Towards responsible conflict minerals supply chain management: A systematic literature review and a supply chain governance framework

Abstract

Purpose – Conflict minerals are those, whose systematic exploitation and trade result in the commission of serious violations of human rights or crimes under international law. Several studies have targeted conflict minerals (CM) management issues but despite the abundance of papers on the topic, a review on supply chain management issues and governance in the context of CM research remains scarce. Therefore, the authors review how CM research addressed supply chain issues over the last decades, present a critical assessment of such literature, and provide an integrative framework of responsible CMSC based on supply chain governance theory.

Design/methodology/approach – A systematic literature review approach was adopted and a sample of 122 papers was identified in relevant journals. A descriptive, thematic and content analysis of the papers is presented to delineate the structure and the main research clusters of the literature.

Findings – The authors provide a comprehensive assessment of the research articles published between 1994 (the earliest date of paper on the topic) and 2019 (the year in which the research has begun). Furthermore, based on the findings, the authors provide a supply chain governance framework that highlights the peculiar aspects of CMSC and provide research propositions related to under-explored aspects in extant literature.

Implications – This study has a number of implications. Practitioners and researchers will gain a greater understanding of specific CMSC issues have been addressed in current literature, and how responsible CMSC actions can be implemented.

Originality/value – This study is one of the first literature reviews of publications on CMSC. Based on supply chain governance perspective, our review presents an overarching map of the research to date and a series of propositions to inform future research.

Keywords –conflict minerals, literature review, supply chain due diligence, responsible supply chain management, supply chain governance, conflict resources.

Paper type – Literature review.

1. Introduction

Conflict minerals (CM) are those, whose systematic exploitation and trade contribute to, benefit from or result in the commission of serious violations of human rights, violations of international humanitarian law or violations amounting to crimes under international law (Hofmann *et al.*, 2018). The military conflicts occurring in several regions around the world are often exacerbated by the presence of minerals and natural resources (Härkönen, 2018; Young, 2015). Indeed, several studies underline how the competition for energy resources and valuable minerals in Africa can cause wars (Gold *et al.*, 2015), and how the revenues resulting from mining in some regions are used to fund military operations and cause further human rights violations (Silva and Shaltegger, 2019). For instance, armed groups in the Congo earn large amounts by mining and trading CM, and in that process they frequently violate the basic human rights by committing sexual violence and torture, or by employing children as miners (Hofmann *et al.*, 2018).

Specifically, the term 'conflict minerals' refers to coltan (the metal ore from which tantalum is extracted), cassiterite (tin), wolframite (tungsten) and gold, also known together as the 3tg minerals (Costanza, 2016). For the most part, CM have high impact on several industries such as electronics, jewellery, clothing and other industries (Swift *et al.*, 2019). Due to the increasing awareness of CM issues, several companies are compelled to adopt responsible management practices following the guidelines of Dodd-Frank Act (section 1502) or the European Union Conflict Minerals Regulation (EU CMR) or the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas (Härkönen, 2018). Instead of banning the sourcing of CM, regulations like the Dodd-Frank Act use a 'name and shame' mechanism to expose non-compliant firms and indirectly entice companies to adopt proactively supply chain due-diligence (SCDD) initiatives (Silva and Schaltegger, 2019).

Thus, supply chain managers have to verify that procurement process is "conflict-free" or take measures to identify and prevent risks associated with these resources due to the globally dispersed nature of supply chains and the opacity of the origin of commodities. Key stakeholders (e.g., consumers, mass media, and employees) expect companies to behave responsibly (Parmar *et al.*, 2010) and have become intolerant of those not fulfilling their human rights expectations (Yawar and Seuring, 2017). Consequently, ensuring responsible mineral supply chains became a major priority of the international agenda since the late 2000s (Islam and van Staden, 2018).

On the whole, conflict minerals supply chain (CMSC) issues are increasingly important and there is a need to shed a light on how operational and strategic supply chain management issues were addressed in current literature. In particular, issues regarding governance are becoming pressing (Hilson, 2014) since several studies have criticized the narrow approach of transparency in SCDD that focuses on commercial transactions within the SC and leaves out other important actors/elements at the upstream level (Silva and Schaltegger, 2019; Hofmann *et al.*, 2018). Also, several regulations highlight the need to develop 'stronger governance' regarding managing CM issues (US Secretary of State and USAID, 2011). Furthermore, the wide spread use of CM in several products and the fact that conflict resources regions are located in different continents (Africa, Asia and South America) makes examining CMSC issues relevant for both researchers and practitioners.

Based on previous premises, this research aims to characterize the published research on CMSC issues and to identify gaps in the literature through critical assessment of previous studies. Moreover, based on supply chain governance lens and our assessment of current literature and categorization of the identified research clusters, we seek to provide a holistic framework of responsible CMSC in order to offer guidance for further investigation on the field.

Our research questions can be summarized as follows:

RQ1. How has literature on conflict minerals addressed supply chain management issues?

RQ2. What is the adequate responsible CMSC framework that can be suggested to address CM supply chain governance issues?

Consequently, this paper makes several contributions. First, it reviews research on CMSC issues, and therefore enriches research on minerals SC and sustainability (e.g. Sauer and Seuring, 2019; Young, 2015, Dashwood, 2013). Thus, we complete prior research on CM that investigated the topic from the perspective of social assessment and sustainability in mineral supply chains. Furthermore, we answer the call of several scholars for a SCM outlook on CM issues, i.e. how a SCM approach can be applicable to CM as well as other theoretical frameworks of sustainable and responsible SCM (Gold and Schleper, 2017). Second, drawing on supply chain governance (SCG) theory (Li *et al.*, 2014; Crisan and Parpucea, 2011), we provide a framework for responsible CMSC that addresses the issues related to complexity, traceability, visibility and lack of performance measurements. Rather than ensure mere compliance with regulations, we argue that a holistic SCG framework of CMSC is likely to address the gaps identified in current literature by emphasizing on nexus suppliers' development and collaboration with other stakeholders in the downstream level of the supply

chain. Third, our conceptualization might also be applied to other conflict resources such as petroleum, diamond and other resources that are extracted and traded in conflict regions such as the Middle East (e.g. Syria, Iraq and Libya), South East Asia and South American countries. Fourth, since several CM are mined in African and developing countries, investigating CMSC research contributes to research on SCM in developing countries and answers the calls of several scholars for more research investigating the peculiarities of such contexts (e.g. El Baz *et al.*, 2018; Ruiz-Torres *et al.*, 2012; Kolk and Rivera-Santos, 2018).

The article is organized as follows: section two presents an overview of CMSC issues, supply chain governance main axes and its relevance for CM. Section three describes the methodology used to search for and select articles from the CMSC literature. Section four classifies and reviews the literature using basic statistics about the articles, journals, and countries presented in the review. Section five proposes a discussion of the main findings, the gaps of current literature and our suggested CMSC framework. Finally, section six presents the research conclusions.

2. Conflict minerals and supply chain governance tenets

2.1. Conflict resources social issues and conflict minerals supply chain

For the most part, the African continent has witnessed several armed conflicts in which natural resources were used to finance armed conflicts such as diamonds, gold, oil and other minerals (Sankara *et al.*, 2016). According to the European Commission (2017) conflict resources are those (i) originating from high risk/conflict regions and (ii) their extraction, manufacturing and trade finance armed groups in conflict-prone areas which intensify human rights abuses. In particular, the intensity of violence and human right abuses in the Democratic Republic of Congo (DRC) in which armed rebels and government's army were involved has shed light on CM exploitation and the need for international intervention. For several scholars, to qualify as a CM its origin must be from a conflict area and its trade and manufacturing entails human rights violations (Hofmann *et al.*, 2018), whereas other scholars claim that any mineral sourced from conflict regions is a CM (Silva and Schaltegger, 2019).

The numerous challenges of CM related to human rights violations, illegal financing, civil wars, corruption, poor working conditions and use of child labor, were highlighted in several studies (Silva and Schaltegger, 2019). To prevent such problems, numerous stakeholders such as Western governments (the United States and the EU), nongovernmental organisations and the extractive industry developed several measures consisting of:

(i) Guidelines, protocols and legislation through which companies can ensure that they respect human rights and do not indirectly fund military conflicts (OECD, 2013).

Regulations such as the Dodd-Frank Act (Section 1502) require publicly traded firms to verify whether they use any CM originated in DRC (Hoffmann *et al.*, 2015). On a parallel track, several guidelines aim to establish a consistent approach to respond to potential risks related to CM identified in the supply chain, to conduct independent third-party audit of SCDD and to report on SCDD (Islam and van Staden, 2018);

(ii) Supply chain traceability and tracking initiatives such as the Tin Supply Chain Initiative and the UN mission *Centres de Negoce*, which provide a means for companies sourcing minerals from DRC to prove their chain of custody did not contribute to armed conflict (Silva and Schaltegger, 2019). Also, certification of mine sites, traders and exportation constitute a significant measure to distinguish between legal and illegal mineral extraction and trade; and

(iii) Support programmes involving financial and technical support from numerous organisations such as the World Bank (PROMINES programme), USAID (Private Alliance for Responsible Mineral Trade) and other public and private partners, all of which aim to modernize the artisanal mining processes in DRC and to absorb the workforce of miners in such regions (Islam and van Staden, 2018).

On the whole, the aim of such measures is to ensure the transparency of the material and financial flows in CMSC and to prevent armed groups from benefiting from CM (Silva and Schaltegger, 2019).

According to several authors (e.g. Young, 2015; Swift *et al.*, 2019), CMSC can be divided into two levels:

(i) The *upstream supply chain* that concerns the stages related to the production, extraction, smelting, refinement, trading and shipping of CM;

(ii) The *downstream supply chain* that comprises all stages related to the use, retail, recycling and disposal of CM end-products.

In the upstream level, CM are situated in local mining sites that can be considered as lowest-tier supplier. Further, what increases the challenges of CMSC is that such minerals are extracted far and early in the supply chains thus compromising the responsible actions of focal firm at the downstream supply chain (Hoffmann *et al.*, 2018).

CMSC is typically characterized as long, dispersed and involves numerous actors, hence making tracking difficult and time consuming (Swift *et al.*, 2019). To identify the origin of minerals used in products, firms have to trace the former's source through multiple tiers of suppliers to the original smelter or refinery (SOR) who purchase mineral ores from mines to

manufacture and/or sell usable metals. Unfortunately, the multiplicity of tiers and suppliers renders tracking CM difficult as the CM can enter several tiers upstream in the supply chain (Kim and Davis, 2016). For those reasons, many firms in the electronics, garment, automotive and medical equipment industries are struggling to comply with the regulations to report on the origins of CM (Schwartz, 2016).

For some scholars, the lack of sufficient data about social implications of CM explains why many corporations are unable to identify the origin of 3TG components used in their products (Sankara *et al.*, 2016). As a result, the available data of the US securities and exchange commission show that only a minority of firms were able to identify the country of origin of the minerals they used and only 1 percent could verify that CM were not used in their supply chains (Kim and Davis, 2016).

Based on the above mentioned premises, we present an overview of the CMSC including the stakeholders and supply chain actors involved (Figure 1).

Figure 1

Insert Figure 1 here

2.2. Responsible supply chain governance and its relevance for conflict minerals

Issues related to ethics, diversity, labor, fair-trade and human rights have been extensively investigated in the context of supply chain, procurement and logistics (e.g. Carter and Jennings, 2004; Park-Poaps and Rees, 2010; Sydow and Frenkel, 2013). Firms are held responsible for their operations within their own territories as well as for the activities of their partners in the supply chain (Andersen and Skjoett-Larsen, 2009). Theoretically, the concept of socially responsible supply chain management (SRSCM) has been developed by scholars to refer to managing social sustainability issues in supply chains (Quarshie *et al.*, 2016; Spence and Bourlakis, 2009). SRSCM reflects the firm's responsibilities towards the social and ecological environment in the firm's global supply chain (Tate *et al.*, 2010).

On a parallel track, the concept of "governance" is often deployed to illustrate how firms can manage the responsibility for suppliers' production conditions as part of their CSR strategies in the context of supply chains (Gimenez and Sierra, 2013; Soundararajan and Brown, 2016). Corporate governance can be defined as an institutional arrangement, including a set of formal or informal, internal or external, institutions or mechanisms that coordinate all stakeholder interests to ensure that the decision-making is more scientific and safeguards all corporate interests (Gillan, 2006). Supply chain governance (SCG) is the framework in which decision

making is carried out in a supply chain situation (Crisan and Parpucea, 2011). More specifically, SCG focuses on the institution, the structures and the mechanisms that guide, regulate and control the activities which are emanated from stakeholders of the supply chain (Gimenez and Sierra, 2013). Thus, through SCG a focal company tries to satisfy the sustainability's requirements of key stakeholders, while maximizing benefits for multiple SC actors and reducing unethical behaviour. Several scholars debate the best way SCG mechanisms can be implemented and parameters related to product, process that can be set by buyers, producers, or other stakeholders such as NGOs, government agencies (Soundararajan and Brown, 2016).

Drawing on several theories (stakeholder theory, legitimacy, responsibility and others), SCG is focused on the firm's responsibility to stakeholders instead of mainly warranting the interests of shareholders (Phillips, 2003) or focusing on financial bottom line approach (Li *et al.*, 2014). Hence, numerous studies highlight collaboration-based SCG frameworks as being the efficient way to develop responsible global supply chain (Detomasi, 2007). Through dialogue and cooperation between stakeholders, their interests and requirements will be taken into account into SCG (Vurro *et al.*, 2009). Furthermore, to address social responsibility, several multinationals have developed voluntary governance mechanisms like codes of conduct and/or social standards to ensure their suppliers' compliance with social requirements (Jiang, 2009). Codes of conduct refer to documents stating values, principles and ethical parameters of the company (Stevens, 2008) that define and enhance its social responsibilities (Kaptein and Schwartz, 2008). Social standards are rules, procedures and methods that are defined by third parties or non-business actors to measure, evaluate, audit and report on the social behaviour of firms (Rasche, 2010).

On the whole, literature on SCG is emerging and evolving, and several scholars debate the components of its mechanisms: (what) content, (how) assessment, and (who) actors are involved in ensuring successful implementation (e.g. Perego and Kolk, 2012; Li *et al.*, 2014; Soundararajan and Brown, 2016).

For companies willing to comply with CM regulations and adopt SCDD, there is a need to initiate voluntary governance mechanisms as described above. Indeed, in CMSC, several companies have low visibility of the beginning of the chain and lack information regarding low-tier suppliers (Swift *et al.*, 2019). The weak number of compliance to Dodd-Frank Act indicates the challenges that corporations face regarding CM issues. Beyond the visible range that focal company has in the supply chain (Carter *et al.*, 2015) concrete actions to mitigate negative CM social impacts are complex to conduct (Silva and Schaltegger, 2019). Therefore,

several scholars advocate for the adoption of governance mechanisms to manage efficiently the legislative pressure and the stakeholders' requirements (Mària and Taka, 2012). Some of those mechanisms include external auditing of CM by third parties to enhance the transparency of the supply chain (Kortelainen, 2008) and code of conducts developed by companies or industry organization such as the Responsible Business Alliance (RBA) that devised a CM disclosure procedures to be followed by firms and their contracted suppliers (RBA Code of Conduct, 2018). In addition, some firms develop voluntary SCG mechanisms such as Intel and Apple who monitor their suppliers of 3TG minerals and who adapting their internal auditing system to avoid CM in their products (Apple Inc., 2015; Intel Corporation, 2015). In some cases, buying firms collaborate with other partners such lower-tier suppliers and NGOs in order to manage pressing CM issues (Choi and Krause, 2006).

3. Methodology

Literature reviews are conducted to assess the chronological evolution of a research area and to provide an in-depth analysis of studies carried out on a specific topic (Mentzer and Kahn, 1995). In particular, systematic literature review (SLR) has demonstrated its potential in reducing potential errors related to reviewing papers by adopting a transparent and replicable protocol (Denyer and Tranfield, 2009). Conducting a SLR is a comprehensive approach to map out the theoretical perspectives and practices prevailing in a specific field (Storey *et al.*, 2006). The SLR adopts an evidence-based approach to identifying, selecting and analysing research papers (Rousseau *et al.*, 2008). Thus, SLR is based on the principles of transparency, inclusivity and explanatory nature; all of which enhance the generation of objective overview of the search results (Denyer and Tranfield, 2009).

Accordingly, we follow a number of stages based on the recommendation of Denyer and Tranfield (2009) including: (i) planning the review; (ii) conducting the review; and (iii) reporting/disseminating the findings.

3.1. Planning the Review

Based on the research aims presented in the introduction, the authors elaborated a research protocol that takes into consideration the scope of the review. In the present review, we focus on CM 3tg issues due to their importance as valuable minerals and their impact on several industries and supply chains (Gold *et al.*, 2015; Costanza, 2016; Härkönen, 2018). Regarding SC boundaries, we decided to include research adopting a multitier perspective as well as papers having a focal firm or dual (upstream or downstream) lens. Such approach has been recommended in several literature reviews related to SCM (e.g. Zhu *et al.*, 2017; Liao-Troth *et al.*, 2012; Derwik and Hellström, 2017).

Subsequently, we elaborated the following set of criteria to be followed in selecting and assessing publications:

1. A search was conducted in several databases including ScienceDirect, EBSCO, ABI/INFORM, and Emerald to collect a substantial number of publications from various disciplines and fields;
2. The review was limited to peer-reviewed publications to guarantee a certain level of quality, and to ensure consistency between the themes and sources ((Burgess *et al.*, 2006). Consequently, chapters in books, conference proceedings, and trade journals were excluded from the search;
3. Conceptual and empirical research on CMSC was considered and no time restriction was applied to gather as many publications as possible;
4. We decided to consider only publications in English to facilitate data analysis.
5. Throughout the selection process, the main subject term in screening the papers is "conflict minerals supply chain" including title, abstract, and keywords. In addition, the collected papers were also screened in their entirety to assess their relevance using this same subject term.

On the whole, the five criteria presented above were applied to avoid bias and selectivity in data gathering and to ensure a reproducible database search (Derwik and Hellström, 2017).

3.2. Conducting the Review

The search terms used in our review include: "supply chain (management)", "conflict minerals", "resources conflict", "blood mineral", "logistics", and "operations management" that we entered in the fields "title," "abstract," and "keywords". Each search term was entered as a single string joined by the AND operator to maximize the range of targeted papers. Several journals in the field of SCM, economics, sustainability, social and political science were selected. The journals cover different quality standards as identified by the Association of Business Schools (ABS) journal ranking (Harvey *et al.*, 2010).

This process yielded initially 520 papers. After application of criteria 2, 145 publications were excluded, leaving 375 publications. After removing duplicates, 205 publications remained for further investigation. The remaining 205 publications were screened for substantive content based on the criterion 5, leaving 118 publications. Subsequently, the authors have read the publications in their entirety, to check for their relevance and to cross-check the selected papers adding references from all the retrieved publications that met the inclusion criteria above (Derwik and Hellström, 2017). This process has generated 3 additional publications which

resulted in 122 final selected papers (Figure 2). The above sampling and publications retrieval process was carried out from May 2019 until September 2019.

(Figure 2)

Insert Figure 2 here

The article type and the topic can be found in the abstract and introduction section of the article. Data related to the country and context of the research is generally found in the empirical research section of the article. While methodology and data analysis techniques used by authors are found in methodology section.

Regarding the thematic and theoretical analysis of papers, we categorized and coded the selected papers based on the content analysis approach (Bryman and Bell, 2007). Thus, the authors coded the papers independently based on the core content of the publications and the research questions of the review. Therefore, samples of coded papers were swapped and re-coded by members of the research team to see if there was agreement. Several meetings were held to discuss potential discrepancies and to resolve disagreements. Furthermore, the authors elaborated for each paper a short s summary to help assess and interpret the data. A Microsoft Excel database was created and the articles were classified under different headings and subheadings for the purpose of analysing the trends and gaps, as described further on. Hence, the selected articles were compiled according to the following categories:

- Article type;
- Journal type;
- Research topic or focus;
- Field of research or country targeted; and
- Research methodology.

The final stage of this systematic review is to report and disseminate the findings in a way so as to add to practitioners' and academics' understanding of the topics or themes discussed (Denyer and Tranfield, 2009).

4. Findings

4.1. Journals Classification

CMSC papers were published in numerous journals specialized in economics, political science, environmental science, business management and international relations (Figure 3).

(Figure 3)

Insert Figure 3 here

4.2. Publications Chronological Evolution

Figure 4 represents the chronological evolution of CMSC literature over the years. Overall, due to the relevance of the topic, the publications number has witnessed a significant surge during the last decade from 2008 to 2019 showing the increasing interest in the topic (Figure 4).

(Figure 4)

Insert Figure 4 here

4.3. Geographical Location

Regarding the geographical location of studies on CMSC (Table 1), most of the CMSC research was carried out in third world countries and regions because most of conflict resources and minerals were mined there. Hence, the research in the African continent represented more than 41% of the papers.

(Table 1)

Insert Table 1 here

4.4. Publications Classification by Methodology

The research methodology used in these studies can be classified into 5 main categories (Table 2). The methodological approach of the papers seems to be focused on conceptual papers representing more than 53% of the papers. The empirical surveys and case studies constituted more than 43.5% of the papers.

(Table 2)

Insert Table 2 here

4.5. Research Clusters

The articles on CMSC issues have focused on a variety of topics. We classify the literature on CMSC into five main thematic areas:

- The first cluster in terms of publications number (n=44) is composed of papers investigating social responsibility, reporting and CM disclosures (e.g. Owens, 2004; Jelinek, 2015; Costanza, 2016; Hofmann *et al.*, 2018). For the most part, the papers in this cluster have focused on the initiatives developed by Western countries to address

the reputational risk emerging from their purchase/procurement of CM. Reporting and CM disclosures aim to communicate about the firms' due diligence, tracking and identifying minerals sources. Thus, such disclosures contain information about minerals country of origin, smelters/refiners, and efforts to locate the source of CM being used by the companies;

- The second cluster (n=27) is composed of articles investigating operational issues of CM tracking, chain of custody traceability, and social assessment (e.g. Low, 2013; Bleischwitz *et al.*, 2012; Kelly, 2014; Hancock *et al.*, 2018). Some of the tools investigated include material flow analyses (Gemechu *et al.*, 2017), 'social footprint analyses' (McBain, 2015) and social life cycle assessment applied in the context of CM (Dewulf *et al.*, 2015; Gualandris *et al.*, 2015);
- Articles in the third cluster (n=25) refer to studies on regulations and guidelines related to CM such as the Dodd Frank Act and OECD guidelines (e.g. Rashty, 2012; Sankara *et al.*, 2016; Härkönen, 2018). Most of the papers in this cluster have provided mainly a descriptive approach of these regulations (e.g. Scheijgrond, 2011; Young, 2015; Partzsch and Vlaskamp, 2016) without investigating in detail how such regulations might affect companies' adoption of responsible CMSC practices;
- Papers of the fourth cluster (n=15) have focused on audit, codes of conduct, certifications and collaborative policies of companies involved in CM management (e.g. Lane *et al.*, 2003; Jelinek, 2015; Islam and van Staden, 2018). While the focus of collaboration with suppliers seems to be limited, most papers have described the approach adopted in certifications of mines, internal codes of conduct or guidelines from industry such as the Conflict-free Smelter program (CFS), the Responsible Jewellery Council chain of custody certification system and the mineral certification scheme by the International Conference on the Great Lakes Region (Kashmanian, 2015). Studies investigating CM audit highlighted the use of assessment methods based on standards developed by industry such as the "fairtrade" standard system (Hilson, 2014; Young, 2015; Schrempf-Stirling, 2016), the supply chain traceability system (Nurminen and Pojasek, 2012; Carrigan *et al.*, 2017) and the Kimberley process certification scheme (KPCS) of the diamond industry (Zulu and Wilson, 2012; Søreide and Truex, 2013; Khadiagala, 2015). Suppliers' code of conduct related to CMSC include the UN Guiding Principles and the Electronic Industry Citizenship Coalition (Martin-Ortega, 2014; Methven O'Brien and Dhanarajan, 2016);

- The fifth cluster (n=11) is composed of papers examining the outcomes of CM disclosure (e.g. Sankara *et al.*, 2019; Swift *et al.*, 2019; Diemel and Dilhorst, 2019). For instance, the research of Swift *et al.*, (2019) has demonstrated the economic and financial impacts of firms' CM disclosures, thus filling a gap in the current literature. Other researchers presented critical assessment of CM policies and reforms that highlight security improvement, enhancement political stability in CM regions (Vogel and Raeymaekers, 2016). Notwithstanding, other scholars have pointed that armed groups have still control over CM trade through companies consisting of family members to manage their day-to-day interests (Diemel and Cuvelier, 2015). Also, other studies have underlined the consequences of CM reforms and bans on the Congolese mining communities and small-scale mineral traders (Geenen, 2012; Parker *et al.*, 2017). A large majority of people living in mining communities in DRC have experienced negative consequences of CM interventions on their livelihoods and were not able to benefit from the mineral extraction and trade (Diemel and Dilhorst, 2019).

Based on our categorization of CMSC literature clusters, we suggest that the regulations and guidelines influence social responsibility communication of companies involved in CM purchase and processing. Those laws and acts such as the Dodd-Frank Act and the EU CMR reflect the principles to which the companies have to conform to and the guidelines to be followed for SCDD initiatives. On a parallel track, CM operational issues (tracking, social assessment) as well as codes of conduct, auditing, certifications and standards influence responsible practices and reporting in the field of CM since they can affect how companies can ensure traceability and tracking of mineral flows (Hofmann *et al.*, 2018). Based on previous premises, we present the categorization of how CSCM clusters interact in the following figure:

(Figure 5)

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5. Discussion

5.1. The "Conflicting" Issues in Conflict Minerals Supply Chain Management Research

Despite the fact that literature on the topic is growing in terms of publications' number, most of research has been focusing on fragmented approach of CMSC issues either conceptually or empirically. Most of the studies focus on implementation of due diligence without explicitly addressing the various aspects of social issues in CMSC. Furthermore, certification and standards mechanisms have been investigated in CMSC literature in a fragmented manner or geared towards conflict-free sourcing.

Consequently, several gaps can be noted in current CMSC literature, namely:

(i) Measuring the outcomes of responsible CMSC actions was not investigated sufficiently and only a minority of studies have highlighted the impacts of corporations CMSC reporting and social initiatives in the field;

(ii) Investigating ways to overcome issues related to visibility, cooperation and collaboration with suppliers and other partners in the supply chain was not studied thoroughly in current CMSC literature. Most research focused on a descriptive assessment of SCDD without providing practical solutions to the lack of sufficient data at the upstream level of CMSC;

(iii) Social responsibility's examination was limited to disclosures about CM sourcing, whereas other aspects related to the role of other partners in the supply chain such as smelters and refiners and their impact on SCDD success were overlooked due to lack of sufficient data;

(iv) In conceptual and empirical CMSC studies, the concept of governance was merely deployed at the political and corporate level, and efforts to develop integrative approach that describes explicitly supply chain governance mechanisms, aims, tools and outcomes remain scarce.

Therefore, we argue that more papers should adopt a more integrated and multilevel approach in their analysis. Given the multiple SC layers and boundaries (Sarkis, 2012), research targeting CMSC topics should attempt to emphasize on the various levels of these topics, from the organization to the network.

5.2. Conflict Minerals Supply Chain Governance: An Integrative Framework

Social sustainability challenges of CMSC require a wider scope to take into consideration the upstream-downstream structure of the flows exchanged which has not been underlined sufficiently in current literature. Several authors have proposed generic models of minerals SC such as Sauer and Seuring (2019), Mena *et al.*, (2013) and Young (2015) that highlight the existence of a second buyer-supplier relationship led by an upstream focal firm. Such approach can generate useful insights because it clarifies the sustainability requirements for members involved in CMSC and enhances how sustainability requirements can be managed.

Elaborating a framework addressing the numerous aspects of CSMC is challenging. The management of CM related social issues requires assessing the upstream supply chain, from the direct, first tier suppliers of a focal company to further n-tier suppliers (Sauer and Seuring, 2017) up to the mineral extracting companies and refineries, where the CM related social and human rights issues occur. To address these challenges, it is essential for firms to develop

supply chain visibility (SCV) regarding their suppliers and supply chain partners. According to Lee and Rammohan (2017), SCV can be defined as the ability to trace the points of origin of materials used in a product in order to control SC operations and networks efficiently. Tracing the origin of material flows stems from data related to supply chain partners that enable the focal firm to mitigate various intra and inter-firm risks (Swift *et al.*, 2019). Hence, we suggest that SCV for CMSC will help firms identify and track mineral sources more efficiently across multiple tiers of suppliers in their supply chains. In particular, working with "nexus" suppliers, would enable the focal firm to implement SCG more effectively (Yan *et al.*, 2015). The importance of "nexus" suppliers stems from their connections and network position that provide access to strategic information about lower-tier suppliers which enhances the visibility and transparency of the whole supply chain (Sancha *et al.*, 2019). In the context of CMSC, smelters can be considered nexus suppliers, due to their structural position which will make them key members in ensuring a conflict free sourcing of minerals (Swift *et al.*, 2019).

Based on several scholars' approach to responsible social management, we suggest the following strategies for SCG in the context of CM:

(i) Communication strategy: to communicate the results of social initiatives (the origin of minerals and the social issues connected to their extraction), which in case of not being involved in CM may be sufficient (Schaltegger and Burritt, 2014). However, if the supply chain contains CM, managing change is required (although it is not directly required by the regulation, risks of reputation loss or subsequent stakeholder pressure are likely to require it);

(ii) Substitution strategy, i.e. to substitute the supply chain (Schaltegger and Burritt, 2014), e.g. through a change of the product design to substitute CM by other materials (e.g. carbon fibre composites), thus making the supply of conflict related minerals and its suppliers obsolete. When this strategy is not possible to implement then the other alternatives are to adopt compliance and/or supplier development;

(iii) Compliance strategy that implies that relevant measures are taken by the focal company to exclude the purchase as well as the direct and indirect use of conflict related 3TGs as part of their products. With regard to the Frank-Dodd Act, this may mean that only 3TG minerals sourced outside the DRC and adjoining countries would be accepted. These measures can include written rules such as codes of conduct or other documents and criteria, for which compliance is monitored and audited to exclude CM in the supply chain. Compliance-related social management approaches for CM are likely to focus on auditing suppliers, reducing risks and to

take action if some suppliers do not comply with the focal company's standards (Yawar and Seuring, 2017). For CM, this implies terminating the contract with the existing supplier and considering suppliers who can offer minerals without a connection to social problems or which are not sourced from conflict-affected or -high risk countries;

(iv) Supplier development strategies that emphasize on the collaboration between the focal company and its suppliers (Harms *et al.*, 2013; Akhavan and Beckmann, 2017). For CM, this means that the collaboration with first tier and further suppliers aims either to jointly find approaches to exclude CM-connections at earlier stages in the supply chain (e.g. by substituting subcontractors early in the supply chain) or to eliminate the social problems directly at the suppliers' level, where they occur. In the first case, the collaboration with a low tier supplier/subcontractor (direct first tier supplier) serves to support assessment of higher tier suppliers and to identify the existence of CM, their origin and/or social issues at an earlier stage of the supply chain. When collaboratively deciding with the direct supplier to execute a compliance strategy for a subcontractor, this can result in an exchange of high tier suppliers (e.g. focal company and first tier supplier decide to substitute second tier supplier). In the second case, the collaboration is based on the conviction that a supplier is willing and able to change their practices to improve the human rights and related social situation in the collaboration with the focal company.

5.3.Supply Chain Governance Mechanisms of Conflict Minerals

Mechanism can be defined as a set of hypotheses that explain the results of interaction between several factors (Hedstrom and Swedberg, 1998). SCG mechanisms refer to the factors influencing and motivating internal and external levels of the supply chain system. The stakeholders in CMSC represent the participants or the subjects in the process of governance, and the objects refer to the consequences of uncertainties of the environment (humanitarian crises, resources depletion, child labor, quality loss; environmental pollution).

Drawing on Li *et al.* (2014)'s classification of the environment we distinguish between: (i) task environment that consists of environmental elements that affect attempts by the organization to achieve its objectives, such as competitors, suppliers, capital markets, customers, and production technology and (ii) institutional environment that refers to other environmental elements that have an impact on the organization, including governments, economic situations, and cultural elements. In a SCG both of task and institutional environments should be considered and the role of governance mechanisms is to reduce the negative impact of

environment uncertainty on the supply chain performance (Li *et al.*, 2014). Therefore, two styles – an efficiency mechanism and a legitimacy mechanism- are suggested in SCG implementation.

5.3.1. Efficiency mechanism of supply chain governance.

The efficiency mechanisms refer to searching for maximum benefits of the organizations involved in SCG. This is the underlying approach for internal governance in the CMSC, where the governance subjects such as the manufacturers representing the focal company and their partners seek to minimize risks of CM and enhance their profit. The density of the supply chain, the complexity of transactions, the capabilities of the suppliers, the centrality of the focal firm and the material and financial flows exchanged all affect the SCG (Sancha *et al.*, 2019). Therefore, some effective means of governance are suggested such as information sharing, technical support, risk sharing and benefits sharing (Li *et al.*, 2014) to facilitate the SCG in CMSC. As an example of such tools in CM, the iTSCi chain of custody tracking helps companies to map their supply chains and to collect and disclose relevant information necessary to comply with international due diligence standards (Sankara *et al.*, 2019). Likewise, the ICGLR Regional Certification Mechanism ensures that companies source from conflict-free mine sites and from suppliers who are not engaged in conflict or human rights abuses by creating a database of certified exporters that can be shared and inspected by third party auditors (ICGLR, 2011; Diemel and Dilhorst, 2019). Developing similar means with broader scope and coverage will enable firms to better address CMSC issues.

5.3.2. Legitimacy mechanism of supply chain governance.

Legitimacy mechanisms aim to satisfy the requirements of institutional environments and are geared toward external governance. In the case of CMSC, the subjects of SCG are not only the focal company representing manufacturers and their supply chain partners, but also external stakeholders, such as governments, NGOs, the media and consumers. The aim of legitimacy mechanisms is to balance social and economic performances by taking into account the characteristics of consumer demand, the regulatory capacity of governments, and the capacity of disclosure by NGOs (Li *et al.*, 2014). To determine how supply chains should be governed and changed, both the internal partners of the supply chain (i.e., suppliers, manufacturers, retailers, etc.) and the external stakeholders (such as governments, NGOs, and the public) should be taken into account. Consequently, the focal firm in CMSC can use the internal efficiency mechanism and the external legitimacy mechanism together to maximize benefits for stakeholders. The manufacturers or large scale buyers in CMSC will have to play key role to reach these goals.

The institutional context in several African countries compel several manufacturers or buyers to be involved actively in financing the CM reform mechanisms and develop initiatives such as the iTSCi traceability scheme in Africa (Diemel and Cuvelier, 2015). Private mineral buyers also provide assistance to African ministries of mines in the implementation of traceability and certification schemes at mine sites by financing such operations in terms of salaries, transportation equipments and exchange of information with state authorities, private industry actors, local communities and civil society (Diemel and Dilhorst, 2019).

Nevertheless, several scholars advocate for larger roles of focal firms since state authorities who assume the responsibility for monitoring and providing oversight over mineral extraction and cross-border trade are often criticized for not implementing thoroughly the reforms or for encouraging illicit CM trade (Diemel and Dilhorst, 2019). In addition, the focus of most CM reforms seems to be the large scale mineral buyers (comptoirs) and leaves out the artisanal small scale miners and traders who represent 90% of all supply chain actors (Diemel and Dilhorst, 2019; Sankara *et al.*, 2019). International requirements for mine sites to be listed, delineated, demarcated and attributed to single licence holder seem to apply only on large scale mining. Therefore, measures should be taken to help part of artisanal mining to integrate modern CMSC which will mitigate social and political negative effects of their exclusion.

5.4. Responsible Conflict Minerals Supply Chain Axes

Responsible CMSC actions refer to the practices initiated by firms to address social issues along the supply chain. CM social and environmental issues are numerous (e.g. human rights, labor conditions, working hours, resources conservation, safety and child labour) and even converge to political issues of power, war and armed conflicts (Gold *et al.*, 2015; Härkönen, 2018). Since the demands of stakeholders are numerous, firms involved in responsible CMSC initiatives have to prioritize and distinguish between such different requirements. In current literature, several studies have highlighted how companies have started to fulfil the expectations of external stakeholders for more responsible supply chain actions that can mitigate the issues of CM without compromising their financial performance (Hofmann *et al.*, 2018). In doing so, the companies involved in such actions maintain or develop competitive advantage by mitigating the reputational risks inherent to CM (Sauer and Seuring, 2019; Hofmann *et al.*, 2018).

While several studies have generated significant insights into literature, we suggest an integrative approach of CM supply chain governance that takes into consideration:

(1) *Reporting and accountability actions* which are initiated to communicate about the companies' actions, thereby encouraging other supply chain members to act ethically.

Hence, in CMSC responsible actions should be clearly communicated to stakeholders and address their concerns. In addition, CMSC reporting constitutes a proactive stance taken up by firms to communicate how sustainability concerns of stakeholders are best integrated into the firm's operations (Tate *et al.*, 2010; Böhling *et al.*, 2017). Such actions are also used to create a loyal customer base, attract socially responsible investments and reap benefits from CSR initiatives (Bhattacharya *et al.*, 2010);

(2) *Social assessment and compliance practices* which are initiated to ensure that the firms comply by law, jurisdiction and stakeholders' pressure. Consequently, the firms develop actions to ensure that stakeholders' requirements are met with the help of their supply chain partners. Therefore, such actions are deployed to mitigate stakeholders' criticism and legitimize the firms' activities through standards and labels. Current literature has focused mainly on the firms' practices to deal with CM issues that are underlined by Dodd Frank-Act, EU CMR and OECD reports which have generated standards and codes of conducts to be respected by all the members of CMSC. Further, auditing and monitoring measures to verify and control how the other partners in CM supply chains meet the firm's and its stakeholders expectations need further elucidation. Monitoring is an effective way of measuring the firms' expectations and conveying the same to the stakeholders (Asif *et al.*, 2013). In the context of CM, auditing and monitoring actions within supply chains would be important especially at the supplier level which is weakly geared towards implementing codes and standards in the field; and

(3) *Cooperation and partnerships between supply chain members* to develop sustainable actions which were not sufficiently covered in current CMSC literature. For several scholars (e.g. Sauer and Seuring, 2019; Hoejmose *et al.*, 2014), developing partnerships in which SC members are actively involved to meet stakeholders demands constitute the key to responsible SSCM strategies. In the context of CM, external stakeholders are concerned with social issues at the upstream supply chain level which requires developing strategic partnerships with suppliers to address such concerns. Such collaborations might involve training, investments, offering technical and financial assistance to help suppliers deal with sustainability issues (Krause *et al.*, 2009). By developing cooperative approach to responsible CMSC, not only risks related to neglecting social and environmental concerns would be controlled, but also increased information sharing will enhance commitment of supply chain members to sustainability (Boyd *et al.*, 2007) and reduce auditing and monitoring activities thereby

reducing costs (Krueger, 2008; Pagell and Wu, 2009). Also, cooperation between focal firms and other stakeholders such as NGOs can be envisaged. Several NGOs in the area of CM try to raise awareness about the social and humanitarian issues by campaigning against irresponsible firms (Kolk and Lenfant, 2012) while others collaborate with firms to end the use of CM such as Conflict Free Sourcing Initiatives (CFSI). Such collaboration initiatives between CFSI and concerned companies involve monitoring, inspecting and providing data to help firms comply with norms and laws such as the Dodd-Frank Act (Islam and Van Staden, 2018).

5.5. Responsible Conflict Minerals Supply Chain Action Outcomes

In a conventional supply chain setting, performance is usually measured in terms of costs, flexibility, adaptability, quality and agility (Hult *et al.*, 2007) but adopting responsible SCM perspective in our SCG framework involves widening the scope of outcomes resulting from sustainability initiatives (Ahi and Searcy, 2013). Consequently, the expected outcomes of responsible CMSC initiatives would be economic and social performances that might improve from mitigating various risks in the CM supply chain. Therefore, by meeting the demands of stakeholders in the supply chain, companies improve both of risk management processes and financial outcomes. In previous studies, the outcomes of CM responsible actions were mostly underscored (Silva and Shaltegger, 2019). Therefore, economic outcomes resulting from responsible CSCM initiatives might include the indicators highlighted in numerous studies such as shareholder net value, return on investments and return on net assets (Sankara *et al.*, 2019) as well as economies resulting from mitigating social risks (Tsoulfas and Papis, 2008). We suggest adopting the same approach when it comes to measuring the economic performance of responsible CMSC actions.

For social performance, indicators will vary according to the context because measuring social outcomes involves investigating externalities such as health, safety, non discrimination, diversity and fairness (Schwartz and Carroll, 2003) all of which cannot be easily operationalized across the supply chain (Ahi and Searcy, 2013). In the context of CMSC, further difficulties in measuring social performance are related to lack of data regarding the upstream supply chain where most of the violations occur (Wilhelm *et al.*, 2016; Hofmann *et al.*, 2018) and where trust and transparency in managing such issues are lacking. Consequently, we suggest a cooperative approach in defining social performance indicators with the help of NGO involved in CM issues so a set of specific indicators depending on the context of where CM issues are occurring can be proposed.

Adopting SCG perspective of responsible CMSC initiatives will help scholars and practitioners widen the scope of their investigation and demonstrate the potential impact on the both upstream and downstream supply chains. Clarifying how these externalities occur will also help legitimize cooperation between partners in the CMSC as well as auditing and monitoring of suppliers' activities.

Based on previous premises, we present the framework of CM supply chain governance in the following figure:

(Figure 6)

Insert Figure 6 here

On the whole, our conceptualization of CM supply chain governance transcends the fragmented approach prevalent in numerous previous studies and provides a holistic approach to CMSC issues. Instead of adopting operational- strategic duality in CM supply chains analysis that several scholars have adopted (e.g. Hofmann *et al.*, 2018; Bleischwitz *et al.*, 2012), we focus on SCG lens that underlines both levels of the supply chain (intra and inter-firm). The SCG can articulate better the various stakeholders' requirements and contributes to enhance the legitimacy and accountability of the firms in CMSC. Accordingly, responsible CMSC actions target internal stakeholders (top management and shareholders) performance objectives while reacting to external stakeholders' social and environmental concerns by developing collaborative efforts to improve the initiatives that the CMSC actors conduct.

6. Conclusion

The previous sections presented and classified the literature that has addressed CMSC issues, which helped us to identify the main research clusters in the field and provide a supply chain governance framework and responsible CMSC axes. In doing so, we contribute to the discussion related to CMSC practices and provide a good foundation for researchers interested in further developing the field.

Further research can target the interactions between the mechanisms and levels of SCG, for instance how internal governance can influence external governance, the impacts on the economic and social performance and the responsible CMSC actions deployed.

The development of theory for CMSC research should capitalize on the strong connections with practice. CM companies are faced with the reality of addressing many SC challenges, and to support the development of SCM research in CM area, it is necessary to move beyond the production of conceptual and descriptive research and engage in more empirical and theory

testing, drawing from the empirical richness in the field and applying frameworks in practice. We believe that the use of mixed methodologies should become more widespread in research targeting CMSC to capture its multifaceted characteristics and externalities.

Several topics were underscored in current literature which can constitute further avenues of research. For instance, highlighting the importance of cultural factors in the context of CMSC seems to be lacking. Studies can target the buyer–supplier relationship between partners from CM areas and other continents and investigate the effects of culture on collaboration and SC integration. Likewise, linking firm culture and orientation to SC success can be proposed as a prospective research direction. To successfully implement SCG of CM, firms have to establish a cultural orientation to guide decision making both inside the firm and within the supply chain (Mello and Stank, 2005). Research on CMSC culture can draw from several theoretical frameworks such as the sub-system culture view (Powell and Butterfield, 1978) or invoking national identity (Cadden *et al.*, 2013) or cultural dimensions (Hofstede, 1991) can be useful. Our SCG framework might be adopted by future research to yield contextual theories and conceptualization of the CMSC.

While the paper's focus is theoretical and academic, our framework of responsible CMSC actions can help practitioners and decision makers to understand these issues from a wider perspective. Our review reveals how complex implementing responsible CMSC can be and the challenges implied by such initiatives. Companies involved in CM need to define their level of commitment and involvement in responsible CMSC actions because the implications of the latter might vary. Hence, some companies might be interested in developing merely internal governance mechanisms with their partners in the upstream and downstream levels of the supply chain, whereas other firms might be interested in wider cooperative initiatives with external stakeholders because concerns regarding legitimacy are more pressing. On the whole, our literature review sheds light on various dimensions of responsible CMSC and supports wider approach to such initiatives by highlighting the outcomes at the economic and social level.

This review was limited by the search capabilities of the databases and other studies may have been published in other languages or local dialects that are not indexed in the databases. Nevertheless, we feel that the review has captured a representative sample of CMSC research. Above all, this review shows the need for continued development and extension of the body of knowledge on CMSC, and in this respect it serves as the foundation for future research projects. In particular, the exact impact of the various complexities of CMSC practices in several countries requires further investigation. From the practitioner's perspective, more empirically

grounded research is needed in order to fully understand the complex nature of CMSC practices so that practical guidelines and frameworks can be developed.

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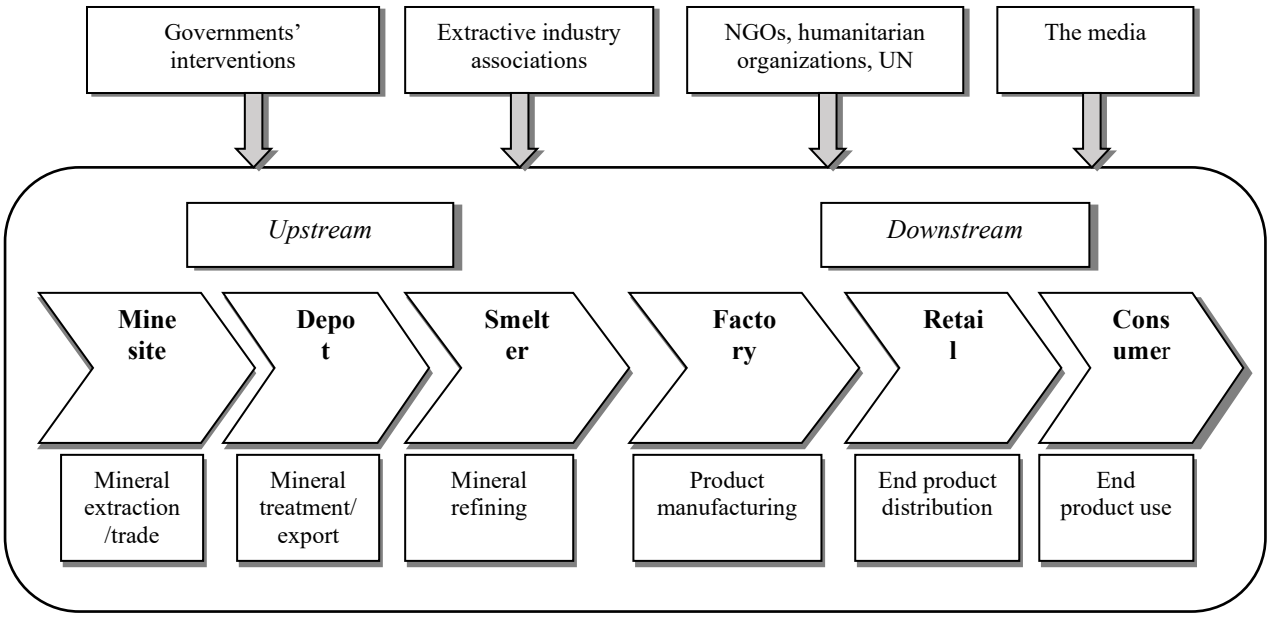
Figure 1: The conflict mineral supply chain



Source: compiled by the authors

Figure 2 The systematic literature review protocol

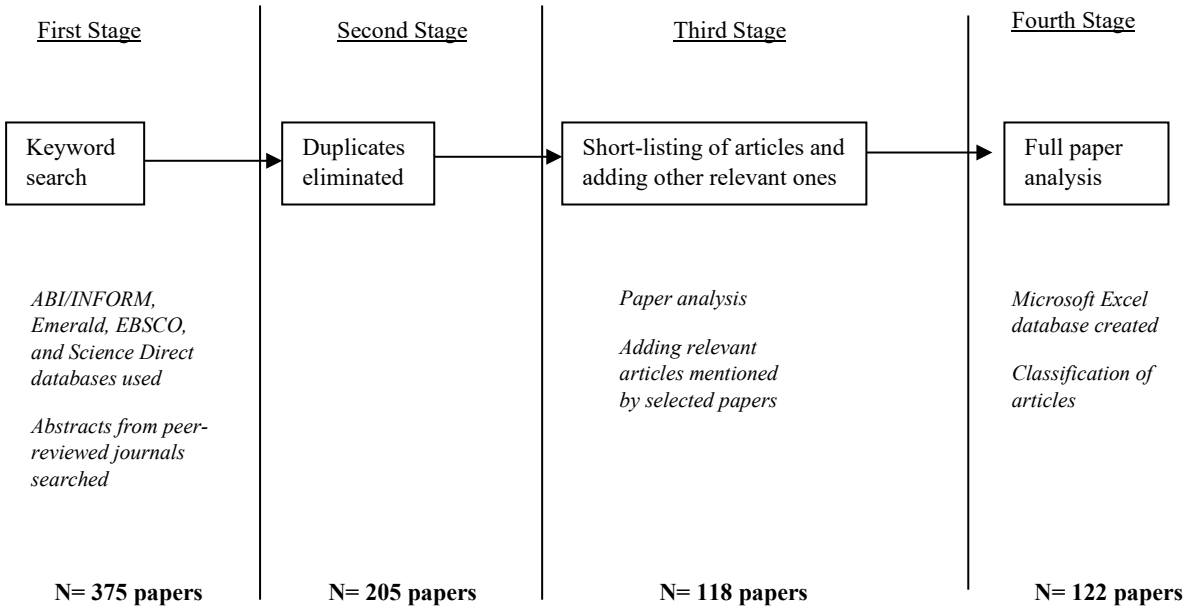


Figure 3 Categories of journals included in the literature review by number of papers

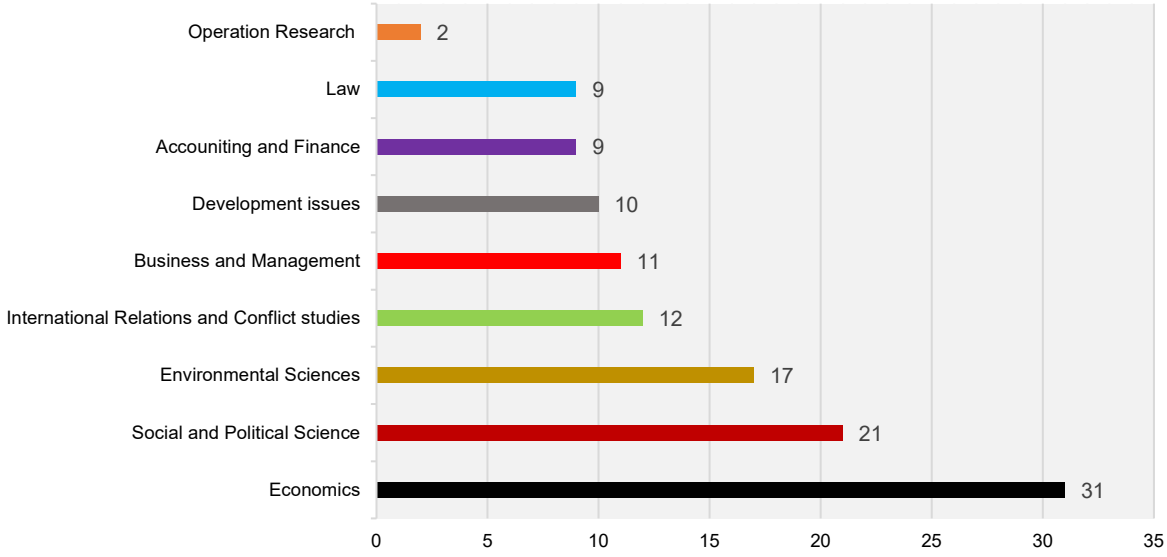


Figure 4 Publications number by chronological periods

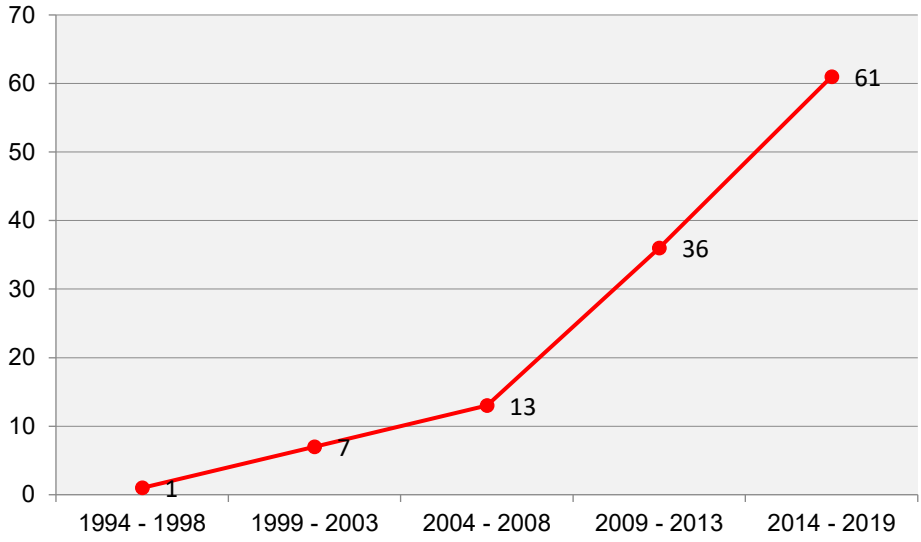


Figure 5 research clusters

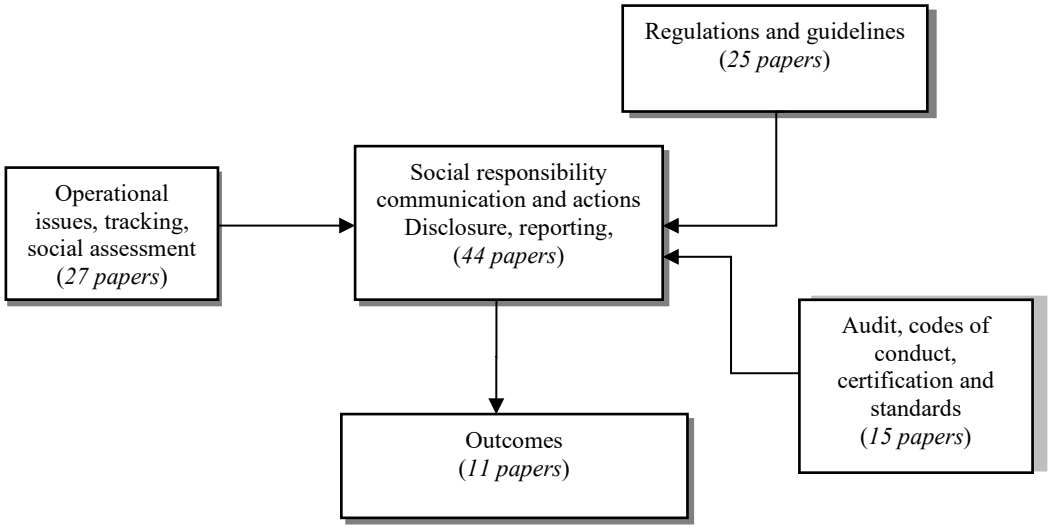


Figure 6 Conflict Minerals Supply Chain Governance

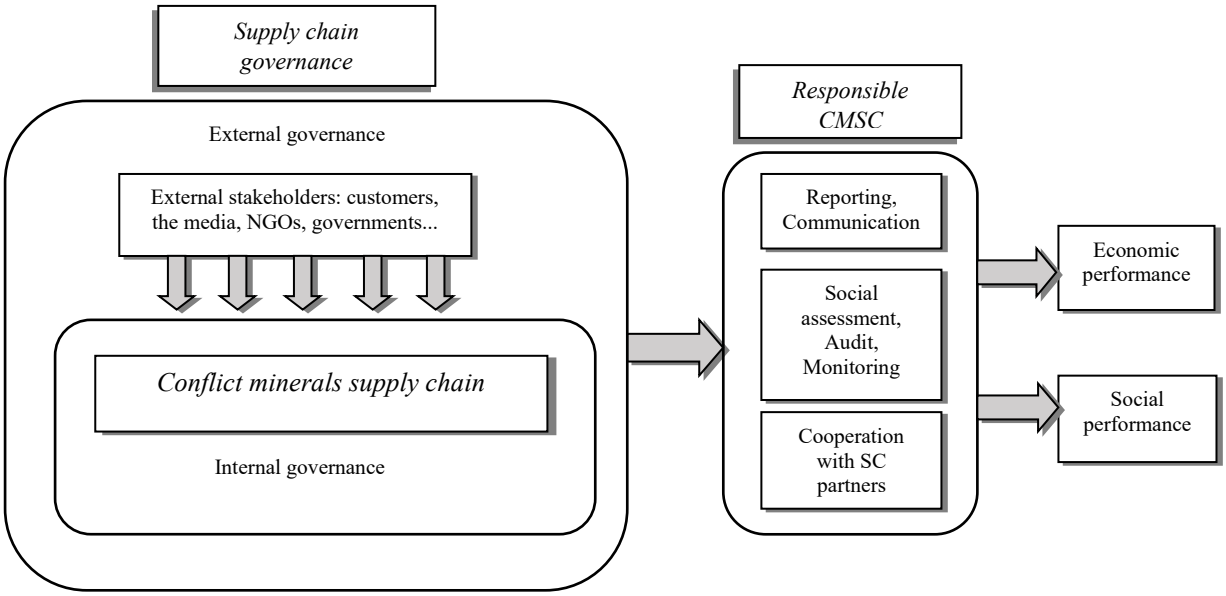


Table 1 Publications number by country

Country/region	Count	%
Africa	33	40.47
Democratic Republic of Congo	17	
Ghana	5	
Sierra Leone	3	
South Africa	2	
Central Africa	1	
Malawi	1	
Mauritius	1	
Mozambique	1	
Zimbabwe	1	
Rwanda	1	
North America	13	16.05
United States	8	
Canada	5	
Multi-countries	13	16.05
Oceania (Australia, New Guinea, New Caledonia)	7	8.64
Europe (UK, Finland, Poland)	5	6.17
South America (Guatemala, Peru, Chile)	5	6.17
Asia (Iran, China, India, Indonesia, Philippines)	5	6.17

Table 2 Publications by research methodology

Research Methodology	Number of Articles	Percent
Conceptual Papers	64	52.4%
Case Study	34	27.8%
Survey	20	16.4%
Mixed Methodologies	4	3.3%
Sum	**122**	**100%**