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Environmental dimension in sustainable supply chain management: Framework and literature review

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ABSTRACT

The purpose of this study is to examine a sample of research works in order to highlight the existing gaps in the literature related to the environmental focus in sustainable supply chain management. Furthermore, the results obtained also provide researchers and practitioners with an integrative framework that helps easily fill lacks according to their area of study.

1. Introduction

Until now, the literature discussing sustainable supply chain management (SSCM) has not drawn a specific study for the environmental focus yet, when it comes to the triple bottom line, the environmental dimension is simply acting a fundamental role in dealing with the whole SSCM. Moreover, literature has not claimed that the environmental dimension represents a set of practices and approaches to be implemented and developed to cover all the dimension, lots of researchers investigate the environmental side in SSCM by focusing solely on improving performance (Tseng et al., 2019; Govindan et al., 2019; Gómez-Luciano et al., 2018; Beske et al., 2014), or reducing risk (Deng et al., 2019; Valinejad and Rahmani, 2018; Giannakis and Papadopoulos, 2016; Foerstl et al., 2010), and sometimes assessing impacts (Beske et al., 2014; Denktas-Sakar and Karatas-Cetin, 2012), and suggesting to follow the international standards in terms (Lin et al., 2018; Seuring et al., 2019; Grimm et al., 2014), without making previously a preliminary and specific study for this dimension, that depends on the field of application, also on the studied part of the SC, which delimits the study and determines the crucial externs and interns factor to be considered. For instance, many studies admit that environmental focus is still regarded as for the main focus of the GSCM only (Luthra et al., 2015; 2016; Madani and Rasti-Barzoki, 2017), by attributing the word "green" to each part of the SC and linking environmental performance to green performance (Gómez-luciano et al., 2018). In summary, works on SSCM should be aligned with the triple bottom line as integral elements in dealing with an SSC, also to cover all the gaps by promoting more studies and analysis in this sense.

1.1. The aim of the research

Based on the review of a significant number of articles, this paper is intended to answer the following research question:

What is the environmental focus outlined in the papers dealing with the topic of SSCM and GSCM?

Our research motivation is to focus on the environmental dimension addressed in SSCM. Despite the considerable amount of research work, this topic is not sufficiently evolved (Lechler et al., 2019; Dubey et al., 2018), the objective of this research is to classify the set of research work according to criteria, to be presented as checklists, and to be used in the future as a database for researchers in this field. To meet the objective of this research, a set of research works is pinpointed, analyzed, and classified according to their field of application, the studied part of SC, context, target, and the environmental focus. Indeed, the main contributions of this work is to suggest an integrative framework, by proposing 12 relevant and

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persistent research gaps by section, as key factors to improve research in SSCM.

The contents of the following sections of this paper: Section 2 represents an overview of the SSCM, and then section 3 describes the research methodology. Section 4 discusses and analyzes the finding of this paper and gives a general framework of the environmental focus in SSCM, lastly, section 5 for the conclusion and some perspectives.

2. Overview of sustainable supply chain management

Over the last two decades, topics on sustainable supply chain management have been overstated in literature. And this, in light of the recently revealed world events, namely climate change, and technological evolution, in addition, these factors have explicitly contributed to the emphasis on the human factor, depending on economic factors. These three dimensions constitute the main axes of the SSCM. Among companies' relevant factors: Sustainability, hence the importance of considering both environmental and social factors in managing supply chain sustainability (Oelze et al., 2018).

Many researchers have attempted to define the SSCM from theoretical and technical insights, (Gupta and Palsule-Desai, 2011) define the SSCM as a set of management practices that include: Environmental impact, the entire value chain for each product, product life-cycle. (Ahi and Searcy, 2013) through this paper, a set of definitions of SSCM and GSCM has been analyzed in order to propose a new definition of SSCM: "An SSCM is the creation of a coordinating SC, through the voluntary integration through the 3 dimensions: Economic, environmental, and social, based on key inter-organizational business systems designed for effective and efficient management of the 3 flows, including the 3 activities of procurement, production, and distribution, with the aim to meet stakeholder requirements and improve over the short and long-term: Competitiveness, profitability, and resilience of the organization." This definition takes into account the triple bottom line of economic, environmental, and social considerations. Knowledge management is among the factors that play an interesting role, in the sense of improving performance in SSCM, considering all attributes and the 3 dimensions (Lim et al., 2017).

Hence, performance is targeted by lots of researchers as the main purpose in achieving SSCM, some of them relate performance to reverse logistics and product recovery (Tseng et al., 2019; Govindan et al., 2019; Lim et al., 2017), while others combine sustainability performance with SC practices and the relationship between enablers, attributes, and stakeholders (Das, 2018; Foo et al., 2018; Esfahbodi et al., 2017; Diabat et al., 2014). In addition, literature is divided into two specific categories (GSCM and SSCM) that ideally converge towards an ultimate and common goal: To minimize the environmental impact of an SC. Thus, the rest of this paper aims to give an integrative framework of the environmental focus after analyzing the background literature.

3. Research methodology

A literature review framework was addressed in our study, relying on the rigorous approach (Jabbour et al., 2019) which suggests an integrative framework dealing with multi-tier modeling in SSCM, the paper analyzed the relevant literature, and then classified papers, and finally, it gave a description of the research gaps. The targeted output of our research is to fill and identify the knowledge gaps by presenting and cumulating the finding of different research work summarized as a map and a taxonomy that would help researchers and practitioners in the future. The metadata presented in this paper addresses descriptive statistics of popular journals, a field of application, countries that contribute a paper in this field, and the studied part of the SC, etc. A similar process model to Seuring and Gold (2012) is adopted, following the steps presented in Fig. 1.

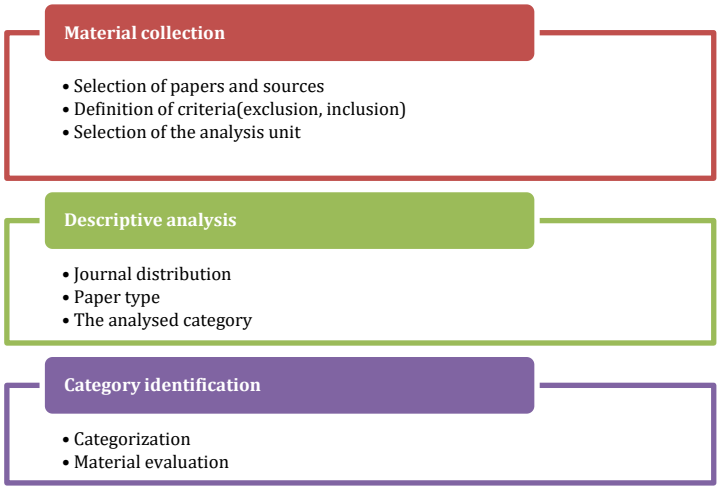

Fig. 1: The main steps of the research methodology

3.1. Material collection

For this study, publications are uniquely selected from the database the web of science since it has adopted by academicians among indexing high-quality content (Tseng et al., 2019). We focused our research on rigorous studies on only the English language and also impact factor journal. For instance, we used as a keyword, key those replies to our research question in the first paragraph. For a period, we delimited our research from (2008-2019), papers are selected according to each year, by screening and checking the adherence of the paper to the main topic, 2009 was excluded since no relevant paper, to our research, was found out this year. We used for our citation index the following linked keyword: SSC, SSCM, SCM, by using a combination of Booleans functions (such as: "SCM or SSCM"; "SCM and SSCM"), in both abstract and title from the main source of the type of article: Review article and research articles, and only English language paper are considered, also some relevant conference proceedings were taken into account. Metadata analysis was achieved by analyzing 132 papers derived objectively from the Web of Science database. Obviously, after screening titles and abstract first, then by removing duplicate and checking the full text, from 441 papers, only 132 papers dealing with SSCM were included. The result is presented in Fig. 2 each year.

3.2. Descriptive analysis

Papers constituting our research work are initially limited by year of publication. Search comprises those that have been published in 11 years (from 2008 to 2019 (May)) (Figs. 2 and 3). Thus, most of the papers are published in the sixth recent years about 86%, from 2014, 2018 was notably the highest number of research work (31 papers, of which 25 are used in Appendix A, Table A1 of the sample), noticed that 2019 is treated in the first half, so the number is constantly increasing, which can be explained by the ever-increasing climate change resulting from SC. As the dominated journal "Journal of cleaner production" is number one in publishing article in this domain from our sample (31 papers), followed by the International Journal of Production Economics (13 papers), hereafter, Fig. 4 represents the top 10 journals of our sample. Regarding countries, India (12 papers) is the dominated country of publication of scientific works on SSCM, followed by Germany (11 papers), UK (11 papers), then China (8 papers), and Taiwan (6 papers) (Fig. 5).

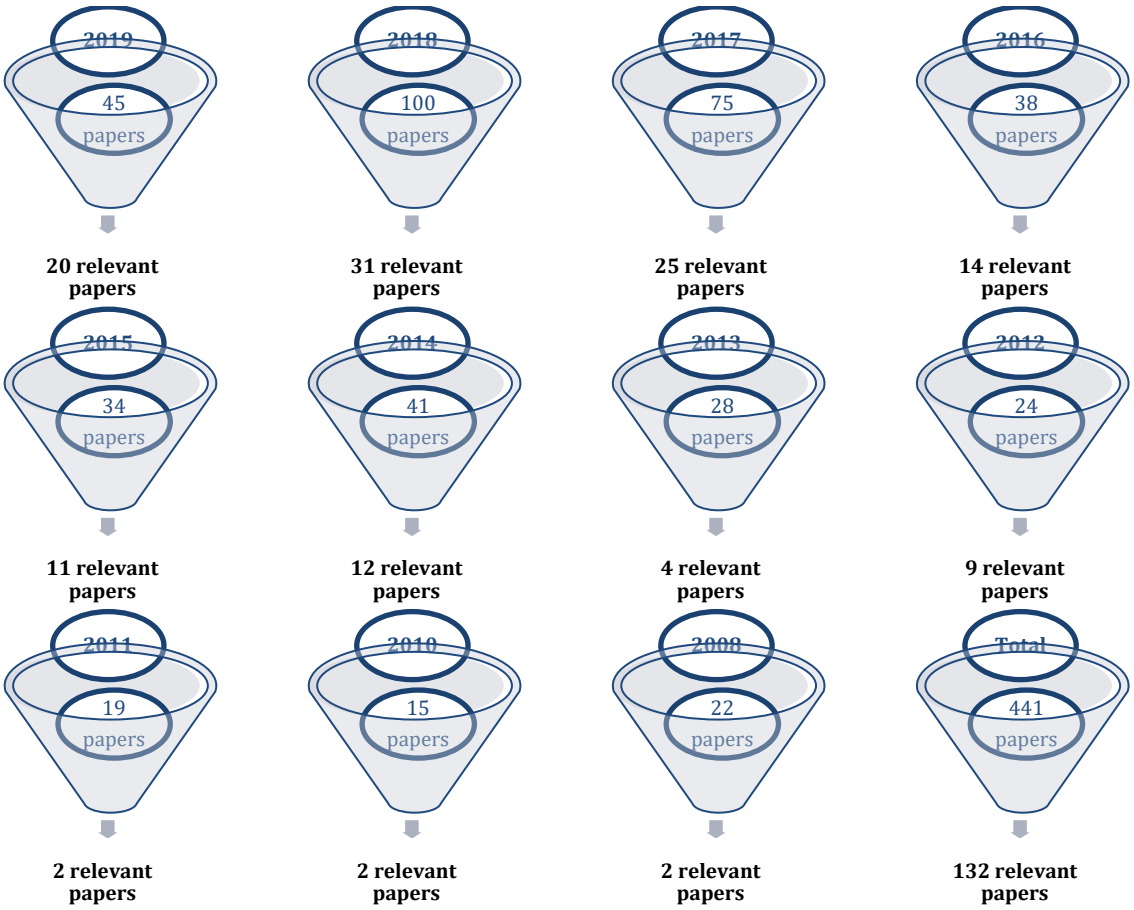

Fig. 2: Selection of literature review sample

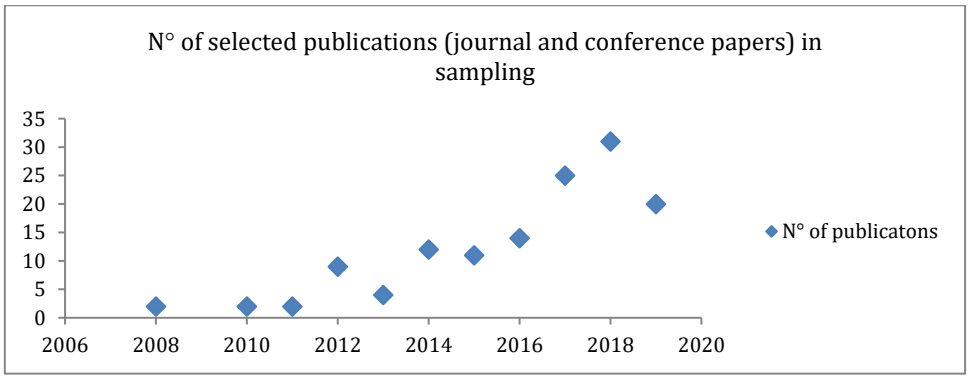

Fig. 3: Selected paper for the sampling

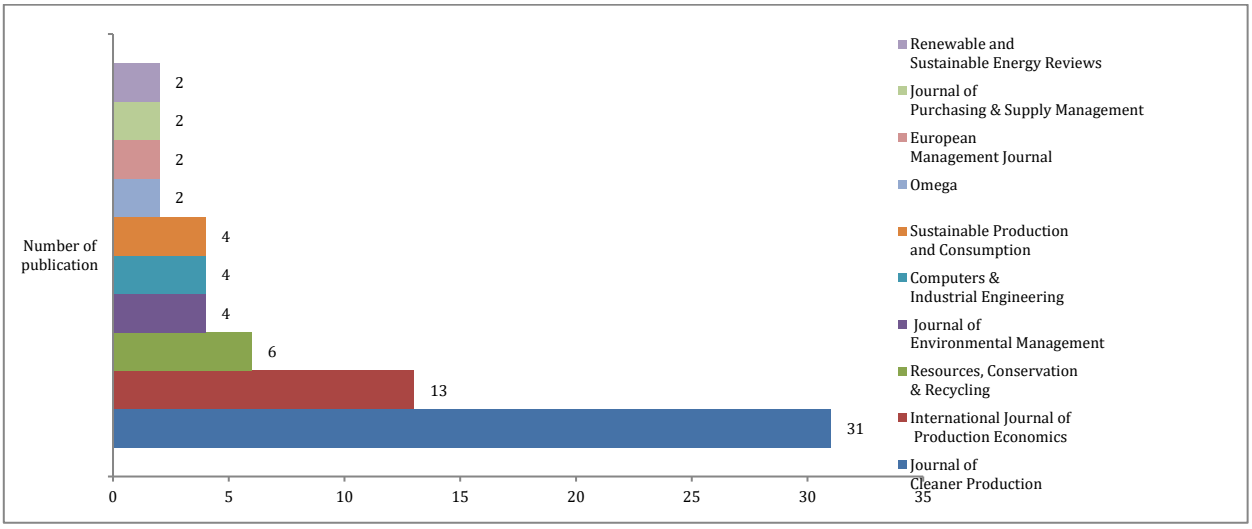

Fig. 4: Top 10 journals

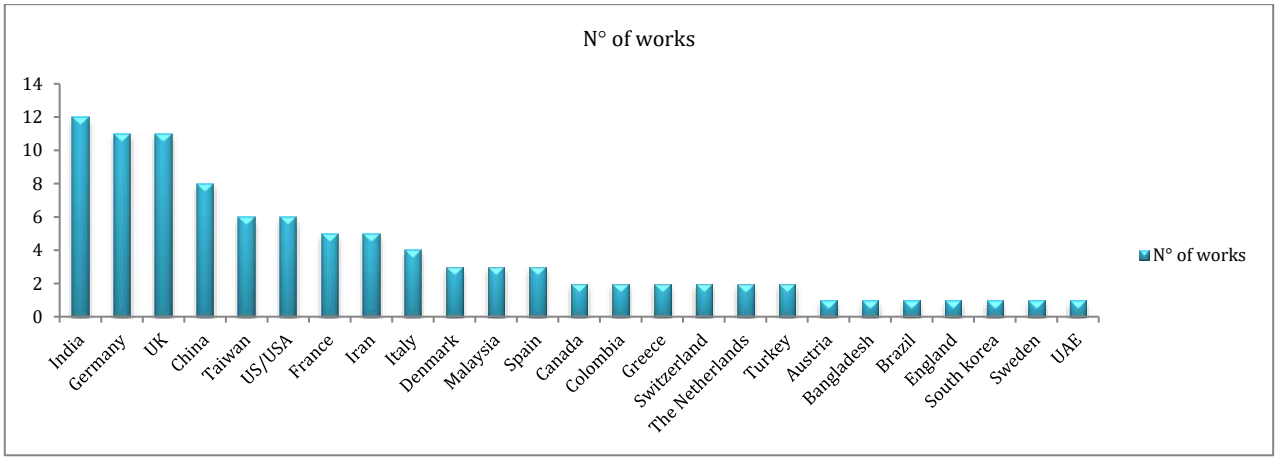

Fig. 5: Number of scientific works according to the country

3.3. Category identification

From 441 papers, we have classified 132 papers, which are relevant to our study, using filters (for each year) according to the keywords, also to related areas. From 132 papers, only 96 papers are selected as the sample of our research, and we used a table to classify them, although the other research works are also taken into consideration in the other sections. The categorical classification is done according to the categories (5 criteria (Fig. 6)) that best describe the purpose of this paper, namely:

- Field of application: The field of application is among the indicators that better describe a topic; it's selected in order to fill the lack of research in each area of study, also to highlight the more addressed one.
- The studied part of the SC: All the research works in this domain differ by the studied part of the SC, so it would be interesting to outline this criterion as well as to help researchers identifying some relevant papers for their research area.
- Context: As for "the context of the paper," four categories are adopted to categorize our sample: "Modeling," "framework," "review," "analysis"

since it appears that those categories are broadly consistent.

- Target: Every research work has a specific target; this category is selected to illustrate the purpose of each paper in terms of the environmental focus.
- Environmental focus: As the main purpose of our research, environmental focuses are identified from paper according to their objectives.

Furthermore, a detailed description of the four categories is addressed in the next section, with systematic analysis.

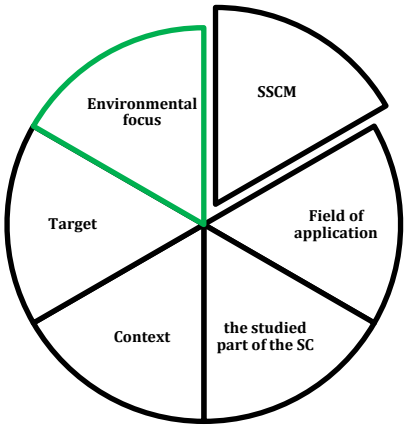

Fig. 6: The structure of the sample table

4. Result and discussion

This section is provided for the selected literature, papers are classified, as mentioned before, according to their field of application, the studied part of the SC, context, target, and the environmental focus in Appendix A, Table A1. A detailed description and analysis of the finding of this paper are addressed below, by classifying and drawing the gaps for each criterion, and then an integrative framework of the environmental focus is proposed.

4.1. Field of application

The topic of SSCM is addressed in many research papers, depending on the field of application. In addition, industrial SSCM is also studied in a broad way, some in the service field, wholesale; most of the work is basically registered in various industrial fields. After an analysis the entire sample, It's noticed that four fields are the most dominant (Fig. 7), namely: Food (18 papers) (Gómez-Luciano et al., 2018; Vargas et al., 2018; Accorsi et al., 2018; Beske et al., 2014; Bitzer et al., 2008; Formentini and Taticchi, 2016; Genovese et al., 2017; Gokarn and Kuthambalayan, 2019; Gold et al., 2013; Grimm et al., 2014; Hong et al., 2018; Lin et al., 2018; Liu et al., 2012; Seuring et al., 2019; Wu and Pagell, 2011; Zaid et al., 2018; Zhu et al., 2018), chemical (gas, oil, petroleum, biofuel/ biorefenery) (16 papers) (Foerstl et al., 2010; Genovese et al., 2017; Hong et al., 2018; Khodakarami et al., 2015; Zaid et al., 2018; Azadi et al., 2015; Raut et al., 2017; Gardas et al., 2019a; Rostamzadeh et al., 2018; Song et al., 2017; Ahmad et al., 2016; Sueyoshi and Wang, 2014; Ahmed and Sarkar, 2018; Crenna et al., 2018; Garofalo et al., 2015; Pérez et al., 2017), textile(8 papers) (Tseng et al., 2019; Diabat et al., 2014; Fallahpour et al., 2017; Giannakis and Papadopoulos, 2016; Hong et al., 2018; Lim et al., 2017; Liu et al., 2012; Tseng and Hung, 2014), automobile/ automotive (7 papers) (Oelze et al., 2018; Govindan et al., 2014; Liu et al., 2012; Luthra et al., 2016; Luthra and Mangla, 2018; Mathivathanan et al., 2018; Shibin et al., 2017) followed by fashion, and electronic industry(4papers for each one).

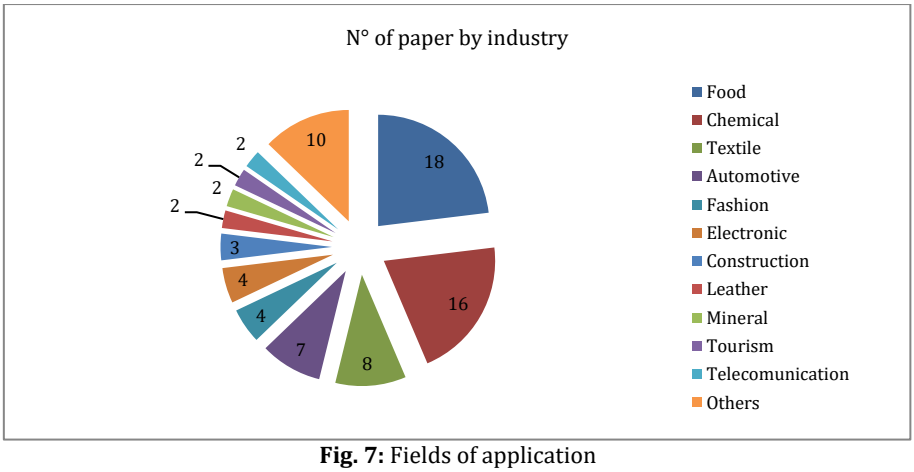

Fig. 7: Fields of application

The majority of research works focuses on industrial SC, yet the environmental impact is present everywhere (e. g. Hotel' SC). As well as the number of works that have been carried out in the case of the transport SC (air, road, and sea) is quite low, despite the significant number of environmental constraints resulting from this SC.

Gap 1: Researchers must work collaboratively to standardize the environmental impact of the same field of SC, based on environmental analysis.

Gap 2: To highlight the environmental impact, it is necessary to work on SSCM in other fields that contribute to environmental degradation (Climate change).

4.2. The studied part of the SC

The existing research works are very diversified in terms of the studied part of the SC, and some works deal with the whole part of SC, others focus on some specific parts such: Logistic (Ahmad et al., 2016), procurement (Esfahbodi et al., 2017), life cycle (Crenna et al., 2018), decision-making (Zhu et al., 2018), partnership (Bitzer et al., 2008), location-allocation (Ahmed and Sarkar, 2018), attributes (Govindan et al., 2019), focal companies (Hou et al., 2019), strategies (Wu and Pagell, 2011), and etc. Overall, the first range of the studied part is dedicated to "suppliers" (27 papers) (Hou et al., 2019; Lechler et al., 2019; Papetti et al. 2019; Valinejad and Rahmani, 2018; Jia et al., 2019; Gómez-Luciano et al., 2018; Lin et al., 2018; Sauer and Seuring, 2019; Gokarn and Kuthambalayan, 2019; Seuring et al., 2019; Luthra and Mangla, 2018; Dubey et al., 2018; Sauer and Seuring, 2017; Luthra et al., 2016; Song et al., 2017; Ahmad et al., 2016; Su et al., 2016; Azadi et al., 2015; Khodakarami et al., 2015; Van Hoof and Thiell, 2014; Turker and Altuntas, 2014; Tseng and Hung, 2014; Lin and Tseng, 2016; Grimm et al., 2014; Ageron et al., 2012; Foerstl et al., 2010), followed by stakeholder (18papers) (Govindan et al., 2019; Tseng et al., 2019; Mathivathanan et al., 2018; Valinejad and Rahmani, 2018; Jin et al., 2018; Seuring et al., 2019; Sauer and Seuring, 2017; Gold and Schleper, 2017; Esfahbodi et al., 2017; Mariadoss et al., 2016; Reefke and Sundaram, 2017; Govindan et al., 2016; Formentini and Taticchi, 2016; Luthra et al., 2016; Luthra et al., 2015; Frostenson and Prenkert, 2015; Denktas-Sakar and Karatas-Cetin, 2012; Liu et al., 2012) and "practices" (15papers) (Scavarda et al., 2019; Zaid et al., 2018; Mathivathanan et al., 2018; Vargas et al., 2018; Moktadir et al., 2018; Luthra and Mangla, 2018; Hong et al., 2018; Raut et al., 2017; Mariadoss et al., 2016; Zeng et al., 2017; Luthra et al., 2016; Zhang et al., 2018; Gualandris and Kalchschmidt, 2014; Govindan et al., 2014, Sigala, 2008). This high percentage might be the source of the panoply of problems due to SC's relationship with its suppliers and stakeholders in terms of environmental constraints, also to its practices. Fig. 8 illustrates the classification of the most treated part per order.

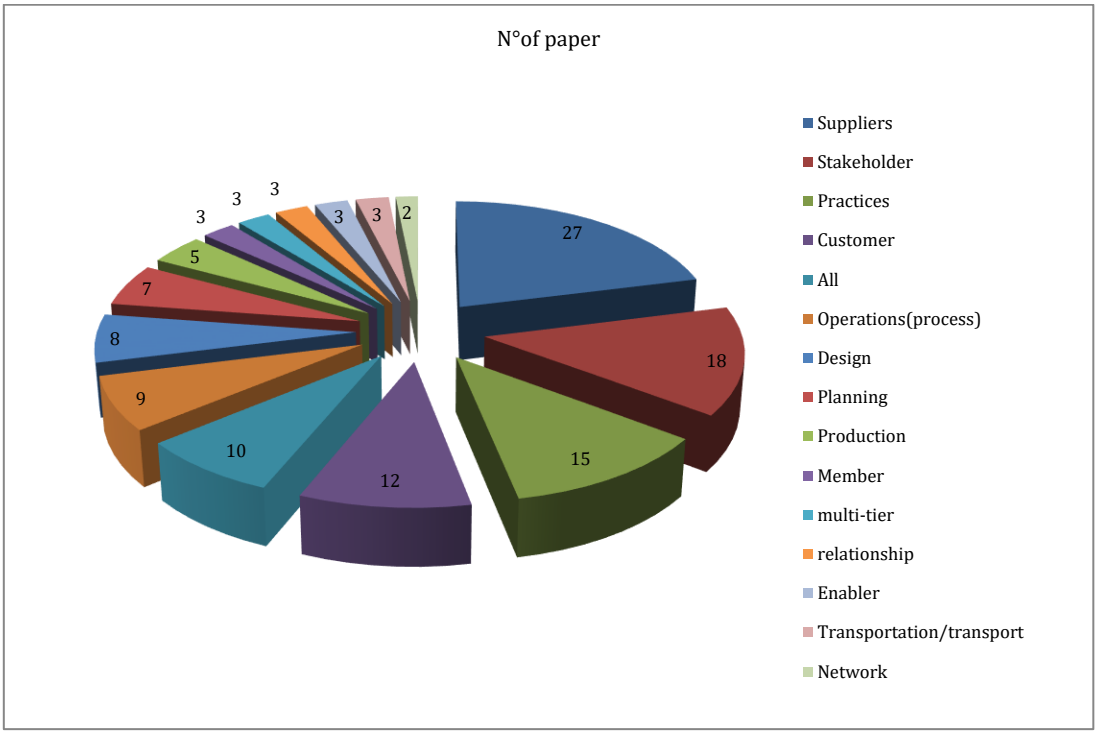

Fig. 8: Target of the set of papers

Gap 3: To carry out a specific study (research work) on the sustainability of SC in relation to its suppliers in terms of environmental performance.
Gap 4: To understand the relationship between SC practices and sustainability (environmental line).
Gap 5: To conduct more research and studies on other parts of the SC in terms of sustainability (environmental line).

4.3. Context

Topics on SSCM are addressed in a varied way regarding the target of research work, also depending on the studied part of the SC. After analyzing the sample table, it is noticed that most of the work tends to model (58 papers), whether to optimize or evaluate or to identify a part or all of the SC, followed by the analysis context (53 papers), as there are some papers that combine two or three or even four contexts in the same paper. Particularly a set of papers cure the method of the survey to analyze the SSCM of a number of enterprises or a given sample, and in some case giving a framework to the SSCM. Table 1 summarizes all the papers of the sample according to their context.

Gap 6: To carry out a complete work that covers the four contexts (review, modeling, analysis, and then framework) in SSCM.

Gap 7: To make a difference between papers treating SSC or GSC: Management and modeling.

Table 1: Context of the papers' sample

Modeling	Framework	Review	Analysis
Mejías et al., 2019; Gardas et al., 2019a; Gardas et al., 2019b; Hou et al., 2019; Govindan et al., 2019; Gong et al., 2019; Tseng et al., 2019; Deng et al., 2019; Zaid et al., 2018; Das, 2018; Mathivathanan et al., 2018; Gómez-Luciano et al., 2018; Reefke and Sundaram, 2018; Vargas et al., 2018; Lin et al., 2018; Jin et al., 2018; Moktadir et al., 2018; Foo et al., 2018; Zhu et al., 2018; Rostamzadeh et al., 2018; Gokarn and Kuthambalayan, 2019; Luthra and Mangla, 2018; Dubey et al., 2018; Ahmed and Sarkar, 2018; Fallahpour et al., 2017; Genovese et al., 2017; Crenna et al., 2018; Hong et al., 2018; Shibin et al., 2017; Lim et al., 2017; Raut et al., 2017; Dubey et al., 2017; Madani and Rasti-Barzoki, 2017; Esfahbodi et al., 2017; Mariadoss et al., 2016; Zeng et al., 2017; Zhang et al., 2018; Azadi et al., 2015; Hussain et al., 2016; Khodakarami et al., 2015; Luthra et al., 2015; Ji et al., 2016; Xu and Gursoy, 2015; Diabat et al., 2014; Van Hoof and Thiell, 2014; Hsueh, 2015; Chardine-Baumann and Botta-Genoulaz, 2014; Gualandris and Kalchschmidt, 2014; Govindan et al., 2014; Brandenburg et al., 2014; Tseng and Hung, 2014; Sueyoshi and Wang, 2014; Lin and Tseng, 2016; Gold et al., 2013; Nagurney and Yu, 2012; Ageron et al., 2012; Liu et al., 2012; Sigala, 2008	Martín-Gómez et al., 2019; Scavarda et al., 2019; Gardas et al., 2019b; Govindan et al., 2019; Accorsi et al., 2018; Papetti et al., 2019; Bastas and Liyanage, 2019; Jabbour et al., 2019; Mathivathanan et al., 2018; Valinejad and Rahmani, 2018; Jia et al., 2019; Moktadir et al., 2018; Oelze et al., 2018; Rostamzadeh et al., 2018; Gokarn and Kuthambalayan, 2019; Seuring et al., 2019; Dubey et al., 2018; Genovese et al., 2017; Stindt, 2017; Crenna et al., 2018; Shibin et al., 2017; Dubey et al., 2017; Mariadoss et al., 2016; Bechtsis et al., 2017; Zeng et al., 2017; Giannakis and Papadopoulos, 2016; Luthra et al., 2016; Tseng et al., 2018; Song et al., 2017; Hussain et al., 2016; Turker and Altuntas, 2014; Chardine-Baumann and Botta-Genoulaz, 2014; Beske et al., 2014; Ageron et al., 2012; Denktas-Sakar and Karatas-Cetin, 2012; Winkler, 2011; Foerstl et al., 2010; Bitzer et al., 2008; Sigala, 2008	Jabbour et al., 2019; Reefke and Sundaram, 2018; Pérez et al., 2017; Stindt, 2017; Sauer and Seuring, 2017; Mariadoss et al., 2016; Bechtsis et al., 2017; Reefke and Sundaram, 2017; Govindan et al., 2016; Giannakis and Papadopoulos, 2016; Luthra et al., 2015; Beske et al., 2014; Sueyoshi and Wang, 2014; Grimm et al., 2014; Ageron et al., 2012; Denktas-Sakar and Karatas-Cetin, 2012	Mejías et al., 2019; Scavarda et al., 2019; Gong et al., 2019; Lechler et al., 2019; Bastas and Liyanage, 2019; Das, 2018; Valinejad and Rahmani, 2018; Gómez-Luciano et al., 2018; Vargas et al., 2018; Jin et al., 2018; Moktadir et al., 2018; Sauer and Seuring, 2019; Foo et al., 2018; Zhu et al., 2018; Gokarn and Kuthambalayan, 2019; Seuring et al., 2019; Luthra and Mangla, 2018; Ahmed and Sarkar, 2018; Das, 2017; Stindt, 2017; Hong et al., 2018; Lim et al., 2017; Sauer and Seuring, 2017; Dubey et al., 2017; Gold and Schleper, 2017; Esfahbodi et al., 2017; Reefke and Sundaram, 2017; Zeng et al., 2017; Formentini and Taticchi, 2016; Giannakis and Papadopoulos, 2016; Luthra et al., 2016; Song et al., 2017; Zhang et al., 2018; Ahmad et al., 2016; Su et al., 2016; Garofalo et al., 2015; Luthra et al., 2015; Ji et al., 2016; Xu and Gursoy, 2015; Diabat et al., 2014; Hsueh, 2015; Turker and Altuntas, 2014; Gualandris and Kalchschmidt, 2014; Govindan et al., 2014; Frostenson and Prenkert, 2015; Brandenburg et al., 2014; Beske et al., 2014; Lin and Tseng, 2016; Grimm et al., 2014; Gold et al., 2013; Ageron et al., 2012; Wu and Pagell, 2011; Bitzer et al., 2008

4.4. Target

SSCM include a wide range of area of study, based on the sample the object of the majority of paper is to study risk management in SSCM (Deng et al., 2019; Rostamzadeh et al., 2018; Giannakis and Papadopoulos, 2016; Foerstl et al., 2010) factors influence SSCM(development, implementation, evaluation, integration), sustainability of SCM via suppliers, sustainability in SCM through different part, and SSCM performance/effectiveness (Gardas et al., 2019b; Govindan et al., 2019; Tseng et al., 2019; Das, 2018; Gómez-Luciano et al., 2018; Dubey et al., 2018; Genovese et al., 2017) in other terms, there are some works that focus their study on: SSCM (policies, strategies, decision making, practices, innovation), while others in relating SSCM to different factors such: Customer awareness (Gong et al., 2019); design (Pérez et al., 2017; Bechtsis et al., 2017; Tseng et al., 2018) planning (Bechtsis et al., 2017; Reefke and Sundaram, 2017), enablers (Diabat et al., 2014), stakeholders (Gold and Schleper, 2017; Esfahbodi et al., 2017), governance (Madani and Rasti-Barzoki, 2017; Esfahbodi et al., 2017; Govindan et al., 2016), and others tried through their research works to highlight the topic on leanness and greenness: Relation between SSCM and lean /GSCM, Green marketing (Liu et al., 2012) green HR (Zaid et al., 2018) management etc.

Gap 8: To promote more research that gathers jointly the 3 dimensions, namely: Lean, green, sustainable, of the SCM.
Gap 9: To explore the recent works in order to reach another relevant target in SSCM.

4.5. Environmental focus

The purpose of this paper is to highlight the environmental focus in SSCM; through the set of the identified papers, we tried to visualize the environmental part of the triple bottom line of the SSCM. The most common terms used in research work are Environmental: Criteria, dimension, orientation, factors, aspect, impacts, risk, assessment, performance, and sustainability. Furthermore, in terms of performance, it's noticed that works are divided into two categories:

Environmental performance, and green performance, perhaps this difference is one of the reasons that have created the famous term "green supply chain"? We derived a set of environmental focus, as shown in Fig. 9 that classifies them into two main categories risk/issues, and performance:

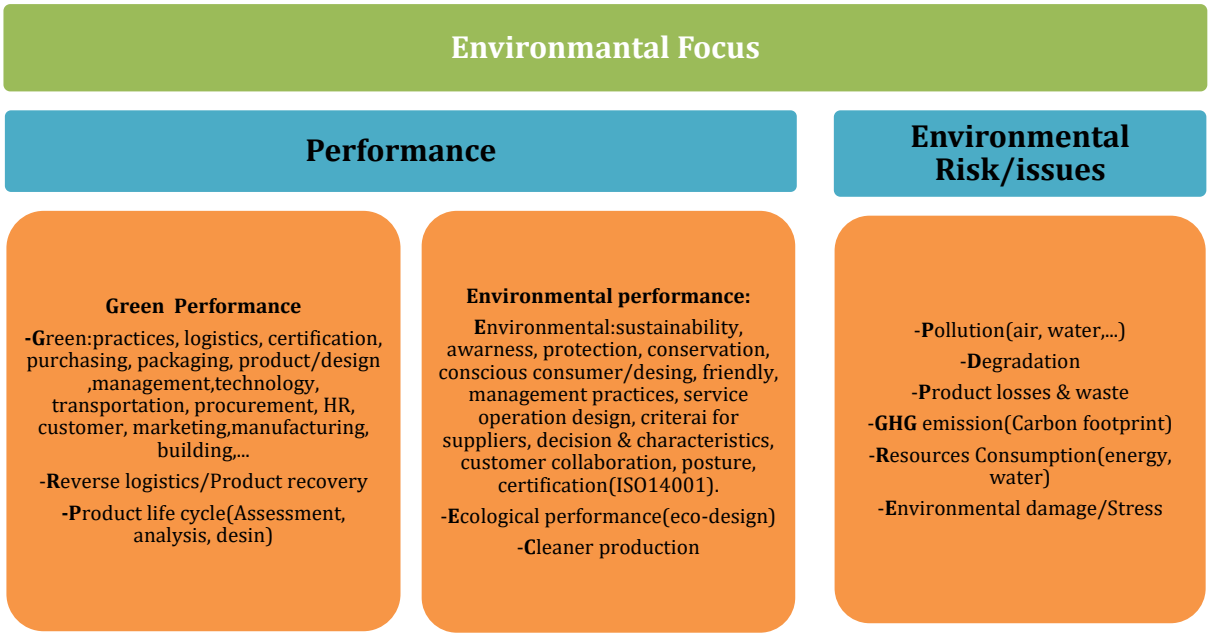

Fig.9: Environmental focus

It observed that most research work typically evoked the environmental dimension in SSCM (performance, issues, risk), and sometimes considering only some environmental constraints like GHG emission (CO2 emission), pollution, and reduction of waste, etc.

Gap 10: To carry out more research in the environmental dimension based on the triple bottom line of SSCM research work and to include the new features.
Gap 11: To include all environmental constraints in the environmental focus of SSCM based environmental analysis studies.
Gap 12: To study and link environmental focus in GSCM and SSCM research works.

4.6. Framework

The literature analysis shows a panoply of diverse way to discuss or treat topics of SSCM, the established framework is the first to be proposed in the literature in terms of criteria, gaps and barriers that tackle both GSCM and SSCM, also it's useful for future research works as key insights and literature background in this field. This framework presents the set of gaps in each section, and the related barriers, as shown below in Fig. 10.

The environmental focus is related to dispersed and non-similar paper targets, each research work focuses on a particular target, by selecting one or two contexts regarding the feasibility of the used tools or methods, independence to the studied part of the supply chain that is imposed by internal and external constraints, it is also limited by the field of application. The field of application derives from the environmental focus and may also depend on the information sharing, because, as discussed in section 4 and filled in gap 2, not all areas of application are covered in the literature in terms of environmental focus. The set of gaps is presented in Table 2, according to some references of the sample.

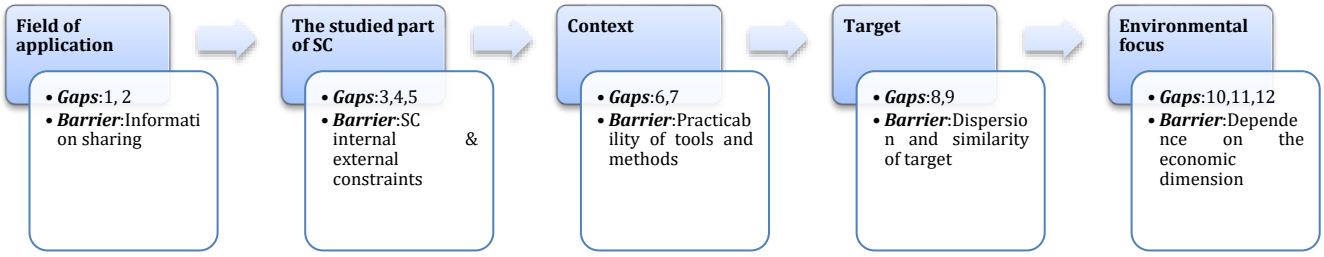

Fig. 10: General framework of the environmental focus in SSCM

Table 2: Summary of gaps

Category	Gaps	Definition	Barriers	Reference sample
Field of application	1	➢ Researchers must work collaboratively to standardize the environmental impact of the same field of the SC, based on environmental analysis.	➢ Information sharing	Gómez-Luciano et al., 2018; Vargas et al., 2018; Foerstl et al., 2010; Genovese et al., 2017; Tseng et al., 2019; Diabat et al., 2014; Oelze et al., 2018; Govindan et al., 2014
	2	➢ To highlight the environmental impact, it is necessary to work on SSCM in other fields that contribute to environmental degradation (Climate change).		
The studied part of the SC	3	➢ To carry out a specific study (research work) on the sustainability of SC in relation to its suppliers in terms of environmental performance.	➢ SC internal and external constraints	
	4	➢ To understand the relationship between SC practices and sustainability (environmental line).		Lechler et al., 2019; Papetti et al. 2019; Scavarda et al., 2019; Zaid et al., 2018; Hou et al., 2019
	5	➢ To conduct more research and studies on other parts of the SC in terms of sustainability (environmental line).	➢ Practicability of tools and methods	
Context	6	➢ To carry out a complete work that covers the four contexts (review, modeling, analysis, and then framework) in SSCM.		Lin et al., 2018; Jin et al., 2018; Jabbour et al. 2019; Mathivathanan et al., 2018; Govindan et al., 2016; Giannakis and Papadopoulos, 2016; Ahmed and Sarkar, 2018; Das, 2017
	7	➢ To make a difference between papers treating SSC or GSC: management and modeling.		
Target	8	➢ To promote more research that gathers jointly the 3 dimensions, namely: lean, green, sustainable, of the SCM.	➢ Dispersion and similarity of target	Deng et al., 2019; Rostamzadeh et al., 2018; Giannakis and Papadopoulos, 2016; Foerstl et al., 2010; Pérez et al., 2017; Bechtsis et al., 2017; Tseng et al., 2018; Reefke and Sundaram, 2017
	9	➢ To explore the recent works in order to reach other relevant targets in SSCM.		
Environmental focus	10	➢ To carry out more research in the environmental dimension based on the triple bottom line of SSCM research work and to include the new features.	➢ Dependence on the economic dimension	
	11	➢ To include all environmental constraints in the environmental focus of SSCM based environmental analysis studies.		Gong et al., 2019; Deng et al., 2019; Accorsi et al., 2018; Song et al., 2017; Liu et al., 2012
	12	➢ To study and link environmental focus in GSCM and SSCM research works.		

5. Conclusion

SSCM from a literal point of view is carried out in different ways, depending on the background or expectations of each researcher. Since it is a current subject linking two different concepts, namely SCM and sustainability, which were previously treated separately. In other words, the notion of sustainability is implemented as an essential criterion for an optimal SCM. Sustainability is, as known, involves together in the three dimensions: Economic, environmental, and social, except that practitioners of SCM always tend to give priority to the economic level. This dilemma recently has begun to reveal the importance of considering the triple bottom line, particularly the environmental dimension.

Hence, the environmental component is included in the SCM from several points of view; whether to improve the performance of the SC, minimize or optimize environmental impact, greening the SC, and even by following regulatory standards. The contribution of this paper highlights the environmental focus from a sample of different research works dealing with the SSCM. First of all, this study classified papers of the sample according to some criteria, such the field of application, targets; then in the basis of sample analysis, an integrative framework is suggested by proposing 12 relevant and persistent research gaps by section, as key factors to improve research in SSCM. This study mainly contributes to enhancing the environmental lack of SSCM in literature, which may help researchers and practitioners in the future.

6. Limitations

Despite the number of papers analyzed in this article, it is still not covering all the literature on this topic. So it turns necessary to state the limitations of this study as follows, to further enrich, and push forward research in terms of results:

- To do the same work on the others database (e.g., SCOPUS);
- To compare with more paper review and make an analysis;
- To involve changes in keywords in order to cover all the existing literature, (e.g., Combining “green” with “sustainable”);
- To add another criterion in the papers’ categorization.

Appendix A: The set of research works sample

Table A1: Table sample of research works

ID	Research work/country	Field of application	The studied part of the SC	Context				Target	Environmental focus
				Modeling	Framework	Review	Analysis		
1	(Martín-Gómez et al., 2019)/ Spain	Annual manufacturing of a family of products of urban furniture	All		■			The smart connected social metabolism integrated within the natural environment and oriented towards mitigation and reversal of the metabolic rift, in SSCM	product life cycle
2	(Mejías et al., 2019)/ Spain	Fast Fashion industry	Multi-tier	■			■	-sustainability in terms of relationships and practices developed upstream in SC -assessing the level of commitment with Code of Conduct perceive in suppliers,	Lack of environmental control of operations noted.
3	(Scavarda et al., 2019)/	Healthcare	Practices, materials		■		■	Innovative solution of the sustainability problems in health care SC.	Solid waste management
4	(Gardas et al., 2019a)/ India	(Industry) the reusable plastic packaging	All	■				Identification of the critical success factors of the SC	Reduction in packaging waste, GHG emissions, and energy consumption
5	(Gardas et al., 2019b) /India	Oil and gas industry	SC determinants	■	■			Identification of the influence of determinant factors in implementing SSCM practices on the Operational Business Performance	-Collaboration green logistics (forward and Reverse) -Green Purchasing and Production Management -Eco-friendly Design and Environmental Management
6	(Hou et al., 2019)/ China	Industry	Supplier and Focal companies	■				Product sustainability	Product green level
7	(Govindan et al., 2019)/ India	Electronics industry	Attributes and stakeholders	■	■			The performance attributes of the OEMs of the triple bottom line of sustainability	Reverse logistic Product recovery
8	(Gong et al., 2019)/ UK	Given sectors	Customer	■			■	-Customer Awareness -The factors that influence the development of SSCM	The environmental awareness of customer (environmental criteria (ISO 14000, energy consumption, etc.))
9	(Tseng et al., 2019)/ China	Textile industry	Stakeholders	■				Data-driven SSCM performance	Reverse logistic Product recovery
10	(Lechler et al., 2019)/Germany	Anonym companies	Suppliers				■	strategic alliances in the context of sustainable MSCM (multi-tier supply chain management)	-
11	(Deng et al., 2019)/ China	Perishable product	Operations	■				Risk Propagation Mechanisms and Risk Management Strategies	-Environmental pollution -Risk breeding environment
12	(Accorsi et al., 2018)/ Italy	Food industry	Planning		■			The implementation of data-driven analyses in sustainable SC	Environmental stress GHGs emission
13	(Zaid et al., 2018)/ Malaysia	Different industries (food, chemical, and etc.)	Practices, HR	■				Sustainability through green human resource management bundle practices and green SCM	-Green Human Resource (Green hiring, Green training, and etc.) -Eco-design -Green SCM (reverse logistic, green purchasing, and etc.)
14	(Papetti et al., 2019)/ Germany	Leather shoe Industry	Suppliers and related processes		■			A web based platform on tracing suppliers and related processes in (SC), as a tool for improving SC environmental sustainability.	Environmental sustainability (eg: Energy consumed (e.g., Energy consumed electricity and heat, Airborne emissions).
15	(Bastas and Liyanage, 2019)/ UK	Different areas	All		■		■	Integration of sustainability into the two influential management approaches of quality management and SCM	Environmental sustainability impact of SCM practices
16	(Jabbour et al., 2019)/ France	Different field	SC multi-tier		■	■		Literature on the effective management of sustainability in SC, and its attendant implications for multi-tier SC modeling problems.	Reverse logistics, carbon footprints
17	(Das, 2018)/ India	Diverse industries	Operations	■			■	Adoption of SSCM practices in manufacturing and process-based organization and it impacts on the SC performance	-Environmental management practices -Environmental performance -Reverse logistics, using Product recovery techniques
18	(Mathivathanan et al., 2018)/ Denmark	Automotive industry	SC practices, stakeholder	■	■			Interrelated influences among SSCM practices	- Environmental purchasing - Green packaging - Life Cycle Analysis/Assessment - Use of cleaner process technology
19	(Valinejad and Rahmani, 2018)/ Iran	Telecommunication industry	Stakeholder(suppliers, consumers, organization), environment		■		■	Sustainable risk in SCM	-Environmental sustainability -Environmental risk: CO2 emission, electromagnetic radiation, and etc.
20	(Jia et al., 2019)/ UK	Diverse industry	Suppliers		■			The role of Supply chain leadership and Supply chain learning	- Creation of a recycling chain - Modernization dairy farmers - Promoting sustainable cotton.
21	(Gómez-Luciano et al., 2018)/ Spain	Food(supplies market chain)	Suppliers	■			■	The food supply chain performance without harming the environment while meeting social expectations	Green performance(encourages green packaging, reverse logistics)
22	(Reefke and Sundaram, 2018)/ UK	Different	Relationship	■		■		Realization of sustainability goal(vision, strategy, execution)in SC: factors and decision model	Environmental issues(general)
23	(Vargas et al., 2018)/ Colombia	Food industry	internal enablers and SC practices	■			■	Top and middle management support and strategic purchasing The development of sustainable supply chain practices	-Environmental collaboration with customers -Green logistics -Green manufacturing -Green purchasing -Reverse logistics
24	(Lin et al., 2018)/ Taiwan	Agri-food industry	Supplier	■				Influential factors in SSCM	Environmental issues, Standardization (ISO) 14000
25	(Jin et al., 2018)/ China	Urban Construction	Stakeholders (Contractors,	■			■	The relationship between the green contractor in the upstream	Carbon emissions, the green building technology

			sub-contractors)						and downstream of the supply chain and its multiple subcontractors	
26	(Moktadir et al., 2018)/ Bangladesh	Leather industry	SC practices	■	■		■		Identification of influential barriers to SSCM practices, and the causal relationships	-Environmental issues, impacts, requirements -Environmentally conscious consumers -Practice on reverse logistics
27	(Oelze et al., 2018)/ Germany	-Transportation -Automotive	All		■				SSCM policies in managerial practice	Environmentally friendly product
28	(Sauer and Seuring, 2019)/ Germany	Mineral industry	Multi-tier, Sub-supplier				■		Sustainability issues in the multi-tier mineral SC	Reducing environmental damage
29	(Foo et al., 2018)/Malaysia	Industry	Customers	■			■		Relationship between green SCM practices and sustainability performance	Green practices: (Environmental collaboration, Eco-design, Investment recover, and etc.)
30	(Zhu et al., 2018)/England	Food industry	Product, decision making	■			■		Product deletion decisions: Integration of SCM, considering leanness and sustainability as major objectives	Environmental(decision, dimension, characteristics, sustainability
31	(Rostamzadeh et al., 2018)/Iran	The oil industry	All	■	■				SC risk management: evaluation	-Environmental risks (wars, Terrorism, unsteadiness of politics, economic-related concerns, natural incidents, and common work conflicts - Sustainable recycling risks(Lack of proper sewage infiltration, Groundwater pollution risks, Discharging of wastes risks, Inability to use of another company's wastes)
32	(Gokarn and Kuthambalayan , 2019) /India	Food(fresh produce)	Customers and firm(supplier, buyer-customer)	■	■		■		The influence of supply, demand, and price uncertainties in fresh produce supply chains	Food losses and waste,
33	(Seuring et al., 2019)/ Germany	Food(dairy, pineapple)	Stakeholders(government, customers, supplier)		■		■		SSCM as a theoretical basis for the evaluation of Base-of-the-Pyramid (BoP) related empirical research.	Environmental risk management(implementation of environmental standards
34	(Luthra and Mangla, 2018)/ India	Automotive industry	SC practices and member, suppliers	■			■		Strategies for SSCM practices implementation.	Use of clean technologies and modern information management approaches
35	(Dubey et al., 2018) /USA	Industry	Contractor (supplier-buyer)	■	■				SC effectiveness	Environmental concerns
36	(Ahmed and Sarkar, 2018) / South Korea	Biofuel industry	Cost Location-allocation	■			■		Minimizing the total cost biofuel SC (carbon emission) and location-allocation for agricultural zones and biorefineries	Carbon emission Sustainable energy
37	(Fallahpour et al., 2017)/ Malaysia	Textile industry	Suppliers	■					Sustainable supplier criteria and sub-criteria selection	-Environmental Management System -Green product -Green warehousing -Eco-design -Green Transportation -Green Technology
38	(Genovese et al., 2017) /UK	Industries (chemical and food	Production	■	■				The performances of traditional and circular production systems across a range of indicators	Life cycle assessment CO2 emission
39	(Pérez et al., 2017) /France	Biorefinery industry	Design			■			SSC design and management optimization	Environmental sustainability in SC design
40	(Das, 2017)/ India	Diverse industries	Operations				■		Measurement of Sustainable Supply Chain Management (SSCM) practices, and evaluation of its performance	-Reverse logistics -Environmental management practices
41	(Stindt, 2017)/ Germany	Manufacturing	Planning, operations		■	■	■		Planning in SSC	-Environmental performance -Mitigation of adverse environmental effects (Reduction of water consumption, Reduction of solid wastes and etc. -Resource-saving(Land use and Biodiversity, and etc.
42	(Crenna et al., 2018) /Italy	Biotic resources (ecology, engineering)	Life cycle	■	■				Ranking resources based on one key element of their sustainability (the potential for renewal)	Life cycle assessment
43	(Hong et al., 2018) /China	Different manufacturing companies (food, chemicals, textile and etc.)	Practices	■	■		■		Effects of SSCM in sustainable development, and enterprise performance.	Environmental performance
44	(Shibin et al., 2017)/ India	Automotive industry	Enablers	■	■				SSC performance	Environmental performance
45	(Lim et al., 2017)/ UK	Textile industry	Hierarchical interrelationships and attributes	■			■		Knowledge management in SSCM to improve the performance	-Cleaner production, -Waste Minimization and Recovery, -Recycling (reverse logistics), -Green purchasing
46	(Sauer and Seuring, 2017)/ Germany	Mining and mineral industry	stakeholders(buyer-supplier), operations			■	■		Practices for improving the sustainability in mineral SCs	Environmental pro-activity
47	(Raut et al., 2017)/ India	Oil and gas industries	SC relationship and practices	■					identification the critical success factors (CSFs) of motivation and encouragement, for the successful implementation of SSCM practices	Green manufacturing
48	(Dubey et al., 2017)/ India	Manufacturing	All	■	■		■		The dynamic nature of SSCM and bridge the existing quantitative/qualitative divide.	-Green warehousing -Environment conservation -Green product design
49	(Gold and Schleper, 2017)/ Germany	Companies and society	Stakeholders				■		The tradition of critical management studies in relation to sustainable business and sustainable supply chains.	-General environmental sustainability
50	(Madani and	Manufacturing(general	SC members	■					Pricing policies, greening	Eco-friendly products,

	Rasti-Barzoki, 2017) /Iran	)	and product					strategies and governance tariffs determining in SSCM competition under government financial	GSCM, environmental loss and damage(pollution)
51	(Esfahbodi et al., 2017) /UK	Manufacturing industry	SSCM drivers(or stakeholders)(governance pressures) - Procurement, - Design, -Distribution	■			■	Governance pressures-SSCM practices-performance	Performance gains in environmental protection : sustainable procurement, sustainable design, sustainable distribution
52	(Mariadoss et al., 2016)/ USA	Manufacturing and service	SC practices, stakeholder	■	■	■		Relationships and interactions between a firm's orientations and SSC practices	Environmental orientation
53	(Bechtsis et al., 2017) /Greece	Digitalization era	Design and Planning		■	■		the adoption of AGV systems into SC design and planning	Environmental sustainability insights
54	(Reefke and Sundaram, 2017) /UK	Different	Planning, execution, stakeholders			■	■	Identification and Evaluation OF Key Themes and Research Opportunities in SSCM.	Environmental sustainability
55	(Zeng et al., 2017)/ China	Eco-industrial park	Relationship, design, practices	■	■		■	SSCM and sustainable business practices(circular economy capability)	Environmental performance Environmental factors (climate change, and etc)
56	(Govindan et al., 2016)/ Denmark	Different field	Stakeholders Governance			■		Sustainability dynamics in supply chain relationship management and governance structures	Different focus: Environmental sustainability, collaboration, supplier development, impacts, performance and etc.
57	(Formentini and Taticchi, 2016) /UK	Industries(food, Construction, Fashion, Construction Mechanical tools, Mechanical components)	Stockholders(governance, leader, practitioner)				■	The relationship between governance mechanisms and SSCM	Environmental impacts and sustainability
58	(Giannakis and Papadopoulos, 2016) /France	Textile industry	All		■	■	■	Risk management process in SSC	Environmental risk (Energy consumption, Greenhouse gases, Pollution (air, water, soil), Water scarcity and etc.)
59	(Luthra et al., 2016)/ India	Automobile industry	SC practices, stakeholders(s uppliers, customers), design		■		■	GSCM towards sustainability: critical success factors of implementation	Green practices(Green Design; Green Purchasing; Green Production; Green Management; Green Marketing and Green Logistics Practices)
60	(Song et al., 2017)/ China	Telecommunication products	Suppliers				■	Sustainable supply chain management risk factors	Environmental risk factors (pollution, product waste problem)
61	(Tseng et al., 2018)/ Taiwan	Product and service	Design and operation		■			Assessment measure of sustainable service (SSCM) performance	Environmentally conscious design, environmental service operations design and environmentally sustainable design
62	(Zhang et al., 2018)/ UK	Different industries	Practices	■			■	Practices in SSCM	-Environmental issues -Sustainable Product Design -Environmental Procurement -Environmental Customer Collaboration -Internal Green Management -Investment Recovery
63	(Ahmad et al., 2016)/ The Netherlands	Oil and gas industry	Suppliers, production, logistic, product				■	Commitment to and preparedness for sustainable practices of upstream and downstream SC companies. and the impact of these factors on their sustainability strategies.	-Green logistics (e.g., Use of recyclable packaging) -Environmental friendly source materials
64	(Song et al., 2017) /Canada	Oil and gas industry	All		■			SSCM implementation(Environmental Turbulence, Institutional Voids, and Sustainability Trajectories)	Environmental performance
65	(Su et al., 2016)/ Taiwan	Electronic products industry	Suppliers				■	SSCM hierarchical structure (criteria for the supplier selection).	Environmental management (Environmental certificates (ISO 14000, carbon footprint, etc., customers environmentally friendly)
66	(Azadi et al., 2015) /Iran	Resin production	Suppliers	■				Selection of the best sustainable suppliers	Eco-design cost
67	(Hussain et al., 2016)/ CANADA	Industry	SC enablers (customer, government, employee)	■	■			Evaluation of potential alternatives for SSCM	Carbon footprint, green certification, implement environmental management systems
68	(Khodakarami et al., 2015)/ Iran	Chemical industry(Resin)	Network structures (supplier (stage 1) and manufacturer (stage 2)), inputs/outputs.	■				SSCM evaluation	-Eco-friendly factors -Environmental factors (the environmental cost), green production
69	(Garofalo et al., 2015)/ Italy	Cropping systems and biofuel	Production and transport				■	The energy performances of the biomass and sugar yield of sweet sorghum and sugar beet	Energy saving
70	(Luthra et al., 2015)/ India	Mining industry	Planning, stakeholders	■		■	■	Critical Success Factors (CSFs) to implement GSCM towards sustainability in industries	-Role of employees towards GSCM adoption -Organization's policy supporting GSCM
71	(Ji et al., 2016)/ China	Air-condition manufacturing	Transportation	■			■	Transportation strategy and eco-design policy.	Resource consumption and pollution emission, CO2 emission, energy consumption
72	(Xu and Gursoy, 2015)/ US	Tourism	Customers	■			■	Impact of hospitality businesses' actions regarding each dimension of sustainable hospitality SCM on customers' perceptions.	The environmental dimension of hospitality SSCM(greener products, Recycling, Pollution control)
73	(Diabat et al., 2014)/ Abu Dhabi, United Arab Emirates	Textile industries,	Enabler for implementation	■			■	Identification of influential enablers for SSCM	-Environmental performance -Green practices

74	(Van Hoof and Thiell, 2014)/ Colombia	Different industries(small and medium-sized enterprises)	Suppliers	■				Collaboration in SSCM	Greenwash, ecological performance.
75	(Hsueh, 2015)/ Taiwan	Manufacturing	SC actors and corporate social responsibility	■			■	The determination of optimal performance levels of corporate social responsibility (CSR) by SC director	Environmental criteria and dimension
76	(Turker and Altuntas, 2014)/ Turkey	Fashion industry	Suppliers		■		■	SSCM in the fashion industry	Environmental criteria for suppliers
77	(Chardine-Baumann and Botta-Genoulaz, 2014) /France	Industry	All	■	■			The sustainable performance of a company The relationships between an SCM practice and the three fields of sustainable development	Environmental management, The use of resources, Pollution, dangerousness, and the natural environment.
78	(Gualandris and Kalchschmidt, 2014)/ Italy	Machinery and equipment manufacturing	Customer and practices	■			■	Relationships among sustainable process management, SSCM, customer pressure, and innovation	Different focus: Environmental aspect, management, issues, performance
79	(Govindan et al., 2014)/ Denmark	Automotive industry	Practices	■			■	The impact of lean, resilient, and green supply chain management practices on supply chain sustainability.	Eco-design. -Waste elimination, -Cleaner production. -ISO 14001 certification, -Reverse logistics
80	(Frostenson and Prenkert, 2015)/ Sweden	Retail stores	Network(Stockholders)				■	A network perspective SSCM and focal firms	Environmental issues
81	(Brandenburg et al., 2014)/ Germany	Industry	All	■			■	SSCM quantitative, formal modeling	Life cycle analysis and general environmental focus
82	(Beske, et al., 2014)/ Germany	Food industry	Customer		■	■	■	SSCM practices that allow companies to maintain control over their supply chain and achieve a competitive advantage with the implementation of dynamic capabilities	The environmental performance The environmental impact of production
83	(Tseng and Hung, 2014)/ Taiwan	Apparel manufacturing industry(Textile)	Materials suppliers, manufacturing plants, and distribution	■				The cost of carbon dioxide emissions in SSCM	Carbon dioxide emissions
84	(Sueyoshi and Wang, 2014)/ USA	Petroleum industry	Business operations, production, downstream, upstream	■		■		Measure of sustainability in SCM	-Environmental assessment -Environmental performance
85	(Lin and Tseng, 2016)/ Taiwan	Electronic industry	Supplier, customer, business process	■			■	Competitive priorities in SSCM assessment	Environmental aspects, the ISO 14001, Waste Electrical
86	(Grimm et al., 2014)/ Switzerland	Food industry	Suppliers and sub-suppliers			■	■	Critical factors that overcome the complexities and unique challenges of sub-supplier management.	Environmental corporate sustainability standards
87	(Gold et al., 2013)/ Switzerland	Food industry	Design and operations	■			■	Application of SSCM, by multinational corporations (MNCs) to BoP(the Base of the Pyramid) project, in the sustainablity sense	-Minimization of transport; -Environmental aspects, concerns, performance, management -CO2 emission reduction
88	(Nagurney and Yu, 2012)/ US	Fashion industry	Transportation Consumer	■				Oligopolistic competition of fashion supply chains	-Environmental impacts(minimizing the emissions generated in the manufacture of its product, also along its supply chain -Consumers' environmental consciousness
89	(Ageron et al., 2012) /France	Selected companies	Suppliers	■	■	■	■	The sustainability of upstream SCM considering the fact that supply management	Greening supply chains
90	(Denktas-Sakar and Karatas-Cetin, 2012)/ Turkey	Port	Stakeholders		■	■		The influence of SC stakeholder on sustainability of port	Environmental impacts
91	(Liu et al., 2012)/ UK	Diverse industries (Automotive, electronics, food, textile and etc.)	Planning, process, stakeholders	■				Integration of green marketing seeing SSCM	Green marketing, green customer, green product
92	(Winkler, 2011)/ Austria	Manufacturing	Production, design		■			SSC approach: (closed-loop production)	-Environmental performance -Greening production, Life cycle analysis
93	(Wu and Pagell, 2011)/ US	Different industries (food, building)	Strategies				■	SSCM decision making	Environmental postures, aspect, and issues
94	(Foerstl et al., 2010)/ Germany	Chemical Industry	Suppliers		■			Purchasing and supply management (PSM) function in supplier sustainability risks and in elaborating the integration of sustainability risk management in supplier management processes	Environmental protection -Environmental impact of supplier production; air emissions, waste levels, and water and energy efficiency.
95	(Bitzer et al., 2008)/ The Netherlands	Food industry (The coffee chain)	Partnerships		■		■	The role of partnerships in making the global coffee chain more sustainable	Environmentally friendly Environmental degradation, Environmental protection
96	(Sigala, 2008)/ Greece	Tourism	Practices, members	■	■			The role of tour operators in sustainable tourism SC	Environmental management (Sustainable reverse logistics)

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

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