

# A Systematic Review of Responsible Sourcing in the Architecture, Engineering, and Construction Sectors of the UK

Sophie Ball <sup>1,\*</sup>, Colin A. Booth <sup>2</sup>, Abhinesh Prabhakaran <sup>2</sup>, Abdul-Majeed Mahamadu <sup>3</sup> and Jacqueline Glass <sup>3</sup>

<sup>1</sup> Kier Construction, 160 Aztec West, Bristol BS32 4TU, UK

<sup>2</sup> Centre for Architecture and Built Environment Research (CABER), College of Arts, Technology and Environment, University of the West of England (UWE), Coldharbour Lane, Bristol BS16 1QY, UK

<sup>3</sup> The Bartlett School of Construction and Project Management, The Bartlett Faculty of the Built Environment, University College London, 1–19 Torrington Place, London WC1E 7HB, UK

\* Correspondence: sophie.ball@kier.co.uk

**Abstract:** In recent years, responsible sourcing and procurement (including green supply chain management) across the architecture, engineering, and construction (AEC) sectors have become notable contributors to sustainable construction strategies. This study aims to provide a systematic review of responsible sourcing literature across the AEC sectors of the UK to identify a suite of opportunities and obstacles to adopting ethical and environmentally supportive practices and to highlight avenues for further investigation. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) review process was adopted to identify, screen, and select ( $n = 80$ ) articles (from 2000–2020) for review. Analysis of these articles identified the most frequently reported opportunities: (i) stakeholder value (40%); (ii) improved supply chain performance (39%); and (iii) competitive advantage (30%). The most frequently reported obstacles relating to the uptake of responsible sourcing are the following: (i) cost (44%); (ii) industry constraints (28%); and (iii) lack of frameworks/information and lack of awareness (25%). Given the industry importance of these themes, it is proposed that there is a necessity to explore and unravel the perceptions of industry experts about these issues so as to clarify the progress and possibilities for more widely adopting responsible sourcing across the AEC sector and, moreover, for clarifying their contribution towards achieving national and international sustainability targets (e.g., UN Sustainable Development Goals).

**Keywords:** responsible sourcing; responsible procurement; green supply chain management; BES6001; sustainable construction; sustainable development



**Citation:** Ball, S.; Booth, C.A.; Prabhakaran, A.; Mahamadu, A.-M.; Glass, J. A Systematic Review of Responsible Sourcing in the Architecture, Engineering, and Construction Sectors of the UK. *Buildings* **2023**, *13*, 889. <https://doi.org/10.3390/buildings13040889>

Academic Editors: Malik Khalfan and Farshid Rahmani

Received: 5 February 2023

Revised: 18 March 2023

Accepted: 20 March 2023

Published: 28 March 2023



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## 1. Introduction

The global growth and evolution of environmental awareness, particularly over the last decade have instilled a paradigm shift surrounding the interest in responsible practices [1]. This change is due to the measured environmental impacts caused by the architecture, engineering, and construction (AEC) sector's construction activities. The sector contributes around 30% of waste sent to landfill and 50% of the UK's carbon emissions [2,3]. This is compounded by social issues such as bribery and modern slavery which are prevalent within the sector. Rising publicity within the industry has shone a light on the growing incompatibility between modern construction standards and traditional practices [4]. Given that AEC sector growth may reach 70% by 2025 and the sector contributes around 7% of the UK's Gross Domestic Product (GDP), the industry's influence is clear. Still, increasing measures for the reduction of environmental impacts means the sectors must transition towards wholly sustainable construction [5]. The AEC sectors, therefore, can contribute to the global sustainability agenda, with direct influence over multiple active strategies, including the United Nations (UN) Agenda for Sustainable Development—Sustainable Development Goals and Climate Change Act [6–8].

It is widely acknowledged that environmental initiatives have increased in recent years, with these factors at the forefront of modern policy-making [9]. However, within the AEC sector, where waste, recycling, reuse, and procurement of materials used in construction have a significant environmental impact, the road to success remains unclear [10]. It has been suggested that legislation can be effective in encouraging collaborative and innovative thinking [11]. Other research has mirrored this conclusion, in that governments should consider enforcing economic penalties and rewards during policy-making to appeal to businesses profit-driven approach [12]. Nevertheless, the power of the stakeholder (clients in particular) in relation to sustainable practices should not be ignored. Organisations have been forced to react, shifting behaviours through revolutionising design and building supply chains to respond to ethical, environmental, and social issues [13]. This step towards transparent, accountable working is well documented within research, highlighting opportunities including competitive advantage, staff retention, and customer loyalty [14–16]. Responsible practice also allows for effective supply chain management, with companies engaging in higher levels of performance where they have a greater dependency on stakeholders [17]. Though, it should be noted that decision-making surrounding sustainable construction can be complicated by the diverse actors in a supply chain [18]. To manage supply chain performance, responsible sourcing has been proposed as a solution to aid the achievement of sustainable construction.

Responsible sourcing is a system of environmentally sympathetic purchasing, where materials are of certified provenance. This is primarily evidenced through procurement strategies, in which organisations evidence their supply chains' ethical and environmental processes [19]. One such standard is BES6001, a points-based framework coined by the Building Research Establishment which assesses the organisation and supply chain management functions to verify materials derivation [20]. The use of responsible sourcing has been researched and the following opportunities identified: positive brand image [21], reduction in waste [22], cost savings over the life cycle [17], higher quality delivery [23], and improved risk management [24]. Obstacles to responsible sourcing include capital upfront investment (cost) [25], outsourcing [26], risk, time [27], complex quality management [28], a lack of awareness and training, and an abundance of industry-specific challenges [29]. The opportunities and obstacles of responsible sourcing contribute to an organisation's motivations to engage with pro-environmental behaviours, which is crucial as the industry strives to reduce environmental degradation and meet targets surrounding waste and carbon footprints, often outlined in construction policy-making.

Previous research focuses primarily on a singular challenge or opportunity for responsible sourcing. To date, there is limited research on the topic of responsible sourcing and BES6001, with few studies covering this topic over the last decade. In order to stimulate the improvement of responsible sourcing across the AEC sector, it is crucial that the extent of opportunities and obstacles are defined. The aim of this study is, therefore, to provide a systematic review of responsible sourcing literature across the AEC sectors to identify a suite of opportunities and obstacles to adopting ethical and environmentally supportive practices and highlight avenues for further investigation. The structure of this article commences with background information derived from the literature surrounding the research topic (with a focus on responsible sourcing and BES6001) and an outline of the research method utilised in this study. The literature is then categorised and analysed, and a discussion ensues, before concluding with a list of recommendations for future research. The following section presents the methods chosen for this study and a step-by-step approach to the research.

## 2. Methodology

Systematic reviews utilising Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) have previously been used effectively [30]. Therefore, a comprehensive review of existing responsible sourcing literature followed the PRISMA evidence-based transparent, and complete reporting process to provide a suite of opportunities and

obstacles to responsible sourcing. Whereby, extant articles are identified, screened, and checked for eligibility before inclusion in a systematic or structured review (Figure 1). For this study, the literature was restricted to peer-review journal papers, reviews, conference papers, and, book, chapters [31]. This approach was utilised to ensure validity in the research considered—however, the study utilises conference papers and book chapters as research into responsible sourcing is currently limited.

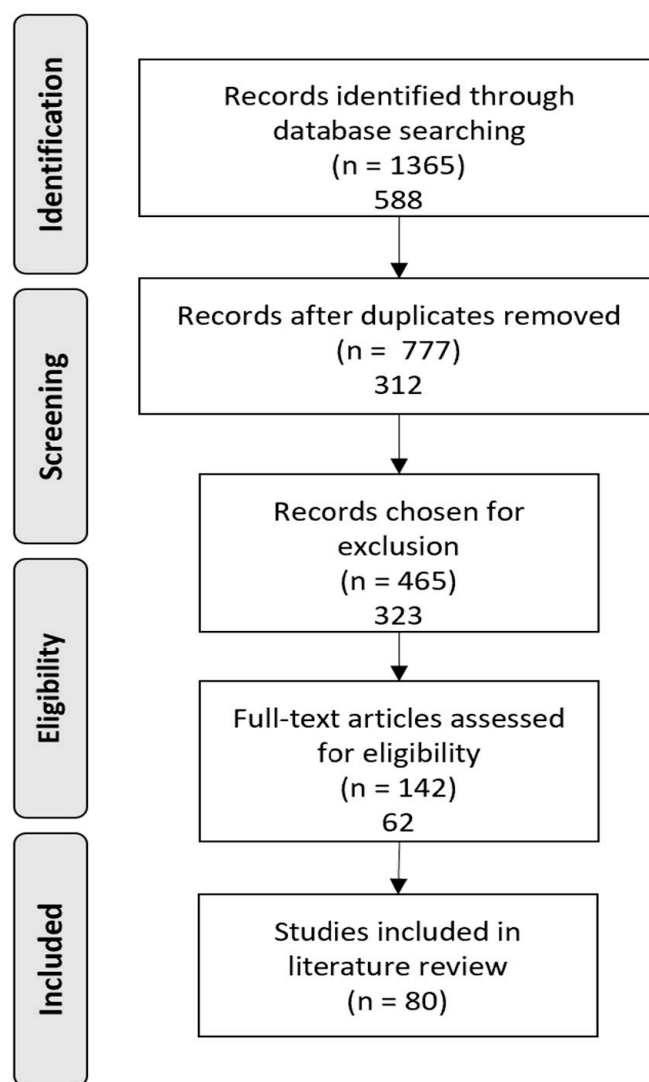


Figure 1. PRISMA Flow Diagram of Literature Search and Selection Process.

Web of Science and Scopus were chosen to cover a variety of different discipline areas (such as engineering, business, and social science). For this research, two databases were used to yield a reasonable number of articles to consider as current research into the topic is limited. The search was limited to common phrases or keywords (such as responsible sourcing, sustainable supply chain, green supply chain, BES and 6001) within fields (such as architecture, engineering, and construction). The literature search was constrained to articles from 2000 to 2020 (years inclusive). Only works published in the English language were chosen. RE reports, documents, and website articles were excluded due to the unknown validity of the research presented in this format. The typical code used to search the databases was: TITLE-ABS-KEY (“responsible sourcing”) OR (“sustainable supply chain”) OR (“BES6001”) OR (“supply chain management”) AND (“construction”) OR (“engineering”) OR (“architecture”) OR LIMIT-TO (DOCTYPE, “re”) OR LIMIT TO (DOCTYPE, “cp”) OR LIMIT-TO (DOCTYPE, “ch”) AND (LIMIT-TO (SUBJAREA, “busi”)

OR LIMIT-TO (SUBJAREA, "engi") AND (LIMIT-TO (LANGUAGE, "English") AND (PUBYEAR AFT 2000)).

As this study seeks to compile lists of the opportunities and obstacles that previous authors have already identified, all publications and reports were screened and checked. Content analysis was used to scrutinise and synthesise those publications selected for inclusion in the review. Scientometric analysis was used to objectively measure and map the status quo of the understanding and evolution of the knowledge structure to facilitate an understanding of AEC's responsible sourcing literature. VOSviewer software (version 1.6.17) was used to construct and visualise the bibliometric networks, where the distance between two nodes approximately indicates the relatedness of the nodes (i.e., strongly related nodes are located close and vice-versa). Nodes are positioned in a two-dimensional space within a network of clusters, with colours used to indicate the cluster to which a node has been assigned and font size to indicate the strength of the recurrence [32,33]. As VOSviewer traditionally utilises a single database and automatic processes, and due to the topic of this study returning a narrow amount of results using a single database, the records were inputted manually to allow for specific results in relation to the papers included within this study (from Web of Science and Scopus).

### 3. Results

The outcome of the article searches and the findings from their analysis are presented below, under four main sections: (i) identification and selection of articles; (ii) classification of articles (iii) article sources; (iii) co-occurrence of countries; and (iv) co-occurrence of keywords.

#### 3.1. Identification and Selection of Articles

The initial literature search generated 1365 articles. Following screening, to remove irrelevant articles, duplicates, and literature outside the scope of this research, the relevance and area of the research were considered (Figure 1). The final articles ( $n = 80$ ) chosen for inclusion in this study are shown in full classification (Table 1). The number of publications relating to responsible sourcing and green supply chain management has increased over the last decade with 68% of articles within this study being post-2010 ( $n = 54$ ) and all articles chosen for this study were published post-2000 (Figure 2). The articles were primarily journal articles ( $n = 63$ ) with the remaining articles noted as conference papers and book chapters ( $n = 17$ ). The top ten cited articles included in the study are shown in Table 2. The top publications totals 31,262 previous citations.

**Table 1.** Classification of the responsible sourcing publications used in this study.

No.	Year	Country/District	Type of Publication	Evaluation Methodologies	Authors
1	2020	Brazil	Journal Paper	Survey and Lit Review	Silva and de Figueiredo
2	2020	UK	Journal Paper	Model or process	Zarei et al. [34]
3	2019	USA	Journal Paper	Survey	Chen et al. [17]
4	2019	UK	Journal Paper	Survey	Krueger et al.
5	2019	UK	Conference Paper	Semi-structured Interviews	Iles and Ryall [35]
6	2019	Oman	Journal Paper	Survey	Al-Sheyadi et al. [36]
7	2019	UK	Conference Paper	Semi-structured Interviews	Hughes et al.
8	2019	UK	Journal Paper	Literature/Framework	Van Den Brink et al.
9	2019	Australia and NZ	Journal Paper	Framework	Taghikhah et al. [37]
10	2018	UK	Journal Paper	Systematic Literature Review	Bastas and Liyanage [38]
11	2018	China	Journal Paper	Case Study	Zeng et al.
12	2017	UK	Journal Paper	Case Study	Nasir et al. [39]
13	2017	India	Journal Paper	Systematic Lit Review	Sivraprakasam et al.
14	2017	UK	Journal Paper	Survey and Lit Review	Dunant et al.
15	2017	Australia and NZ	Conference Paper	Survey	Lim and Loosemore
16	2016	UK	Journal Paper	General assumptions	Agrawal and Lee [29]
17	2016	UK	Journal Paper	Model and Literature	Guo et al. [24]

Table 1. Cont.

No.	Year	Country/District	Type of Publication	Evaluation Methodologies	Authors
18	2016	UK	Journal Paper	Survey	Upstill–Goddard et al. [40]
19	2016	UK	Journal Paper	Survey and Interviews	Brooks and Rich [18]
20	2016	UK	Journal Paper	Survey	Chavez et al. [41]
21	2016	USA	Journal Paper	Semi-structured Interviews	Langwell and Heaton [42]
22	2016	USA	Book Chapter	General assumptions	Yates et al. [43]
23	2015	UK	Journal Paper	Systematic Lit Review	Zorzini et al.
24	2015	UK	Journal Paper	Case Study	Dadhich, et al.
25	2015	UK	Conference Paper	Model and Process	Upstill–Goddard et al. [44]
26	2015	UK	Journal Paper	Quantitative analysis	Meckenstock et al. [45]
27	2014	Slovenia	Journal Paper	Case Study	Cus–Babic et al.
28	2014	Indonesia	Journal Paper	Model	Kursini et al.
29	2014	UK	Journal Paper	Model and Process	Finster and Hernke [9]
30	2014	Nigeria	Conference Paper	Survey	Ojo et al. [46]
31	2014	UAE	Journal Paper	Literature Review/Framework	Balasubramanian
32	2013	UK	Journal Paper	Survey	Williams and Schaefer [47]
33	2013	UK	Journal Paper	Cross-sectional study	Hoejemose et al. [48]
34	2013	UK	Journal Paper	Survey	Osmani and Young
35	2013	India	Journal Paper	Literature/Framework	Luthra et al.
36	2013	UK	Journal Paper	General Assumptions	de Colle et al.
37	2013	USA	Journal Paper	General Assumptions	Perera and del Pino [49]
38	2012	UK	Conference Paper	Literature/Framework	Upstill–Goddard et al. [28]
39	2012	UK	Journal Paper	Survey	Glass et al. [12]
40	2012	Europe	Journal Paper	Systematic Lit Review	Giunipero et al. [50]
41	2012	UK	Journal Paper	Systematic Lit Review	Glass
42	2012	UK	Journal Paper	Survey and Lit Review	Ageron et al. [51]
43	2012	UK	Journal Paper	Survey	Glass et al. (1) [19]
44	2012	UK	Journal Paper	Case Study	Lou et al. [52]
45	2012	UK	Journal Paper	Semi-structured interviews	Williams
46	2011	UK	Conference Paper	Survey	Ghumra et al. [53]
47	2011	UK	Conference Paper	Case Study	Glass (1) [10]
48	2011	UK	Book Chapter	Survey	Harwood, Humby et al. [54]
49	2011	Hong Kong	Journal Paper	Model or process	Xue, et al. [55]
50	2011	UK	Conference Paper	Survey	Glass et al. (2) [56]
51	2011	UK	Journal Paper	Survey	Meehan and Bryde
52	2011	Taiwan	Conference Paper	Survey	Chiou et al.
53	2010	USA	Journal Paper	Survey	Becerik–Gerber and Rice [57]
54	2010	UK	Journal Paper	Survey	Park–Paops and Rees
55	2009	UK	Journal Paper	Survey	Baden et al.
56	2009	Sweden	Journal Paper	Survey	Gluch et al. [58]
57	2009	Taiwan	Conference Paper	Model	Chen and Sheu [12]
58	2008	UK	Journal Paper	Delphi Study	Seuring and Muller
59	2008	UK	Book Chapter	General Assumptions	Epstein
60	2008	Brazil	Journal Paper	Survey and Lit Review	Gavranski et al. [59]
61	2007	UK	Journal Paper	Survey and Interviews	Revell and Blackburn [22]
62	2007	USA	Journal Paper	Literature Review	Falck and Hebllich [14]
63	2007	USA	Journal Paper	General assumptions	Boyd et al.
64	2006	USA	Journal Paper	Model and Lit Review	Mustow [60]
65	2004	UK	Journal Paper	Systematic Lit Review	Paramanthan et al. [61]
66	2004	UK	Journal Paper	General Assumptions	Christopher and Peck [21]
67	2003	UK	Journal Paper	General Assumptions	Azapagic
68	2003	UK	Conference Paper	Literature Review	Zhou and Lowe [11]
69	2003	Australia and NZ	Journal Paper	Survey	Vee and Skitmore [62]
70	2002	UK	Journal Paper	Survey and Lit Review	Carter and Jennings
71	2002	USA	Journal Paper	Model or Process	Zahra and George
72	2001	UK	Book Chapter	Survey	Bowen et al. [63]
73	2001	UK	Conference Paper	Case Study	Khoo et al. [26]
74	2001	Europe	Journal Paper	Literature/Framework	Rohracher [64]
75	2000	UK	Journal Paper	Survey	Akintoye et al. [25]
76	2000	Europe	Journal Paper	Case Study	Vrijhoef, Koskela

Table 1. Cont.

No.	Year	Country/District	Type of Publication	Evaluation Methodologies	Authors
77	2000	Singapore	Journal Paper	Case Study	Ofori [65]
78	2000	UK	Journal Paper	Case Study	Lambert and Cooper [13]
79	2000	UK and Japan	Journal Paper	Survey and Lit Review	Bansal and Roth [66]
80	2000	UK	Journal Paper	Model or Process	Spence and Rutherford

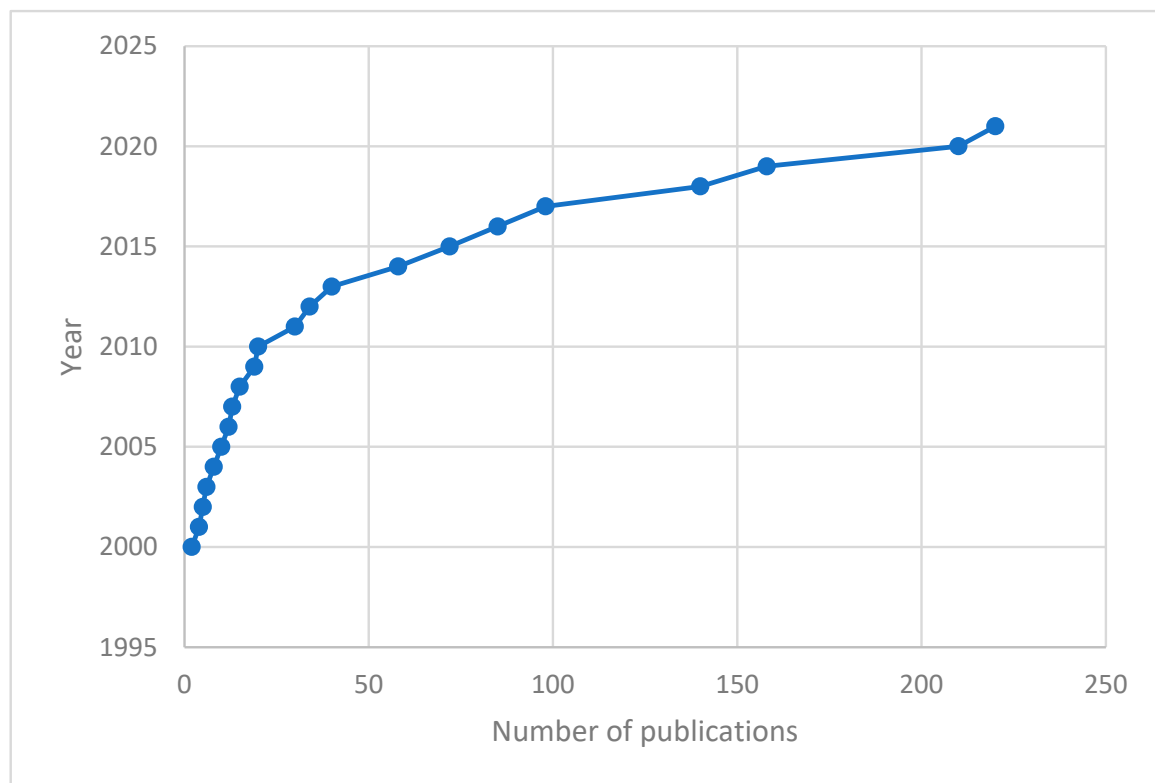


Figure 2. Annual number of scientific articles published between 2000 and 2020.

Table 2. Top 10 citations for the responsible sourcing publications used in this study.

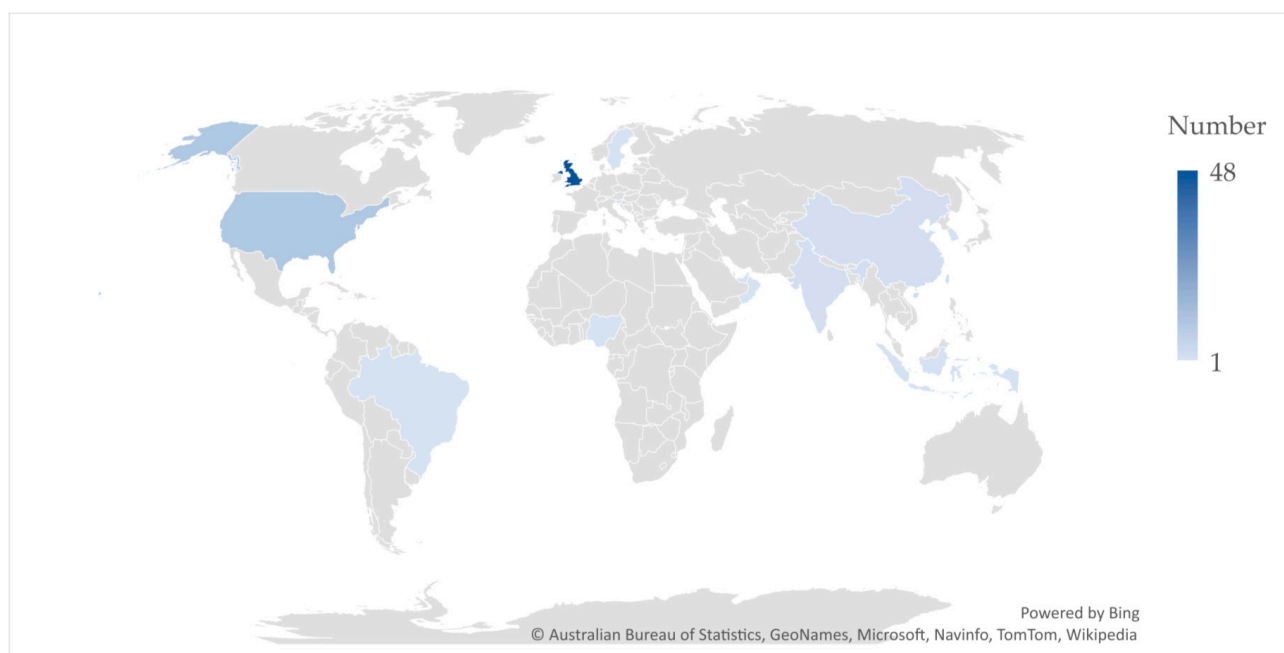
No.	Year	Authors	Citations
71	2002	Zahra and George	13,123
78	2000	Lambert and Cooper [13]	4482
79	2000	Bansal and Roth [66]	4475
66	2004	Christopher & Peck [21]	3010
59	2008	Epstein	2045
76	2000	Vrijhoef, Koskela	1160
42	2012	Ageron et al. [51]	840
52	2011	Chiou et al.	774
58	2008	Seuring and Muller	682
75	2000	Akintoye et al. [25]	671
		TOTAL	31,262

### 3.2. Co-Occurrence Countries

As shown in Figure 3, the majority of articles have a UK–industry–focussed approach ( $n = 48$ ), with others including Australia, USA, Brazil, Hong Kong, India, Indonesia, Singapore, Slovenia, Sweden, and UAE ( $n = 32$ ). These articles were reviewed to identify key themes to ascertain the opportunities and obstacles to the use of responsible sourcing as a procurement mechanism within green supply chain management.

### 3.3. Co-Occurrence of Keywords

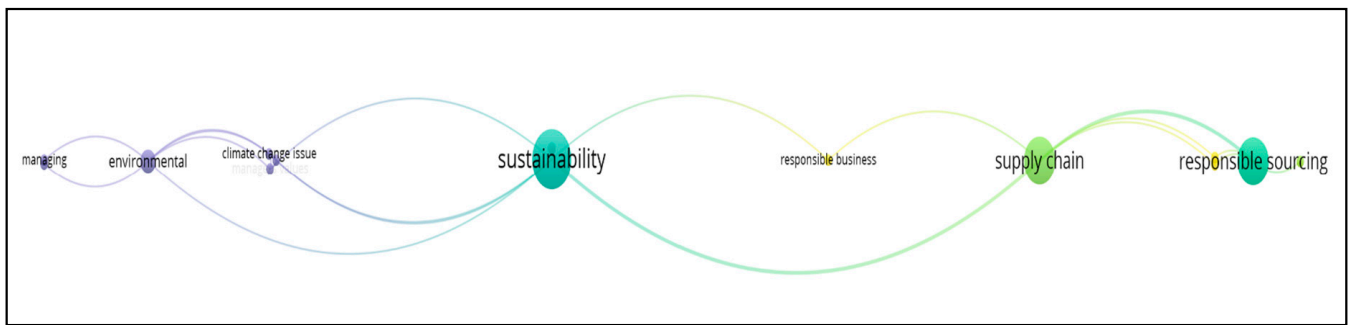
It has been noted previously that keywords can be used to provide a concise description of the content. Thus, a network of keywords can be used to depict knowledge, and relationships between keywords can evidence the overlapping knowledge base provided by researchers (Sue and Lee, 2010). Using VOSviewer, “Author Keywords” and “Fractional Counting” filtered to 8 and 3 respectively recurring throughout the literature chosen for this study [67]. The node size and connecting lines between the keywords are recurring throughout the articles on responsible sourcing. Each cluster is presented in different colours, and keywords within the same cluster are linked with each other strongly. These figures (Figure 4a,b) highlight those keywords such as sustainability, are strongly linked with supply chain, construction, and responsible sourcing—reinforcing that the literature chosen for this study is appropriate to address the aim.



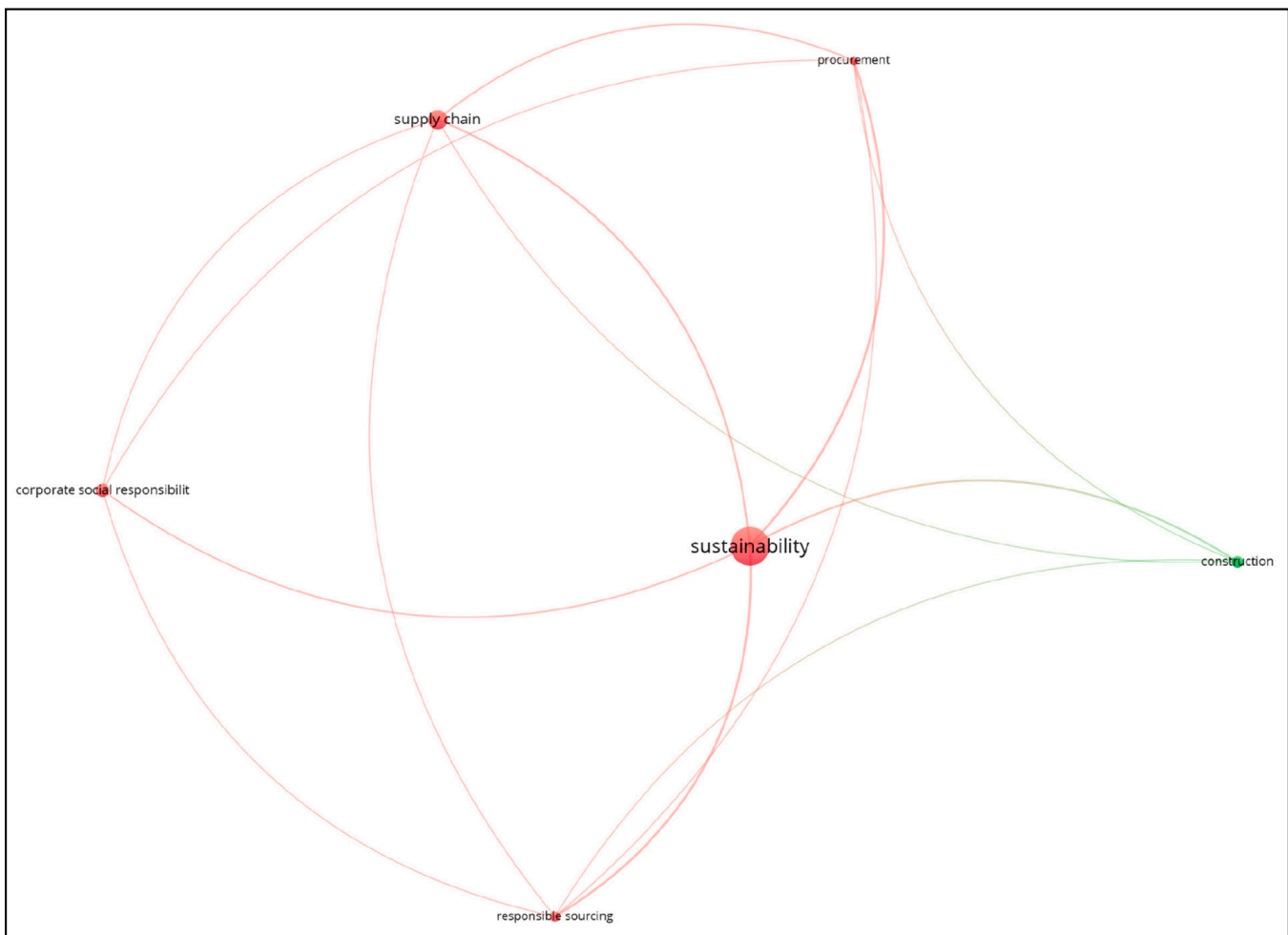
**Figure 3.** Co-occurrence network of countries where articles on responsible sourcing in the AEC sectors have been published (from 2000–2020).

### 3.4. Classification of Articles

The potential interest and the drivers and limitations of green supply chain management and responsible sourcing have been researched continually over the last decade, with increasing traction in terms of business interest in the practicalities of changing traditional processes. This review focuses on the opportunities and obstacles of utilising responsible sourcing (with a focus on BES6001), drawing from literature within this area and those providing a more general overview of corporate social responsibility and green supply chain management. From a review of the full suite of literature, articles were analysed thematically to identify and categorise the opportunities and obstacles of responsible sourcing. Themes were identified, and the occurrences were quantified. Figure 5 shows the main opportunities identified by previous researchers. Those most often noted by the literature review are (i) stakeholder value (40%), (ii) improved supply chain performance (39%), and (iii) competitive advantage (30%). Figure 6 highlights the highest-reported obstacles relating to the use of responsible sourcing as (i) cost (44%), (ii) industry constraints (28%), and (iii) lack of frameworks/information and lack of awareness (25%).



(a)



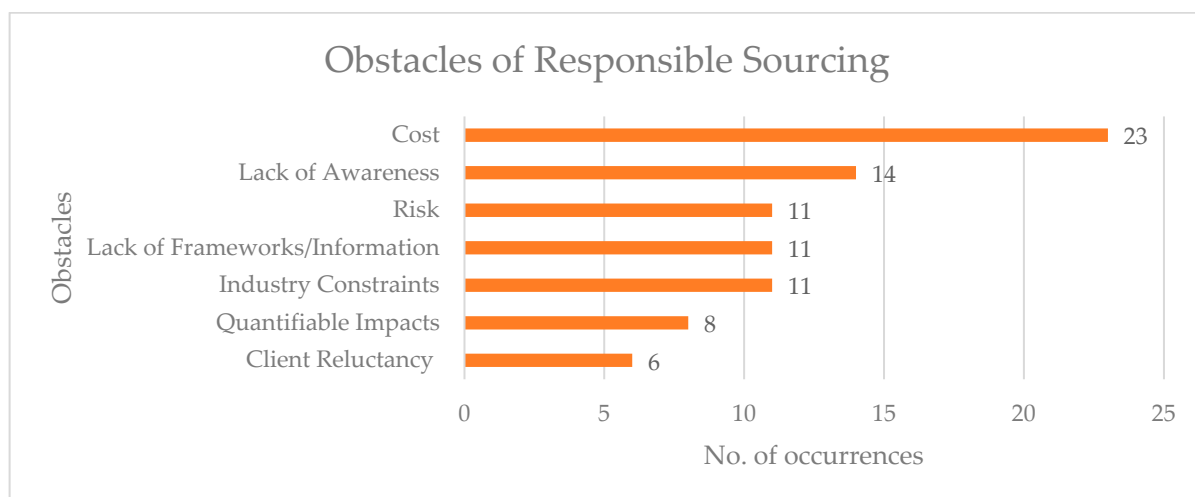
(b)

**Figure 4.** (a) Co-occurrence network of keywords presented in articles on the responsible source in the AEC sectors (from 2000–2020). (b) Co-occurrence network of keywords presented in articles on the responsible source in the AEC sectors (from 2000–2020).





**Figure 5.** This shows the opportunities ( $n = 7$ ) provided by responsible sourcing and the frequency of their reporting in the AEC publications ( $n = 80$ ) used in the literature review.



**Figure 6.** This shows the obstacles ( $n = 7$ ) to responsible sourcing and the frequency of their reporting in the AEC publications ( $n = 80$ ) used in the literature review.

#### 4. Discussion

This section aims to contextualise the findings within the AEC sector and analyse the most reported opportunities and obstacles to organisations utilising responsibly sourced materials.

##### 4.1. Opportunities for Responsible Sourcing

Despite noted improvements in perceptions of sustainable construction and responsible sourcing, the AEC industry maintains that short-term solutions outweigh long-term gains [68]. Nevertheless, the integration of green supply chain management and responsible sourcing can produce self-sustaining economic systems [39]. The literature review notes the three highest reported opportunities as stakeholder value, competitive advantage, and improved supply chain performance which this section will examine in further detail.

Innovative management processing in a proactive manner produces robust client-organisation relationships [58]. Park, Lee, and Kim also emphasised that firms' reputations are improved through palpable action rather than vague communication, thus evidencing responsibly sourced products demonstrating reactions to stakeholder requirements [69]. Growing demands for sustainable behaviours are determinant forces in supply chain

management, overcoming the traditional obstacle of client reluctance [57]. Ageron surmised that management and stakeholder opinions were strong influencers over sustainable supply chain management [51]. Capital cost is highlighted as an obstacle to responsible sourcing [29,63]. This view is expressed chiefly by organisations that do not utilise responsible sourcing [35]. Though the perception of value for stakeholders remains problematic, negative opinions can be mitigated through effective risk management, which reduces conflict between traditional procurement methods and social responsibility to maximise profitability [34,54].

Organisations can also generate client belief and enhance future project bids, by creating collaborative and flexible management processes [70]. The construction industry is a complex and diverse market, and the impact of global agendas and legislation has instigated a shift to increase productivity, value, and quality. Sustainable thinking is driving organisations to assess the viability of current practices, to maintain their resilience in a changing market. Integral to the performance of organisations, Bastas and Liyanage allude to synergies between quality delivery and supply chain performance [38]. Ofori mirrors this, linking complex supply chain networks and their performance to the competitiveness of AEC organisations [65]. Organisations should strive for alliances within their supply chains to develop a seamless process from material procurement to delivery [13]. The use of responsible sourcing creates supply chains with efficient resource use, and green supply chain management enables the reduction of waste and control of harmful substances [29]. Chavez et al. suggested that by effectively managing the supply chain, an organisation can improve delivery, quality, and cost [41]. This is a result of the regular supply chain reviews required for responsible sourcing, which produce proactive material management [55].

In response to external pressures, such as growing concern over carbon emissions, waste, and water production, the industry continues to compete to be viewed as a positive influence on both the physical environment and the communities within which they operate. Through the practice of responsible sourcing, organisations can yield increased access to clients. Competitive advantage as an opportunity of pro-environmental behaviours were identified by Bansal and Roth and mirrored by Revell and Blackburn [22,66]. Responsible sourcing of products results in effective risk management, efficient supply chains and reductions in conflicts and trade-offs, therefore balancing social responsibility and traditional procurement [44]. Thus, responsible sourcing has also been associated with heightened profitability and competitive advantage [1,53]. Hojmosse et al. and Cohen and Robbins also documented organisations' responsible sourcing decisions in yielding competitive advantage [15,48]. Similarly, Vee and Skitmore suggest that ethical behaviours drive the organisational achievement of sustainability-related goals [62]. Furthermore, Ofori noted the importance of supply chain management to improve performance and competitiveness across AEC organisations [65]. This is mirrored within Ball et al. with responsible sourcing being linked to increased innovation, collaboration, and supply chain performance across AEC organisations [71]. Consequently, when considering the overall value of responsible sourcing and its contribution to multiple facets of an organisation's performance indicators, responsible sourcing can be connected with heightened profitability and competitive advantage.

#### *4.2. Obstacles of Responsible Sourcing*

Whilst sustainable development allows prioritising lifestyles in harmony with nature there remains disillusion surrounding responsible behaviours [7]. As previously identified, the most commonly reported obstacles were cost, industry constraints, and a lack of frameworks and awareness. Throughout this section, these aspects will be explored in more detail.

More recently, profit is seen as an advantage of adopting sustainable practices, through the improvements exhibited within quality, delivery, and supply chain performance [36]. However, it can also be viewed as an obstacle. Budgets often control the viability of a project, and the value of responsible sourcing and green supply chain management can be difficult

to envisage [50]. To successfully implement responsible sourcing, organisations must have support from both upstream and downstream aspects of the supply chain [45]. In addition to this, corporate sustainability and procurement processes tend to have conflicting goals, usually as a result of poor communication and incompatible approaches [49]. To avoid trade-offs, sustainability should be approached centrally through an organisation [24]. It has been noted that sustainability initiatives have short-term financial pain, which dependent on the size of the business, economies of scale can be utilised to produce positive outcomes within a shorter time period.

As the AEC sector moves towards sustainable construction, there remains a challenge surrounding culture. Historically, the AEC sector has been catalogued as harming both the environment and the communities it operates within. Researchers also noted stubbornness throughout workforces as an obstacle to responsible practice and the state of supply chain collaboration has also been linked to workplace culture [25,61]. It has been suggested that companies should appeal to values within employees to instil change, thus overcoming the industry culture issues with sustainable policies [42]. Williams and Schaefer mirror this assertion, that the personal beliefs and morals of employees should be acknowledged when considering what practices to adopt [47]. The integration of responsible sourcing into Building Information Modelling has also been suggested as a solution to overcome industry inertia. By enabling the AEC sector to choose responsibly from the design stage and by utilising product information within 3D modelling software, organisations can streamline responsible material procurement [71].

Taghikhah et al. [37] evaluated the evolution of sustainable supply chains and identified that processes are still largely focused on consumer behaviour. This means that whilst organisations aim for sustainable practice, there is a requirement to educate their entire supply chains to improve performance and introduce responsibly sourced alternatives [59]. Upstill-Goddard et al. [44] suggested that organizational learning improves company focus, and when paired with additional specialist resources, employees can assimilate knowledge to emulate responsible practice. This is also noted by Russell et al. [6] posing that educational reform through training and standardisation can improve responsible behaviours. However, it should be acknowledged that the nature of smaller business models, for instance, lack of funds, size, or operating procedures means that attracting and/or retaining a specialist workforce can be challenging [43,61].

The AEC sector has a requirement to alter traditional outdated practices to respond to challenging industry requirements [9]. Research has indicated that a lack of knowledge and poor commitment from top management means that legislation may be necessary to facilitate change across the AEC sector [40,46]. With this in mind, researchers have noted the impact of legislation in creating a consistent approach that can encourage innovation, and a positive ethos integrating smart sustainable decision-making to maximise competitive opportunities is emulated by numerous CSR studies [11,72–74]. A common theme throughout the literature was also the lack of established and reliable information on responsible sourcing between designers and consumers [64]. It has been acknowledged that developing sustainable and innovative solutions to the environmental impacts of the AEC sector is complex, regardless of the size of the organisation [52]. This lack of guidance and frameworks means that organisations struggle to identify areas for improvement within their respective management systems [56]. Responsible sourcing, and BES6001 in particular, has been proposed as a solution because of the structured and transparent requirements for certification [8,75]. Through certification, accurate and up-to-date product information is provided, thus debunking inconsistent perceptions, and producing a tangible measurement of the reduction of environmental impacts [60].

The research analysed within this review adopts a variety of methods, with the majority drawing on qualitative research functions such as surveys, interviews, and case studies. The literature also presents findings and recommendations for analysing processes, determining models for behaviours, and previous reviews of relevant literature. This range of approaches enables this study to analytically collate and validate opportunities and

obstacles for sustainable behaviours to strengthen the approach to responsible sourcing across the AEC sector effectively and analytically.

## 5. Conclusions

Responsible sourcing (BES6001 in particular) provides an analytical and sustainable approach to the use of construction materials across an industry that holds focus as global agendas attempt to rationalise demand and human influence over the planet. Legislation, political aspirations, and stakeholder requirements are driving toward sustainable development, the AEC sector must adapt. However, responsible sourcing practice remains sluggish, as all aspects of the supply chain must invest. Therefore, it is imperative that organisations promote behaviours, maintain transparency, and evidence their true economic impacts to encourage responsible procurement. This may, in turn, reinforce the value of sustainable manufacturing and production.

This systematic literature review has presented an overview of previous studies of responsible sourcing, by drawing from relevant research over the past two decades. This review is presented to provide a clear indication of the previously identified opportunities and obstacles to responsible sourcing within others' research and can be built upon to formulate recommendations for the adoption of responsible sourcing within the sector, and the potential adjustment of national policy to engage the AEC sector in responsible behaviours. The researchers could have increased the study period—for example, before 2000; however, the relevance of articles may not have provided timely data. The main findings of this research outline a suite of main opportunities and obstacles to responsible sourcing within the AEC sector. The most reported opportunities were stakeholder value, improved supply chain performance, and competitive advantage. Conversely, the main obstacles were cost, industry constraints, and lack of frameworks/information and awareness.

Previously, similar research (in terms of scope and method) has been utilised to shape and determine areas for improvement concerning the AEC sector, and the measurable impacts of construction on the natural, social, and economic landscapes of the world. The use of responsible sourcing demonstrates opportunities for organisations, to contribute to their objectives in relation to all aspects of sustainability (social, environmental, and economic). The driving force of stakeholder expectations, political agendas, and employee morals has enabled organisations to strive towards strategic processing throughout all aspects of the supply chain. This research, aligning with those within the review, notes responsible sourcing as a solution to environmental degradation, compliance with standards, and overall supply chain performance. As this research is a review of previous literature, the practical applications should be considered, for instance, the implementation of mandatory certification for specific construction products, or the alteration of national policy to improve compliance with standards such as BES6001. Thus, the following recommendations are made:

- Examine perceptions of responsible sourcing and its uptake from a pool of suitable professionals within the AEC industry,
- Clarification of the challenges faced by the industry's SMEs and their use of schemes such as BES6001, and
- Scrutinise the measurable indicators of responsible sourcing and their performance against the indicators of the SDGs.

Throughout this study, it has been highlighted that whilst the AEC sectors remain a complex network of consultants, clients, and contractors plus their supply chains, responsible sourcing is gathering value. In the short term, organisations should aim to be strategic in their method of responsible sourcing, making integrated and smart decisions that their supply chains can easily achieve. Through this, organisations can move towards a collaborative, innovative approach to material selection, yielding tangible opportunities across all areas of the supply chain. This focused strategy will enable organisations to achieve the expectations of clients and policymakers alike to produce sustainable construction practices.

**Author Contributions:** Conceptualization, S.B. and C.A.B.; methodology, S.B. and A.-M.M.; software, S.B.; validation, C.A.B., A.P. and J.G.; formal analysis, S.B.; investigation, S.B.; resources, S.B.; data curation, S.B.; writing—original draft preparation, S.B.; writing—review and editing, S.B., C.A.B., A.P., J.G. and A.-M.M.; visualization, S.B.; supervision, C.A.B., A.P., A.-M.M. and J.G.; project administration, S.B. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

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