chains, “meeting today’s needs without compromising future generations’ needs” (Gerasimova, 2017).

From an innovation management perspective, this study provides guidelines for innovating management practices in a supply chain context, by integrating social sustainability principles.

## 2. Methodology

The purpose of our study was to advance theories and improve the understanding of measuring social sustainability. To achieve this objective, a systematic literature review (SLR) (Kraus *et al.*, 2022; Vrontis and Christofi, 2021) was conducted following the paradigm proposed by Durach *et al.* (2017). Durach *et al.* advocate for the use of an SLR methodology for inductive theory building (2021). Given that the exploration of the investigated subjects is still in an arising theory, the authors propose an inductive approach that provides a meaning for stepwise theory building (Bourgeois, 1979). This approach is particularly useful when dealing with exploratory endeavors as it allows for the identification of patterns and themes in the literature, which can then be used to develop new theories or refine existing ones. By utilizing an inductive approach in the SLR, the authors were able to build theory and improve the understanding of measuring social sustainability in a systematic and comprehensive way.

Durach *et al.* (2017) note that SLRs typically involve six key steps, regardless of the field, discipline, or philosophical perspective. The process involves several key stages, starting with the formulation of the research inquiry. Next, authors identify the key attributes of primary studies, followed by the acquisition of a representative sample of potentially relevant literature. From this pool, authors carefully choose the most pertinent literature. Subsequently, authors engage in the synthesis of the gathered literature, culminating in the reporting of our findings. Our adaptation of this procedure encompasses three primary phases: paper identification and selection, paper analysis and the presentation of results.

Papers location and selection: the initial phase of the study incorporates the first four steps of the guidelines proposed by Durach *et al.* (2017).

To narrow the focus of the SLR and address the “what,” “how” and “why” research questions pertaining to the measuring of social sustainability, the authors developed an initial theoretical framework. In order to answer the research questions, the following research query to locate papers for the SLR has been defined:

((TS=(supply NEAR/2 chain) OR (TS = purchais\*)) AND (TS=(social NEAR/2 responsibilit\*) OR (TS=(social NEAR/2 sustainabilit\*) OR (TS = ethic\*)) AND ((TS = measuring) OR (TS=KPI) OR (TS = measurement) OR (TS = parameter\*) OR (TS = indicator\*))).

ISI WoS was selected as scientific database to perform the searching and locate papers for further analysis. Authors performed the search at the beginning of March 2023 and found 914 papers.

The following selection criteria have been introduced to ensure the quality and relevance of papers to be analyzed:

- (1) Papers written in English.
- (2) Only “articles” were considered.
- (3) Papers belong to the following “Meso level Citation Topics”: Management, Supply Chain & Logistics, Sustainability Science, Artificial Intelligence & Machine Learning, Design & Manufacturing, Safety & Maintenance, Climate Change, Environmental Science, Transportation, Operations Research & Management Science.

At the end of this step, 614 articles have been extracted.

Subsequently, authors proceeded with the location and selection step utilizing the Biblioshiny digital platform. This platform facilitated the analysis of a specific data sample by applying appropriate filters and generating informative data visualizations as the final output. To ensure the inclusion of only articles published in high-impact journals, authors extracted 369 articles from the top 20% (Appendix) based on the “Source Impact” indicator. The initial sample was then subjected to bibliometric analysis, which will be further elucidated in the following paragraph.

Then, authors analyzed title and abstract of each paper to evaluate the matching with the present study, according to inclusion and exclusion criteria reported in the following table (Vrontis and Christofi, 2021) (see Table 1).

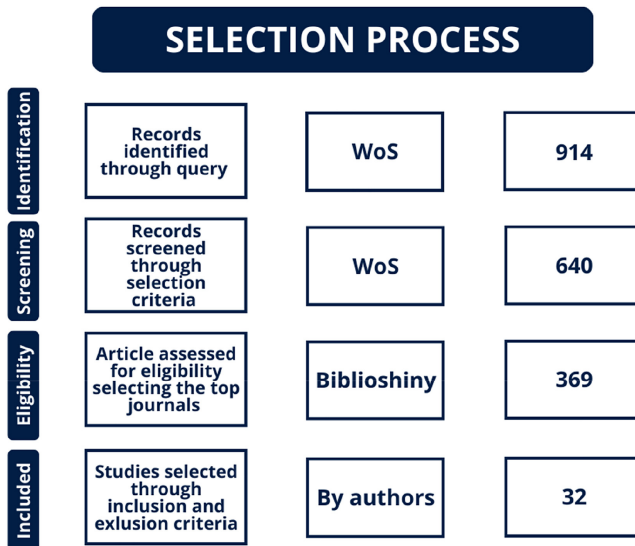
| Description                             | Reason for inclusion                                                                                                                                                                                                                                      | Reason for exclusion                                                                                                                                                                                                          | Examples of excluded papers                                             |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Time-period<br>Conceptual<br>boundaries | <ul style="list-style-type: none"> <li>• Not applicable</li> <li>• The articles focus on the aspect of social sustainability</li> <li>• The articles contribute to the measurement of social sustainability throughout the entire supply chain</li> </ul> | <ul style="list-style-type: none"> <li>• Not applicable</li> <li>• Articles focusing on other aspects of sustainability, such as economic and environmental but not social aspect are not taken into consideration</li> </ul> | <i>Ortas et al. (2014), Pohlmann et al. (2020), Zhang et al. (2019)</i> |
| Search terms                            | <ul style="list-style-type: none"> <li>• Boolean logic with regard to supply chain, sustainability and measurement</li> </ul>                                                                                                                             | <ul style="list-style-type: none"> <li>• Search terms are present in the title, abstract or keywords but the paper does not fit in the conceptual boundaries of this study</li> </ul>                                         | <i>Tipu et al. (2019), van Veen-Dirks and Verdaasdonk (2009)</i>        |
| Database<br>Quality<br>criteria         | <ul style="list-style-type: none"> <li>• Web of Science (ISI)</li> <li>• Articles published in journals</li> </ul>                                                                                                                                        | <ul style="list-style-type: none"> <li>• Not applicable</li> <li>• Books, book chapters<br/>conference proceedings</li> </ul>                                                                                                 | Not applicable<br>Not applicable                                        |

**Source(s):** Table created by authors

**Table 1.**  
Inclusion and  
exclusion criteria

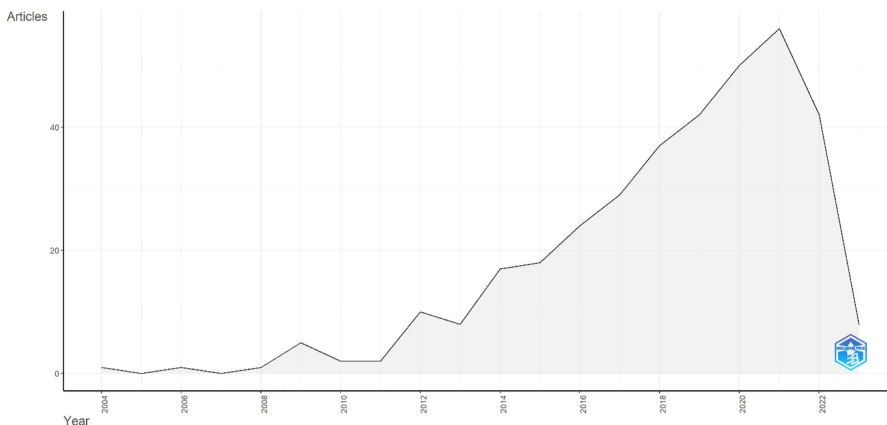
Among the 369 papers obtained by Biblioshiny, an amount of 32 manuscripts have been selected by the authors considering their content in terms of coherence with the study goals (see Figures 1–4).

Synthesizing the literature is the first step involved in the analysis of the initial sample of 369 papers using bibliometric techniques with the software Biblioshiny. Then, following the fifth step of Durach *et al.*'s (2017) guidelines, the theoretical framework has been enhanced using evidences from the final sample of papers. The full texts of the papers were carefully analyzed by at least two authors, and their evaluations were compared and iteratively modified until they agreed. During the phase, content analysis was conducted to develop the findings presented in the following section.



Source(s): Figure created by authors

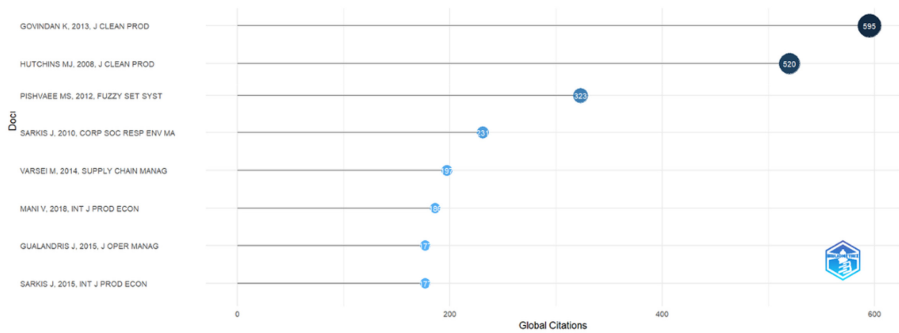
Figure 1.  
Papers selection  
process



Source(s): Figure courtesy of Aria and Cuccurullo (2017)

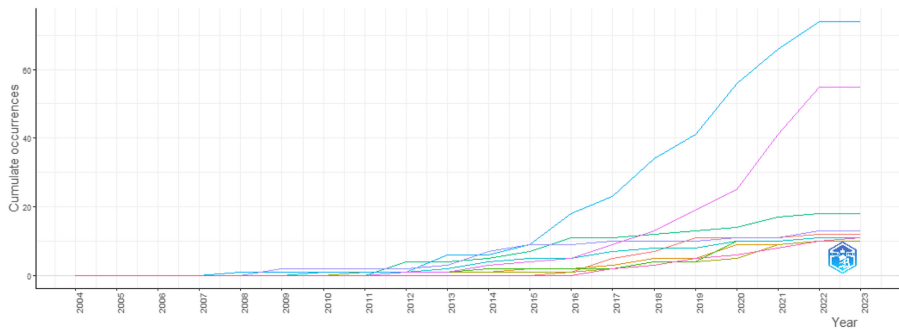
Figure 2.  
Annual scientific  
production

**Figure 3.**  
Most global cited documents



**Source(s):** Figure courtesy of Aria and Cuccurullo (2017)

**Figure 4.**  
Source growth



**Source(s):** Figure courtesy of Aria and Cuccurullo (2017)

Result synthesis is the phase that corresponds to the last step of Durach *et al's* (2017) guidelines, in which the results are presented, including a set of indicators and a summarizing framework that allow for the measurement of social sustainability in the entire supply chain.

### 3. Results

The papers under examination reveal the existence of different approaches to understand social sustainability in companies and, more generally, in the supply chain. These approaches differ not only as far as the used methodology is concerned but also in the factors associated with measuring social sustainability.

#### 3.1 Bibliometric analysis

The results obtained using the existing data analysis and data visualization tools on WoS and Biblioshiny are presented in this section.

The scientific literature analyzed consists of 369 papers published in 45 journals, authored by a total of 1,102 contributors.

The scientific output on this topic has grown exponentially over the past decade, with an annual rate of 11.57%, reaching its peak in 2021. Considering the articles published in 2023, the projection of scientific production by the end of the year is 48 articles, which is very close to the peak reached in 2021.



Furthermore, an additional data point demonstrates that the practical and inspiring nature of these works is the 21,538 references, or 44.71 per paper. Next are shown the most global cited document of the scientific production analyzed. [Govindan et al. \(2013\)](#) and [Hutchins and Sutherland \(2008\)](#) are the most representative articles of the subject matter ([Govindan et al., 2013](#); [Hutchins and Sutherland, 2008](#)). The former uses a qualitative approach while the latter uses a quantitative approach; this shows how in scientific research both methods are used, separately.

The majority of the research has been developed in countries such as the USA, England, China, India and Italy. Among the various sources, the *Journal of Cleaner Production* stands out both for the absolute number of published works and for the growth trend of Biblioshiny's source indicator.

In the following graph, it can be seen that the growth of scientific production in selected top journals is increasing. In particular, the highest growth is recorded by the Journal of cleaner production, which has been continuously increasing since 2013.

The works focus on measuring social sustainability in the supply chain. An analysis of the most commonly used words in the literature reveals that the words "performance," "impact" and "green" define the main areas and references of the whole research.

### 3.2 Classification of indicators

The results obtained from the systematic literature review reveal divergences in the measurement of social sustainability along the supply chain.

Firstly, the most relevant difference lies in the approach used: qualitative or quantitative. For this reason, the presentation of results in this paper is divided into two paragraphs each dedicated to one of the two approaches.

The qualitative and quantitative approach are different in their type of indicators used, involve different skills in the people tackling the measurement work and imply different methods and processes ([Guo and Wu, 2022](#); [Mani et al., 2016](#)). Moreover, qualitative rather than quantitative indicators often provide different types of information ([Morais and Silvestre, 2018](#); [Popovic et al., 2018](#)).

In each of the two methodologies, previous studies have pinpointed various categories of indicators. Given the broad scope of social sustainability, the associated indicators vary widely. To establish a framework that is both straightforward and practical, the key categories relevant to social sustainability indicators were determined by analyzing actual indicators from literature reviews. It is essential to acknowledge that certain indicators are specific to individual companies, given that, for example, people are considered assets of a specific company. However, to evaluate the overall value of a category within the supply chain, it is crucial to aggregate the values from different companies. The utility of these indicators is further explored by developing an integrated framework, which aims to overcome the limitations associated with these indicators.

The description of how the measurement of social sustainability is carried out through the analyzed studies is reported next.

**3.2.1 Qualitative methods.** With reference to the qualitative approach, [Table 2](#) reports for each category the list of indicators identified in the literature and summarizes the related references. Each category described in detail in the sections that follow.

**3.2.1.1 Employment benefits and rights.** Employment benefits and rights are often measured through qualitative method, encompassing the policies and procedures that pertain to the welfare of workers. These standards ensure that employees' fundamental needs, such as contracts, job opportunities and compensation, are safeguarded. Accurately monitoring the conditions of the workforce and safeguarding employment rights can be challenging given the high number of individuals involved in the supply chain and the



**Table 2.**  
Qualitative indicators

| Category                                | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | References                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Employment benefits and rights          | salaries and others compensations(C), working time(C), rest periods(C), vacations(C), proportion of staff with workload(C), proper organizational structure(C), level of support for top and middle managers of the sustainable supply chain(SC), quality of employment(C), staff skill(C), performance evaluation system(C), career management(C), employee motivation and practices(C), work-life balance policies(C), employee perspective considered(C), labor rights-related initiatives considered outstanding or innovative(C), capacity development(C), employment practices of suppliers(SC), labor working conditions(C), policy for prohibition of child and forced labor(C), rights policy for manufacturing facilities(C), labor audits in supplier locations(SC) | El Amrani <i>et al.</i> (2021), Chardine-Baumann and Botta-Genoulaz (2014), Narimissa <i>et al.</i> (2020a, b), Mani <i>et al.</i> (2016, 2018), Varsei <i>et al.</i> (2014), Marshall <i>et al.</i> (2015), Haroon <i>et al.</i> (2021), Castillo <i>et al.</i> (2018), Hussain and Al-Aomar (2018), Govindan <i>et al.</i> (2013), Sarkis <i>et al.</i> (2010)                                                                                                                                                                                                                                                             |
| Health and safety                       | strict safety regulations(C), non-usage of hazardous materials(C), product traceability(SC), health programs(C), clean drinking water and sanitation(C), health and safety and well-being management systems(C), guide and audit suppliers to guarantee adherence of health policy(SC)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Chardine-Baumann and Botta-Genoulaz (2014), Rajesh (2022), El Amrani <i>et al.</i> (2021), Mani <i>et al.</i> (2016, 2018), Marshall <i>et al.</i> (2015), Cruz (2013), Narimissa <i>et al.</i> (2020a, b), Kauppi and Hannibal (2017), Haroon <i>et al.</i> (2021), Azevedo <i>et al.</i> (2017), Hanson and Holt (2014), Govindan <i>et al.</i> (2013), Gualandris <i>et al.</i> (2015), Sarkis <i>et al.</i> (2010), Rajesh (2022), El Amrani <i>et al.</i> (2021), Cruz (2013), Chardine-Baumann and Botta-Genoulaz (2014), Narimissa <i>et al.</i> (2020a, b), Haroon <i>et al.</i> (2021), Sarkis <i>et al.</i> (2010) |
| Training, education and personal skills | evaluating capacity development(C), training needs assessments(C), training opportunities(C), recording and reporting employee training and education programs(C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | El Amrani <i>et al.</i> (2021), Castillo <i>et al.</i> (2018), Chardine-Baumann and Botta-Genoulaz (2014), Rajesh (2022), Mani <i>et al.</i> (2016, 2018), Narimissa <i>et al.</i> (2020a, b), Kauppi and Hannibal (2017), Haroon <i>et al.</i> (2021), Hanson and Holt (2014), Govindan <i>et al.</i> (2013), Gualandris <i>et al.</i> (2015)                                                                                                                                                                                                                                                                               |
| Ethics, equity and diversity            | Workplace diversity and non-discrimination(C), hiring local individuals(SC), women(C), people with disabilities(C), history of involvement in human rights-related legal cases(C), physical abuse or violation of other rights(C), resistance to improved practices(C), child and forced labor(C), freedom of association and respect for social dialogue(SC), efforts to combat corruption(SC)                                                                                                                                                                                                                                                                                                                                                                                | Mani <i>et al.</i> (2018), Cruz (2013), Haroon <i>et al.</i> (2021), Narimissa <i>et al.</i> (2020b), Hussain and Al-Aomar (2018), Govindan <i>et al.</i> (2013), Sarkis <i>et al.</i> (2010)                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Investment and supplier commitment      | firms initiatives towards supplier's social sustainability(SC), make long-term investments(SC), investment in new technology(C), contractual stakeholders influence(SC), procurement standards(SC), partnership standards(SC), consumers education(C), stakeholder empowerment(SC), stakeholder engagement(SC), establish long-term partnerships with suppliers(SC), do not significant harms(C)                                                                                                                                                                                                                                                                                                                                                                               | Mani <i>et al.</i> (2018), Cruz (2013), Haroon <i>et al.</i> (2021), Narimissa <i>et al.</i> (2020b), Hussain and Al-Aomar (2018), Govindan <i>et al.</i> (2013), Sarkis <i>et al.</i> (2010)                                                                                                                                                                                                                                                                                                                                                                                                                                |

(continued)

| Category                        | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                             | References                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturing performance       | suppliers meet delivery schedules(SC), suppliers' reliability(SC), suppliers minimize errors and increase operational efficiency(SC), achieve hassle-free operational environment(C)                                                                                                                                                                                                                                                   | Mani <i>et al.</i> (2018), Morais and Silvestre (2018)                                                                                                                                                                                                                                                                                                                                                 |
| Philanthropy                    | donate to religious organizations(SC), volunteer at local charities(SC), encourage suppliers in philanthropic activities(SC), donate to NGOs for societal development(SC), conducts health related camps for the society surrounding to manufacturing facilities (SC)                                                                                                                                                                  | Mani <i>et al.</i> (2016)                                                                                                                                                                                                                                                                                                                                                                              |
| Sales and customer relationship | customer service levels(SC), compressed order cycle time/lead time(SC), reduced operating costs(C), time delivery/delivery precision(SC), information sharing(SC), customer privacy(C), customer satisfaction on social aspect(C)                                                                                                                                                                                                      | Narimissa <i>et al.</i> (2020b), El Amrani <i>et al.</i> (2021), Chardine-Baumann and Botta-Genoulaz (2014), Mani <i>et al.</i> (2018), Morais and Silvestre (2018), Cruz (2013)                                                                                                                                                                                                                       |
| Societal responsibility         | involvement in local community(SC), culture and technological development(C), societal investment in community in terms of job creation and healthcare(SC), policy for using local suppliers(SC), conducting health camps and awareness programs(C), employee participation in community projects(SC), financial support for community activities(SC), partnerships with government agencies and membership in research institutes(SC) | Morais and Silvestre (2018), Rajesh (2022), Chardine-Baumann and Botta-Genoulaz (2014), Mani <i>et al.</i> (2018), Morais and Silvestre (2018), Varsei <i>et al.</i> (2014), Cruz (2013), Kauppi and Hannibal (2017), Narimissa <i>et al.</i> (2020a), Haroon <i>et al.</i> (2021), Hussain and Al-Aomar (2018), Govindan <i>et al.</i> (2013), Sarkis <i>et al.</i> (2010), Mani <i>et al.</i> (2018) |

**Source(s):** Table created by authors

complexities of the different employment systems (Narimissa *et al.*, 2020a). Among the traditional objectives, introducing employment rights and practices reduces turnover and, indirectly, enhances productivity within a supply chain network (El Amrani *et al.*, 2021). The adoption of sustainable practices is required for achieving this goal. Supporting evidence demonstrates that sustainable employment practices imply a mutually beneficial, long-lasting and committed relationship between employers and employees. Therefore, it is crucial to evaluate the impacts of employment practices on work conditions, social welfare and employment within a company (Chardine-Baumann and Botta-Genoulaz, 2014). As far as the employers are concerned, companies play a critical role in contributing to society's goal of improving the standard of living by providing stable and full employment opportunities. A large number of qualitative indicators can be used to this end, including salaries and others compensations, skills, structure and collaboration of employees, level of support for top and middle managers, labor audits in supplier locations (Mani *et al.*, 2016, 2018; Varsei *et al.*, 2014; Marshall *et al.*, 2015; Haroon *et al.*, 2021; Narimissa *et al.*, 2020b; Castillo *et al.*, 2018; Hussain and Al-Aomar, 2018; Govindan *et al.*, 2013; Sarkis *et al.*, 2010).

3.2.1.2 Health and safety. To achieve sustainability, it is imperative that supply chain organizations prioritize the welfare, safety and health of their workers. Even though health and safety are often underestimated in the workplace, the integration of safety and health into the workplace environment and supply chain is suitable for attaining sustainable development (El Amrani *et al.*, 2021). The health of a supply chain company's workforce is a key element of its social and societal sustainability performance, as healthy workers are more productive and becomes a key strategy for overcoming poverty (Rajesh, 2022). The risks associated with workplace health are relatively higher in small firms (Hasle and Limborg, 2006). Measuring, monitoring and evaluating safety performance is mandatory. Performance measurement and its coherence to agreeable standards can reveal opportunities for growing. The goal is to promote and maintain the highest degree of physical, mental and social well-being in workers, and to prevent accidents resulting from working conditions. It is also a matter of protecting workers from health risks and adapting the working environment to their physiological and psychological needs (Chardine-Baumann and Botta-Genoulaz, 2014). Properly designed health and safety practices, pollution control and exposure reduction are common elements for ensuring the health of workers, protecting surrounding communities and preserving the environment for future generations (Mani *et al.*, 2016, 2018; Marshall *et al.*, 2015; Cruz, 2013; Narimissa *et al.*, 2020a, b; Kauppi and Hannibal, 2017; Haroon *et al.*, 2021; Azevedo *et al.*, 2017; Hanson and Holt, 2014; Govindan *et al.*, 2013; Gualandris *et al.*, 2015; Sarkis *et al.*, 2010).

3.2.1.3 Training, education and personal skills. Training and education initiatives have the potential to cultivate heightened awareness thereby encouraging environmentally conscious decision-making that bolsters the supply chain organization's sustainability capabilities (El Amrani *et al.*, 2021). While training programs are tailored to enhance specific skill sets or behaviors at the operational level, education represents a comprehensive process of systematic learning that fosters sound judgment and reasoning abilities in employees across all levels of the organization (Rajesh, 2022). Properly evaluating capacity development, conducting thorough training needs assessments, affording ample training opportunities and recording and reporting training records constitute integral components of an effective employee training and education programs (Cruz, 2013; Chardine-Baumann and Botta-Genoulaz, 2014; Narimissa *et al.*, 2020a, b; Haroon *et al.*, 2021; Sarkis *et al.*, 2010).

3.2.1.4 Ethics, equity and diversity. Ethics, equity and diversity are strong elements of social sustainability for a supply chain network (Kauppi and Hannibal, 2017). It is important to promote due diligence to avoid any violation of human rights and to address any concerns related to distributors, buyers and suppliers that may have a negative impact on ethical practices (Narimissa *et al.*, 2020b). The companies can take exceptional initiatives to promote

human rights, including promoting transparency and disclosure of human rights issues as demonstrated industry leaders in this area. CSR results in a self-regulatory mechanism to enhance the long-term profitability of the supply chain. The company and its business partners can ensure compliance with legal, ethical and national or international standards. Literature has identified several important sub-factors that must be considered when addressing rights and ethics within a supply chain network. Information disclosure involves sharing information throughout the supply chain to enhance transparency and accountability among stakeholders. Workplace diversity and non-discrimination aim to provide equal opportunities for all individuals, regardless of their origin, age, gender, or race. A diverse workforce can facilitate knowledge acquisition and promote innovation (El Amrani *et al.*, 2021). Hiring local workers, people with disabilities, from marginalized groups, regardless of gender and promoting employees based on merit are key considerations (Mani *et al.*, 2016). The evaluation of human rights violations hinges on the degree of controversy surrounding a company's impact on human rights stemming from its operations. Numerous factors contribute to this assessment, including, though not exclusively limited to, factors such as a company's track record in human rights-related legal matters, its stance on freedom of association and respect for social dialogue, as well as its initiatives to combat corruption (Castillo *et al.*, 2018; Chardine-Baumann and Botta-Genoulaz, 2014; Rajesh, 2022; Mani *et al.*, 2018; Narimissa *et al.*, 2020a; Haroon *et al.*, 2021; Hanson and Holt, 2014; Govindan *et al.*, 2013; Gualandris *et al.*, 2015).

3.2.1.5 Investment and supplier commitment. Businesses make significant investments in improving their technology, not only to enhance their competitiveness but also to improve people's quality of life (Mani *et al.*, 2018). Moreover, involving suppliers in corporate initiatives exponentially amplifies their impact (Cruz, 2013). In fact, some of the indicators include firms initiatives towards supplier's social sustainability, stakeholder engagement and establish long-term partnerships with suppliers (Haroon *et al.*, 2021; Narimissa *et al.*, 2020b; Hussain and Al-Aomar, 2018; Govindan *et al.*, 2013; Sarkis *et al.*, 2010).

3.2.1.6 Manufacturing performance. Manufacturing represents the heart of the company in the operational aspects and impacts on the company's success as well as on the social aspects. Indicators refers to suppliers meet delivery schedules and their reliability, suppliers efficiency to minimize errors and increase operational activities, achieve hassle-free operational environment, improving quality to maintain customer satisfaction and loyalty (Mani *et al.*, 2018; Morais and Silvestre, 2018).

3.2.1.7 Philanthropy. A supply chain has a social role in addition to its business. The initiatives carried out for the benefit of the community enable the continuous improvement of the level of education and the growth of complementary activities, integrating and streamlining the entire supply chain. To measure a level of commitment in philanthropy activities different items can be considered like donations to religious or NGO's organizations and volunteer activities for societal development (Mani *et al.*, 2016).

3.2.1.8 Sales and customer relationship. Gaining an understanding of consumer behaviour looking at the business ethics and highlighting the mechanisms by which ethical considerations can inform the management of consumer-related issues is a must for fostering the social and economic development of a supply chain network (Narimissa *et al.*, 2020b). The implementation of business ethics and sustainability practices is pivotal for attaining optimal levels of consumer satisfaction (Morais and Silvestre, 2018). Several key indicators of a positive customer relationship include the evaluating of customer satisfaction about social aspect and the consideration of customer role in supply chain taking care about information sharing and customer privacy (El Amrani *et al.*, 2021; Chardine-Baumann and Botta-Genoulaz, 2014; Mani *et al.*, 2018; Cruz, 2013).

3.2.1.9 Societal responsibility. CSR initiatives are aimed at promoting social welfare and are planned with a broader perspective beyond the interests of the supply chain and legal

requirements (Morais and Silvestre, 2018). A single firm of a supply chain has the option to either comply with the law or doing more than the standard, based on its strategic objectives. In fact, a focal company collaborates with other supply chain stakeholders to address social issues or initiate social programs (Govindan *et al.*, 2013). To measure these activities named “societal commitment and responsibility” various attributes exist, taken from literature, like involvement in local community and doing societal investment in community also in terms of job creation and healthcare, helping to develop and incentive policy for using local suppliers (Rajesh, 2022; Chardine-Baumann and Botta-Genoulaz, 2014; Mani *et al.*, 2018; Varsei *et al.*, 2014; Cruz, 2013; Kauppi and Hannibal, 2017; Narimissa *et al.*, 2020a; Haroon *et al.*, 2021; Hussain and Al-Aomar, 2018; Sarkis *et al.*, 2010; Mani *et al.*, 2018).

3.2.2 *Quantitative methods.* With reference to the quantitative approach, Table 3 reports for each category the list of identified indicators and summarizes the related references. In the following, each category is described in detail.

3.2.2.1 *Employee benefits and rights.* This category measures a supply chain organization’s workforce, labor practices and human resources management, as well as the relationship between labor policy and employment characteristics (Popovic *et al.*, 2018). The assessment takes into account fundamental job characteristics and the benefits offered by the company through its contractual and compensation policies (Hutchins and Sutherland, 2008). A measure is needed to describe the distribution of employee compensation within a supply chain. Ideally, this measure would be based on the wages of all employees within the organization (Yakovleva *et al.*, 2012; Narimissa *et al.*, 2020b; Pishvaei *et al.*, 2012; Sarkis and Dhavale, 2015).

3.2.2.2 *Health and safety.* A single company of the supply chain can demonstrate its commitment to implementing a responsible health and safety culture by monitoring the quality of working conditions and potential health and safety risks (Popovic *et al.*, 2018). This is critical as it can enhance employee satisfaction, maintain operational processes and positively impact the company’s image and brand (Hutchins and Sutherland, 2008). In order to evaluate a corporation’s role in providing/supporting healthcare for its employees and their families, several metrics can be used. As an example, a possible metric to consider is the ratio of healthcare expenses covered by the company per employee to the market capitalization per employee. Another viable measure might involve health maintenance or wellness-related expenditures per employee. Additionally, in the context of assessing workplace safety within a supply chain, an indicative metric linked to social sustainability can be introduced. One frequently employed metric is the ratio of average injury-free days to the total days worked per employee (Guo and Wu, 2022; Narimissa *et al.*, 2020b; Mastos *et al.*, 2022; Gargalo *et al.*, 2021; Pishvaei *et al.*, 2012).

3.2.2.3 *Training, education and personal skills.* The aim of this category is to assess the employee’s individual sphere by means of career development strategies, continuous learning opportunities and job analysis. These factors are fundamental in promoting employee efficiency and avoiding possible inconsistencies in career trajectories (Narimissa *et al.*, 2020b). Measurable benchmarks in this category encompass the degree of training and education attained, as well as the associated expenditures related to training and personnel development (Popovic *et al.*, 2018).

3.2.2.4 *Ethics, equity and diversity.* In this category, the metric is associated with initiatives against certain opaque practices. Instances of such practices may include offering bribes to contract managers to overlook contractual issues or providing bribes to government officials by suppliers to obtain public permits and conduct business while supplying products and services to other companies (Azevedo *et al.*, 2017). Besides, this category considers assessing the supply chain company’s internal policies regarding non-discrimination. Discrimination can manifest in various forms, including racial and sexual harassment, as well as bias against individuals with disabilities (Narimissa *et al.*, 2020b). Additionally, this

| Category                                | Indicators                                                                                                                                                                                                                                                                                                                                                                                                                                                         | References                                                                                                                                                                                                 |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Employment Benefits and rights          | working hours(C), percentage of full-time and part-time employment(C), length of service(C), promotion rates(C), number of unionized employees(C), total employment(C), average number of employees per year(C), employees per enterprise(C), minimum average gross wages per employee(C), number of job opportunities created(C), employee turnover rate(C)                                                                                                       | Popovic <i>et al.</i> (2018), Hutchins and Sutherland (2008), Yakovleva <i>et al.</i> (2012), Narimissa <i>et al.</i> (2020a, b), Pishvae <i>et al.</i> (2012), Sarkis and Dhavale (2015)                  |
| Health and Safety                       | Number of health and safety incidents(C), product safety incidents(C), environmental incidents per year(C), safety and health incidents per year(C), number of employee accidents(C), percentage of employees who agree that their workplace is safe and comfortable(C), proportion of staff working with hazardous/harmful/toxic materials(C), fatal incidents(C), lost days caused by work damages(C), workforce safety training(C), amount of produced waste(C) | Popovic <i>et al.</i> (2018), Hutchins and Sutherland (2008), Guo and Wu (2022), Narimissa <i>et al.</i> (2020b), Mastros <i>et al.</i> (2022), Gargalo <i>et al.</i> (2021), Pishvae <i>et al.</i> (2012) |
| Training, Education and Personal Skills | degree of training and education attained(C), expenditures related to training and personnel development(C)                                                                                                                                                                                                                                                                                                                                                        | Popovic <i>et al.</i> (2018), Narimissa <i>et al.</i> (2020a, b)                                                                                                                                           |
| Ethics, Equity and Diversity            | payment nondiscrimination(C), assessment of corruption risks across operations(C), gender distribution(C), employment of disabled individuals(C)                                                                                                                                                                                                                                                                                                                   | Azevedo <i>et al.</i> (2017), Narimissa <i>et al.</i> (2020b), Gargalo <i>et al.</i> (2021), Popovic <i>et al.</i> (2018), Yakovleva <i>et al.</i> (2012)                                                  |
| Innovation and Competitiveness          | ratio of socially responsible innovations to total innovations(C), quantity of new products generated(C), number of scientific publications(C), collective bargaining agreements(C)                                                                                                                                                                                                                                                                                | Popovic <i>et al.</i> (2018)                                                                                                                                                                               |
| Manufacturing                           | customer rejection rate(C), number of critical quality issues(C), overall equipment effectiveness(C), manufacturing cost(C), work-in-progress inventory/turns(C), capacity utilization(C), schedule or production planned(C), downtime as a proportion of operating time(C), energy cost per unit(C), order fill rate(C), time to make changeovers(C)                                                                                                              | Guo and Wu (2022)                                                                                                                                                                                          |
| Philanthropy                            | ratio of philanthropy expenditure to market capitalization(C), the percentage of sales contributed by a supplier to educational(SC), philanthropic and charitable causes(SC)                                                                                                                                                                                                                                                                                       | Hutchins and Sutherland (2008), Sarkis and Dhavale (2015)                                                                                                                                                  |
| Sales and Customer relationship         | number of converted leads(SC), number of successful tenders(C), accuracy and timeliness of sales quotations(SC), on-time delivery(SC), volume of resolved and active issues(C), escalation rate(C), return rate(C), average resolution time(C), customer issue retention rate(SC), net promoter score(C), customer effort score(SC), customer satisfaction score(SC)                                                                                               | Guo and Wu (2022), Wei <i>et al.</i> (2022)                                                                                                                                                                |
| Societal responsibility                 | proportion of the procurement budget on local suppliers(SC), number of employment opportunities created(SC)                                                                                                                                                                                                                                                                                                                                                        | Sarkis and Dhavale (2015), Azevedo <i>et al.</i> (2017), Pishvae <i>et al.</i> (2012), Wei <i>et al.</i> (2022)                                                                                            |

**Source(s):** Table created by authors

**Table 3.**  
Quantitative indicators



category evaluates the company's efforts towards fostering a diverse workforce within the workplace. This involves the implementation of guidelines and programs aimed at regulating anti-corruption practices among suppliers, who must comply with the prescribed regulations and abstain from engaging in corruption activities, price-fixing or forming cartels to gain undue advantages. Quantifiable metrics in this category should demonstrate how the companies ensures equal opportunities for all employees and guarantee non-discrimination or non-corruption (Gargalo *et al.*, 2021; Popovic *et al.*, 2018; Yakovleva *et al.*, 2012).

3.2.2.5 Innovation and competitiveness. To advance sustainability in supply chain, a valuable approach is to promote novel technical solutions. The progress of society and technology relies heavily on research and development, making this category crucial for assessing a company's capability to innovate and optimize its research and sharing information with supply chain partners for faster development (Popovic *et al.*, 2018).

3.2.2.6 Manufacturing performance. Manufacturing is a fundamental aspect of a supply chain company's operations and the indicators used to measure its success should be aligned with the organization's goals and objectives. These goals typically include suppliers' efficiency to minimize errors, improving quality, efficiency and productivity to maintain customer satisfaction and loyalty, while reducing risks. The key performance indicators used to evaluate manufacturing performance, which affect also the quality of working life, include manufacturing yield, quality aspect and activities planning (Guo and Wu, 2022).

3.2.2.7 Philanthropy. A supply chain has a crucial financial and social role within a community and society at large, beyond its core supply chain business functions. This includes activities such as funding museums, supporting performances and art exhibitions, providing scholarships to graduate students. To measure a corporation's level of philanthropic commitment, charitable donations or support by a supplier to educational, philanthropic and charitable causes have been considered (Hutchins and Sutherland, 2008; Sarkis and Dhavale, 2015).

3.2.2.8 Sales and customer relationship. Sales and customer relationship management serves distinct sales objectives, specifically, retaining customers, expanding within existing markets and entering new geographic regions and industries. Since customers are a crucial component of a supply chain, engaging with them is a crucial aspect of enhancing the social sustainability of the supply chain. Consequently, it is suitable to investigate customer feedback responsiveness to include it into the measurement of social sustainability of supply chain (Guo and Wu, 2022; Wei *et al.*, 2022).

3.2.2.9 Societal responsibility. Hiring and procuring from local suppliers enhance regional income and social welfare, showing the affirmative influence of such sourcing on local communities and development. Fostering social responsibility towards the resident community and region entails the prosperity of the supplier's employees, assessed by the purchasing company (Sarkis and Dhavale, 2015). This phenomenon is measured by the proportion of the procurement budget allocated to significant operating locations spent on local suppliers to that operation such as the percentage of locally acquired products and services, taking into account community development through, for instance, the number of employment opportunities created, social welfare and product quality (Azevedo *et al.*, 2017; Pishvaei *et al.*, 2012; Wei *et al.*, 2022).

#### 4. Discussion

The aim of this study is to highlight the results of research on the topic of measuring social sustainability along the entire supply chain through a systematic literature review. Conducting such a study has led to the emergence of three factors to be analyzed and discussed, as reported below.



The first issue concerns the measurement of social sustainability. Many studies only refer to a single company or, at most, the first-tier supplier, excluding numerous factors that have been reported in the previous section and are fundamental for the definition of social sustainability (Marshall *et al.*, 2015; Kauppi and Hannibal, 2017). Limiting the evaluation at the first tier, many suppliers which contribute to the supply chain are not taken into account. Therefore, social responsibilities may be shifted to second or third-level suppliers that, to meet the strict demands of customers, may not comply with optimal working conditions or consider the importance of social sustainability. For these reasons, authors propose that the measurement of SCSS requires to be extended to the entire supply chain. Besides, most indicators were firstly developed to be used in the context of a single company and then extended to the supply chain level by aggregating individual scores (Hutchins and Sutherland, 2008; Popovic *et al.*, 2018). This approach can be of limited effectiveness when discontinuities exist between the organizational and the supply chain level. The second issue concerns the choice of the method for measuring. The majority of scientific production uses a qualitative approach compared to the quantitative one. Nonetheless, a relevant number of studies considering quantitative methods exist.

On the contrary, hybrid forms of measurement are seldom considered. These kinds of measurements have proven useful in other domains according to (Azevedo *et al.*, 2017).

Indeed, each of the two approaches has some advantages and, in fact, both are necessary for an assessment of social sustainability more robust and complete. Measuring through a quantitative approach provides a precise value for each indicator easily and quickly. Moreover, it is also easily comparable across different supply chains. The qualitative approach requires a more complex process as it requires the involvement of professionals or alternative methods to assign a score, as accurately as possible. However, the advantage of the qualitative approach is that it can take into account factors that are not measurable (or easily measurable) by means of a precise value, thereby losing important characteristics, such as consideration of contextual factors.

The third issue refers to the contextual factors in which social sustainability is studied and measured. Most analyzed studies do not consider the influence of surrounding context. However, social sustainability depends on factors determined by geographical location and sectors of activity. In fact, some studies focus on measuring social sustainability in developing Countries considering that they largely prioritize economic benefits neglecting the impact on the context (Morais and Silvestre, 2018; Rajesh, 2022). Other studies consider a specific sector like food supply chain (Hanson and Holt, 2014; Wei *et al.*, 2022).

The related social effects are instead not considered (Hutchins and Sutherland, 2008).

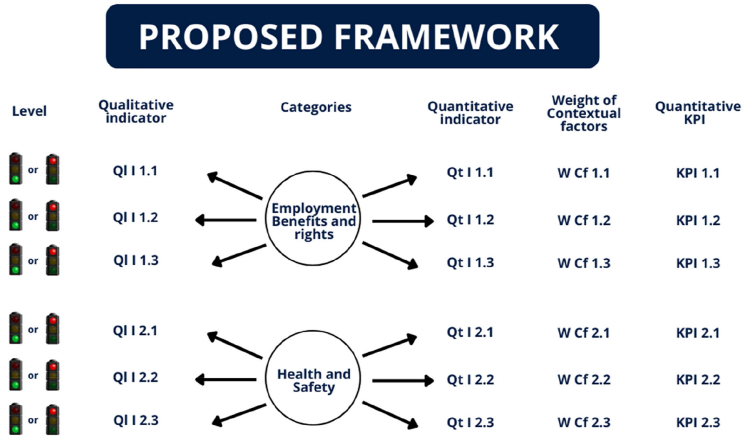
There is no studies describing how social sustainability changes depending on geographical variables or different sector.

According to Xu *et al.* (2019), however, the most crucial factors influencing governance in the context of the supply chain are typically perceived to be political stability, the absence of violence or terrorism, government effectiveness, regulatory quality, as well as indicators related to the rule of law and control of corruption.

#### *4.1 Proposal of an integrated framework to measure SCSS*

Based on the above discussed issues, the authors propose an original framework using a hybrid approach to measure social sustainability of the entire supply chain. The framework provides two outputs according to a quantitative and qualitative approach respectively: a numeric value and a level of quality. The evaluation process is graphically described in the Figure 5.

The framework proposed represent a relevant output considering the scientific research analyzed. Indeed, the framework uses a hybrid approach, which has not been investigated



**Figure 5.**  
Proposed framework

Source(s): Figure created by authors

sufficiently in literature, taking the strengths of the quantitative and qualitative method (Morais and Silvestre, 2018; Popovic et al., 2018). Furthermore, it identifies measurement categories and related indicators.

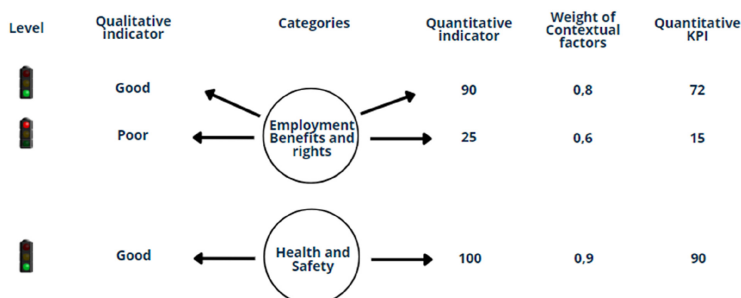
The final measurement includes qualitative and quantitative indicators for each category, as listed in the previous paragraphs.

Authors will first examine the quantitative indicators. These are numbers that indicate the level of performance of the analyzed supply chain in relation to a specific dimension of SCSS. In Figure 5, for example, Qt I 1.1 is the first indicator for the “Employment benefits and rights” already normalized to ensure uniformity in size among all indicators. W Cf 1.1 represents the weight of the contextual factor related to the first indicator. The weight can be obtained in different ways. For example, through scoring methods based on expert opinions, statistical analysis and so on. The quantitative key performance indicator (KPI) is calculated by multiplying Qt I 1.1 and W Cf 1.1.

Let’s consider the qualitative indicators. These are labels that indicating satisfactory or poor performance in relation to a specific dimension of SCSS. Performance is represented by the color red (poor performance) or green (good performance) color. In Figure 5, for example, QI I 1.1 is the first indicator for the “Employment benefits and rights”. In Figure 6, QI I 1.1 is associated with a green color, indicating satisfactory performance with respect to this indicator.

In order to clearly explain the proposed integrated framework, Figure 6 aims to present an implementation example with numerical values. Quantitative KPI. The indicator Qt I 1.1 equals 90 and represents the value of the category across the entire supply chain normalized to 100, W Cf 1.1 equals 0.8 and represents the weight of contextual factors. The KPI 1.1 is given by the product of 90 and 0.8, hence the final KPI 1.1 for the entire supply chain equals 72. Qualitative KPI. QI I 1.1 is the qualitative KPI that synthesizes the value of the entire supply chain considering qualitative aspects. In this case, it is associated with a green color, indicating satisfactory performance with respect to this indicator.

The final output is therefore represented by the numerical values of the quantitative KPIs and a level of quality represented as a traffic light color through the qualitative KPIs.



Source(s): Figure created by authors

**Figure 6.**  
Application of  
proposed framework

The model is hybrid because, as stated before, considers both quantitative and qualitative approaches. The qualitative approach, in particular, is used twice:

- (1) Through qualitative indicators and
- (2) By developing weights of contextual factors for quantitative indicators based on the opinion of experts or other specific qualitative techniques.

When using quantitative approach, managers can calculate the indicators and compare each of them with previous measurement or other supply chains. Besides, manager could simulate different configurations of the supply chain, such as changing suppliers or customers, and calculate the associated performance.

When considering qualitative approach, managers can focus their attention on red lights (parameters with poor performance). As with quantitative indicators, managers can evaluate different supply chains by changing suppliers or customers to assess the potential performance.

Based on the obtained results, managers can pursue strategies to improve the indicators and, as a consequence, the social sustainability performance.

## 5. Conclusion and future research

The conducted research has resulted in an innovative framework for assessing social sustainability throughout the entire supply chain. Utilizing this framework, managers can derive significant benefits by measuring the outcomes of their sustainability-related actions. Furthermore, our solution can be seamlessly integrated into the Plan-Do-Check-Act (PDCA) cycle, enhancing the check phase through measurable outputs, thus enabling the correction of specific situations and the planning of remedial measures.

The study conducted represents an opportunity for researchers but even more so for managers and business entities, as it highlights the advantages for which companies must implement social sustainability internally. Furthermore, this research provides a tool for measuring and monitoring one's condition of social sustainability, that of clients and suppliers, facilitating more durable and valuable relationships among various actors in the supply chain. This is because it becomes simple to collaborate with partners who share the same vision and a similar strategy that involves all aspects of sustainability. The scientific literature confirms that innovation and progress can no longer ignore the themes of sustainability, especially social sustainability. Researchers, managers, companies and governments must synergize to continue evolving with the welfare of the entire community in mind (Silvestre and Țircă, 2019).

For future scientific research purposes, several aspects warrant investigation. Foremost among them is the exploration of how companies can collaborate to collectively manage the measurement process. For instance, the establishment of a supply chain governance system comprising managers with a broader perspective could prove instrumental.

Another aspect pertains to the presentation of the final framework results. In the case of quantitative indicators, various options exist:

- (1) Individual indicators can be reported with their respective quantitative scores, similar to the example illustrated in [Figure 6](#);
- (2) A quantitative value for each category can be derived by aggregating normalized indicators within the category using a convex combination;
- (3) A single quantitative value, representative of all supply chain indicators, can be computed by applying a convex combination to the normalized indicators.

Moreover, as mentioned in the discussion, certain categories necessitate further scientific exploration. Similarly, more research is required to investigate the quantitative approach and the influence of contextual factors. From an innovation management perspective, the approach suggested in this study provides an original point of view on managerial practices innovation, by showing how social sustainability principles can be introduced in the measurement of performances in an interorganizational context.

The limitations of the study, including a limited dataset of full paper analyzed and a final framework that has not yet been tested in a real-world environment, allow for future directions. The introduction of this framework for measuring social sustainability in supply chain described possible applicability in different geographical contexts and sectors.

## References

- Aria, M. and Cuccurullo, C. (2017), "bibliometrix: an R-tool for comprehensive science mapping analysis", *Journal of Informetrics*, Vol. 11 No. 4, pp. 959-975, doi: [10.1016/j.joi.2017.08.007](https://doi.org/10.1016/j.joi.2017.08.007).
- Azevedo, S.G., Carvalho, H., Ferreira, L.M. and Matias, J.C.O. (2017), "A proposed framework to assess upstream supply chain sustainability", *Environment, Development and Sustainability*, Vol. 19 No. 6, pp. 2253-2273, doi: [10.1007/s10668-016-9853-0](https://doi.org/10.1007/s10668-016-9853-0).
- Bausch, A., Diehl, S. and Karmasin, M. (2023), "Communicating for sustainable development how social enterprises aim at differentiating themselves online from profit-maximizing competitors", *Medien Journal*, Vol. 47 No. 1, pp. 5-23, doi: [10.24989/medienjournal.v47i1.2242](https://doi.org/10.24989/medienjournal.v47i1.2242).
- Bourgeois, L.J. (1979), "Toward a method of middle-range theorizing", *The Academy of Management Review*, Vol. 4 No. 3, pp. 443-447, doi: [10.5465/amr.1979.4289127](https://doi.org/10.5465/amr.1979.4289127).
- Bové, A. and Swartz, S. (2016), "Starting at the source: sustainability in supply chains", McKinsey & Company, pp. 1-13, available at: <https://www.mckinsey.com/capabilities/sustainability/our-insights/starting-at-the-source-sustainability-in-supply-chains>
- Carroll, A.B. (1979), "A three-dimensional conceptual model of corporate PerforCarroll, A. B. (1979). A three-dimensional conceptual model of corporate performance", *Academy of Management Review*, Vol. 4 No. 4, pp. 497-505, doi: [10.5465/amr.1979.4498296mance](https://doi.org/10.5465/amr.1979.4498296mance).
- Carroll, A.B. (1991), "The pyramid of corporate social responsibility: toward the moral management of organizational stakeholders", *Bus Horiz*, Vol. 34 No. 4, pp. 39-48, doi: [10.1016/0007-6813\(91\)90005-G](https://doi.org/10.1016/0007-6813(91)90005-G).
- Castillo, V.E., Mollenkopf, D.A., Bell, J.E. and Bozdogan, H. (2018), "Supply chain integrity: a key to sustainable supply chain management", *Journal of Business Logistics*, Vol. 39 No. 1, pp. 38-56, doi: [10.1111/jbl.12176](https://doi.org/10.1111/jbl.12176).

- Chardine-Baumann, E. and Botta-Genoulaz, V. (2014), "A framework for sustainable performance assessment of supply chain management practices", *Computers and Industrial Engineering*, Vol. 76, pp. 138-147, doi: [10.1016/j.cie.2014.07.029](https://doi.org/10.1016/j.cie.2014.07.029).
- Cruz, J.M. (2013), "Modeling the relationship of globalized supply chains and corporate social responsibility", *Journal of Cleaner Production*, Vol. 56, pp. 73-85, doi: [10.1016/j.jclepro.2011.09.013](https://doi.org/10.1016/j.jclepro.2011.09.013).
- De Pieri, B., Chiodo, V. and Gerli, F. (2023), "Based on outcomes? Challenges and (missed) opportunities of measuring social outcomes in outcome-based contracting", *International Public Management Journal*, Vol. 26 No. 3, pp. 437-462, doi: [10.1080/10967494.2022.2077490](https://doi.org/10.1080/10967494.2022.2077490).
- Desiderio, E., García-Herrero, L., Hall, D., Segrè, A. and Vittuari, M. (2022), "Social sustainability tools and indicators for the food supply chain: a systematic literature review", *Sustainable Production and Consumption*, Vol. 30, pp. 527-540, doi: [10.1016/j.spc.2021.12.015](https://doi.org/10.1016/j.spc.2021.12.015).
- Durach, C.F., Kembro, J. and Wieland, A. (2017), "A new paradigm for systematic literature reviews in supply chain management", *Journal of Supply Chain Management*, Vol. 53 No. 4, pp. 67-85, doi: [10.1111/jscm.12145](https://doi.org/10.1111/jscm.12145).
- Durach, C.F., Kembro, J.H. and Wieland, A. (2021), "How to advance theory through literature reviews in logistics and supply chain management", *International Journal of Physical Distribution and Logistics Management*, Vol. 51 No. 10, pp. 1090-1107, doi: [10.1108/IJPDLM-11-2020-0381](https://doi.org/10.1108/IJPDLM-11-2020-0381).
- El Amrani, S., Ibne Hossain, N.U., Karam, S., Jaradat, R., Nur, F., Hamilton, M.A. and Ma, J. (2021), "Modelling and assessing sustainability of a supply chain network leveraging multi Echelon Bayesian Network", *Journal of Cleaner Production*, Vol. 302, 126855, doi: [10.1016/j.jclepro.2021.126855](https://doi.org/10.1016/j.jclepro.2021.126855).
- Gargalo, C.L., Pons, E.P., Barbosa-Povoa, A.P. and Carvalho, A. (2021), "A lean approach to developing sustainable supply chains", *Sustainability (Switzerland)*, Vol. 13, pp. 4-6, doi: [10.3390/su13073714](https://doi.org/10.3390/su13073714).
- Gerasimova, K. (2017), *An Analysis of the Brundtland Commission's Our Common Future*, 1st ed., Macat Library.
- Gloet, M. and Samson, D. (2022), "Knowledge and innovation management to support supply chain innovation and sustainability practices", *Information Systems Management*, Vol. 39 No. 1, pp. 3-18, doi: [10.1080/10580530.2020.1818898](https://doi.org/10.1080/10580530.2020.1818898).
- Govindan, K., Khodaverdi, R. and Jafarian, A. (2013), "A fuzzy multi criteria approach for measuring sustainability performance of a supplier based on triple bottom line approach", *Journal of Cleaner Production*, Vol. 47, pp. 345-354, doi: [10.1016/j.jclepro.2012.04.014](https://doi.org/10.1016/j.jclepro.2012.04.014).
- Govindan, K., Shaw, M. and Majumdar, A. (2021), "Social sustainability tensions in multi-tier supply chain: a systematic literature review towards conceptual framework development", *Journal of Cleaner Production*, Vol. 279, 123075, doi: [10.1016/j.jclepro.2020.123075](https://doi.org/10.1016/j.jclepro.2020.123075).
- Gualandris, J., Klassen, R.D., Vachon, S. and Kalchschmidt, M. (2015), "Sustainable evaluation and verification in supply chains: aligning and leveraging accountability to stakeholders", *Journal of Operations Management*, Vol. 38, pp. 1-13, doi: [10.1016/j.jom.2015.06.002](https://doi.org/10.1016/j.jom.2015.06.002).
- Guo, R. and Wu, Z. (2022), "Social sustainable supply chain performance assessment using hybrid fuzzy-AHP-DEMATEL-VIKOR: a case study in manufacturing enterprises", *Environment, Development and Sustainability*, Vol. 25 No. 11, pp. 12273-12301, doi: [10.1007/s10668-022-02565-3](https://doi.org/10.1007/s10668-022-02565-3).
- Hanson, J. and Holt, D. (2014), "Sustainable food procurement in British and Irish zoos", *British Food Journal*, Vol. 116 No. 10, pp. 163-165, doi: [10.1108/BFJ-02-2013-0035](https://doi.org/10.1108/BFJ-02-2013-0035).
- Haroon, S., Wasif, M., Khalid, R. and Khalidi, S. (2021), "Supply chain practitioners' perception on sustainability: an empirical study", *Sustainability (Switzerland)*, Vol. 13 No. 17, pp. 1-16, doi: [10.3390/su13179872](https://doi.org/10.3390/su13179872).
- Hasle, P. and Limborg, H.J. (2006), "A review of the literature on preventive occupational health and safety activities in small enterprises", *Industrial Health*, Vol. 44 No. 1, pp. 6-12, doi: [10.2486/indhealth.44.6](https://doi.org/10.2486/indhealth.44.6).

- Hussain, M. and Al-Aomar, R. (2018), "A model for assessing the impact of sustainable supplier selection on the performance of service supply chains", *International Journal of Sustainable Engineering*, Vol. 11 No. 6, pp. 366-381, doi: [10.1080/19397038.2017.1414898](https://doi.org/10.1080/19397038.2017.1414898).
- Hutchins, M.J. and Sutherland, J.W. (2008), "An exploration of measures of social sustainability and their application to supply chain decisions", *Journal of Cleaner Production*, Vol. 16 No. 15, pp. 1688-1698, doi: [10.1016/j.jclepro.2008.06.001](https://doi.org/10.1016/j.jclepro.2008.06.001).
- Kauppi, K. and Hannibal, C. (2017), "Institutional pressures and sustainability assessment in supply chains", *Supply Chain Management*, Vol. 22 No. 5, pp. 458-472, doi: [10.1108/SCM-01-2017-0004](https://doi.org/10.1108/SCM-01-2017-0004).
- Kraus, S., Breier, M., Lim, W.M., Dabić, M., Kumar, S., Kanbach, D., Mukherjee, D., Corvello, V., Piñeiro-Chousa, J., Liguori, E., Palacios-Marqués, D., Schiavone, F., Ferraris, A., Fernandes, C. and Ferreira, J.J. (2022), "Literature reviews as independent studies: guidelines for academic practice", *Review of Managerial Science*, Vol. 16 No. 8, pp. 2577-2595, doi: [10.1007/s11846-022-00588-8](https://doi.org/10.1007/s11846-022-00588-8).
- Lii, P. and Kuo, F.-I. (2016), "Innovation-oriented supply chain integration for combined competitiveness and firm performance", *International Journal of Production Economics*, Vol. 174, pp. 142-155, doi: [10.1016/j.ijpe.2016.01.018](https://doi.org/10.1016/j.ijpe.2016.01.018).
- Mani, V., Agarwal, R., Gunasekaran, A., Papadopoulos, T., Dubey, R. and Childe, S.J. (2016), "Social sustainability in the supply chain: construct development and measurement validation", *Ecological Indicators*, Vol. 71, pp. 270-279, doi: [10.1016/j.ecolind.2016.07.007](https://doi.org/10.1016/j.ecolind.2016.07.007).
- Mani, V., Gunasekaran, A. and Delgado, C. (2018), "Enhancing supply chain performance through supplier social sustainability: an emerging economy perspective", *International Journal of Production Economics*, Vol. 195, pp. 259-272, doi: [10.1016/j.ijpe.2017.10.025](https://doi.org/10.1016/j.ijpe.2017.10.025).
- Marshall, D., McCarthy, L., Heavey, C. and McGrath, P. (2015), "Environmental and social supply chain management sustainability practices: construct development and measurement", *Production Planning and Control*, Vol. 26 No. 8, pp. 673-690, doi: [10.1080/09537287.2014.963726](https://doi.org/10.1080/09537287.2014.963726).
- Mastos, T., Gkotzamani, K. and Kafetzopoulos, D. (2022), "Development and validation of a measurement instrument for sustainability in food supply chains", *Sustainability (Switzerland)*, Vol. 14 No. 9, p. 5203, doi: [10.3390/su14095203](https://doi.org/10.3390/su14095203).
- McWilliams, A., Siegel, D.S. and Wright, P.M. (2006), "Corporate social responsibility: strategic implications", *Journal of Management Studies*, Vol. 43, pp. 1-18, doi: [10.1111/j.1467-6486.2006.00580.x](https://doi.org/10.1111/j.1467-6486.2006.00580.x).
- Morais, D.O.C. and Silvestre, B.S. (2018), "Advancing social sustainability in supply chain management: lessons from multiple case studies in an emerging economy", *Journal of Cleaner Production*, Vol. 199, pp. 222-235, doi: [10.1016/j.jclepro.2018.07.097](https://doi.org/10.1016/j.jclepro.2018.07.097).
- Mulej, M., Hrast, A. and Ženko, Z. (2012), "An information-based view at the communication from the commission to the european parliament, the council, the european economic and social committee and the committee of the regions: a renewed eu strategy 2011-2014 for the corporate social responsibility", *IDIMT 2012 - ICT Support for Complex Systems, 20th Interdisciplinary Information Management Talks*, Vol. 38, pp. 231-241.
- Nakamba, C.C., Chan, P.W. and Sharmina, M. (2017), "How does social sustainability feature in studies of supply chain management? A review and research agenda", *Supply Chain Management: An International Journal*, Vol. 22 No. 6, pp. 522-541, doi: [10.1108/SCM-12-2016-0436](https://doi.org/10.1108/SCM-12-2016-0436).
- Narimissa, O., Kangarani-Farahani, A. and Molla-Alizadeh-Zavardehi, S. (2020a), "Evaluation of sustainable supply chain management performance: indicators", *Sustainable Development*, Vol. 28 No. 1, pp. 118-131, doi: [10.1002/sd.1976](https://doi.org/10.1002/sd.1976).
- Narimissa, O., Kangarani-Farahani, A. and Molla-Alizadeh-Zavardehi, S. (2020b), "Evaluation of sustainable supply chain management performance: dimensions and aspects", *Sustainable Development*, Vol. 28, pp. 1-12, doi: [10.1002/sd.1959](https://doi.org/10.1002/sd.1959).
- Ortas, E., Moneva, J.M. and Álvarez, I. (2014), "Sustainable supply chain and company performance: a global examination", *Supply Chain Management*, Vol. 19 No. 3, pp. 332-350, doi: [10.1108/SCM-12-2013-0444](https://doi.org/10.1108/SCM-12-2013-0444).



- Pishvaei, M.S., Razmi, J. and Torabi, S.A. (2012), "Robust possibilistic programming for socially responsible supply chain network design: a new approach", *Fuzzy Sets and Systems*, Vol. 206, pp. 1-20, doi: [10.1016/j.fss.2012.04.010](https://doi.org/10.1016/j.fss.2012.04.010).
- Pohlmann, C.R., Scavarda, A.J., Alves, M.B. and Korzenowski, A.L. (2020), "The role of the focal company in sustainable development goals: a Brazilian food poultry supply chain case study", *Journal of Cleaner Production*, Vol. 245, 118798, doi: [10.1016/j.jclepro.2019.118798](https://doi.org/10.1016/j.jclepro.2019.118798).
- Popovic, T., Barbosa-Póvoa, A., Kraslawski, A. and Carvalho, A. (2018), "Quantitative indicators for social sustainability assessment of supply chains", *Journal of Cleaner Production*, Vol. 180, pp. 748-768, doi: [10.1016/j.jclepro.2018.01.142](https://doi.org/10.1016/j.jclepro.2018.01.142).
- Rajesh, R. (2022), "Sustainability performance predictions in supply chains: grey and rough set theoretical approaches", *Annals of Operations Research*, Vol. 310 No. 1, pp. 171-200, doi: [10.1007/s10479-020-03835-x](https://doi.org/10.1007/s10479-020-03835-x).
- Sarkis, J. and Dhavale, D.G. (2015), "Supplier selection for sustainable operations: a triple-bottom-line approach using a Bayesian framework", *International Journal of Production Economics*, Vol. 166, pp. 177-191, doi: [10.1016/j.ijpe.2014.11.007](https://doi.org/10.1016/j.ijpe.2014.11.007).
- Sarkis, J., Helms, M.M. and Hervani, A.A. (2010), "Reverse logistics and social sustainability", *Corporate Social Responsibility and Environmental Management*, Vol. 17 No. 6, pp. 337-354, doi: [10.1002/csr.220](https://doi.org/10.1002/csr.220).
- Silvestre, B.S. and Țircă, D.M. (2019), "Innovations for sustainable development: moving toward a sustainable future", *Journal of Cleaner Production*, Vol. 208, pp. 325-332, doi: [10.1016/j.jclepro.2018.09.244](https://doi.org/10.1016/j.jclepro.2018.09.244).
- Sodhi, M.S. and Tang, C.S. (2018), "Corporate social sustainability in supply chains: a thematic analysis of the literature", *International Journal of Production Research*, Vol. 56 Nos 1-2, pp. 882-901, doi: [10.1080/00207543.2017.1388934](https://doi.org/10.1080/00207543.2017.1388934).
- Thomas, A., Scandurra, G. and Carfora, A. (2022), "Adoption of green innovations by SMEs: an investigation about the influence of stakeholders", *European Journal of Innovation Management*, Vol. 25 No. 6, pp. 44-63, doi: [10.1108/EJIM-07-2020-0292](https://doi.org/10.1108/EJIM-07-2020-0292).
- Tipu, S.A.A., Fantazy, K. and Kumar, V. (2019), "An empirical examination of the effects of the attributes of supply chain openness on organizational performance", *Benchmarking*, Vol. 26 No. 3, pp. 788-814, doi: [10.1108/BJJ-09-2017-0259](https://doi.org/10.1108/BJJ-09-2017-0259).
- van Veen-Dirks, P.M.G. and Verdaasdonk, P.J.A. (2009), "The dynamic relation between management control and governance structure in a supply chain context", *Supply Chain Management*, Vol. 14 No. 6, pp. 466-478, doi: [10.1108/13598540910995237](https://doi.org/10.1108/13598540910995237).
- Varsei, M., Soosay, C., Fahimnia, B. and Sarkis, J. (2014), "Framing sustainability performance of supply chains with multidimensional indicators", *Supply Chain Management*, Vol. 19 No. 3, pp. 242-257, doi: [10.1108/SCM-12-2013-0436](https://doi.org/10.1108/SCM-12-2013-0436).
- Vrontis, D. and Christofi, M. (2021), "R&D internationalization and innovation: a systematic review, integrative framework and future research directions", *Journal of Business Research*, Vol. 128, pp. 812-823, doi: [10.1016/j.jbusres.2019.03.031](https://doi.org/10.1016/j.jbusres.2019.03.031).
- Wei, G., Zhou, L. and Bary, B. (2022), "Operational decision and sustainability of green agricultural supply chain with consumer-oriented altruism", *Sustainability (Switzerland)*, Vol. 14 No. 19, pp. 1-25, doi: [10.3390/su141912210](https://doi.org/10.3390/su141912210).
- Xu, M., Cui, Y., Hu, M., Xu, X., Zhang, Z., Liang, S. and Qu, S. (2019), "Supply chain sustainability risk and assessment", *Journal of Cleaner Production*, Vol. 225, pp. 857-867, doi: [10.1016/j.jclepro.2019.03.307](https://doi.org/10.1016/j.jclepro.2019.03.307).
- Yakovleva, N., Sarkis, J. and Sloan, T. (2012), "Sustainable benchmarking of supply chains: the case of the food industry", *International Journal of Production Research*, Vol. 50 No. 5, pp. 1297-1317, doi: [10.1080/00207543.2011.571926](https://doi.org/10.1080/00207543.2011.571926).



**Appendix**  
**Top 20% journals**

- (1) Annals of operations research
- (2) Benchmarking an international journal
- (3) British food journal
- (4) Business strategy and the environment
- (5) Clean technologies and environmental policy
- (6) Computers industrial engineering
- (7) Computers operations research
- (8) Corporate social responsibility and environmental management
- (9) Decision sciences
- (10) Ecological indicators
- (11) Environment development and sustainability
- (12) European journal of operational research
- (13) Expert systems with applications
- (14) Fuzzy sets and systems
- (15) Human relations
- (16) International journal of human resource management
- (17) International journal of contemporary hospitality management
- (18) International journal of life cycle assessment
- (19) International journal of logistics management
- (20) International journal of management reviews
- (21) International journal of operations production management
- (22) International journal of physical distribution logistics management
- (23) International journal of production economics
- (24) International journal of production research
- (25) International journal of productivity and performance management
- (26) International journal of sustainable engineering
- (27) International marketing review
- (28) Journal of business ethics
- (29) Journal of business logistics
- (30) Journal of cleaner production
- (31) Journal of industrial ecology
- (32) Journal of intelligent manufacturing

- (33) Journal of manufacturing technology management
- (34) Journal of operations management
- (35) Management research review
- (36) Production and operations management
- (37) Production planning control
- (38) Research in transportation business and management
- (39) Resources conservation and recycling
- (40) Supply chain management an international journal
- (41) Sustainable cities and society
- (42) Sustainability
- (43) Sustainable development
- (44) Sustainable production and consumption
- (45) Technological forecasting and social change

**Source(s):** Appendix created by authors

**Corresponding author**

Gabriele Zangara can be contacted at: [gabriele.zangara@unical.it](mailto:gabriele.zangara@unical.it)

---

For instructions on how to order reprints of this article, please visit our website:

[www.emeraldgroupublishing.com/licensing/reprints.htm](http://www.emeraldgroupublishing.com/licensing/reprints.htm)

Or contact us for further details: [permissions@emeraldinsight.com](mailto:permissions@emeraldinsight.com)