



# Reinvigorating research on sustainability reporting in the construction industry: A systematic review and future research agenda

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## ABSTRACT

This study investigates sustainability reporting (SR) in the construction industry, which is vital to achieving sustainable development goals. Despite extensive research on sustainability practices, scant attention has been paid to SR, a crucial channel for communicating and managing sustainability performance. Aiming to advance SR research, this study systematically reviews 150 articles on the topic in 73 journals. The review reveals significant knowledge gaps and methodological limitations, highlighting the need for a more diversified theoretical lens for evaluating the complex nature of SR. The investigation identifies four study themes: assessment and indicators, determinants, strategic management, and outcomes of SR. The review offers a comprehensive analysis of the current literature and presents an integrated framework that encompasses sustainability attributes and reporting in the construction sector. The study's contributions include directions for future research and practical implications for managers and policymakers that can support the transition toward sustainable development in the construction industry.

## 1. Introduction

Resource depletion, environmental deterioration, and social unfairness have sparked concern for a more sustainable society and economy (Else et al., 2022; Gu & Wang, 2022; Higgins et al., 2020). Corporate sustainability has become a strategic priority for many companies worldwide, forming a burgeoning sustainability consciousness (Jones et al., 2010). Although academics and practitioners suggest that sustainable construction is critical as it will influence the urban future (Araújo et al., 2020; Christofi et al., 2021), there is still considerable ambiguity around the topic and a lack of research on the integration of sustainability approaches and measuring, monitoring, and reporting practices (Glass, 2012). To understand this better, an assessment of sustainability reporting (SR) studies in the construction industry is needed.

Stakeholders increasingly demand accountability, transparency, and stakeholder involvement from enterprises in demonstrating their contributions to a sustainable society (Cooper & Owen, 2007). Through SR, organizations communicate their beliefs, activities, and performance around sustainable development goals (SDGs) (Joseph, 2012). Calls for

societal transformation to sustainability urge corporate decisionmakers to improve SR, a direct antecedent to and proxy for actual sustainability behavior (Myers, 2005; Thomson & El-Haram, 2019; Zhang et al., 2020). The construction industry is considered a fruitful context for assessing SR because of its historically complex environment with distinctive and immutable sustainability impacts. However, SR in the construction industry has often been disregarded, despite increasing demand for transparency and accountability from stakeholders (Glass, 2012; KPMG, 2020; Liao et al., 2017).

Furthermore, the construction industry is responsible for many undesirable consequences, such as the generation of 45 %–65 % of the landfill waste, dreadful working conditions, and harmful emissions. It also accounts for about 39 % of the greenhouse gases (Yilmaz & Bakır, 2015). Thus, although the industry plays a vital role in meeting fundamental socioeconomic needs and improving quality of life (Goel et al., 2019), it is also responsible for undesirable consequences. Thus, the necessity for SR in the construction industry has become even more critical as stakeholders urge enterprises to demonstrate their contributions to a sustainable society (Cooper & Owen, 2007).

Recently, studies on sustainability issues have also increased

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significantly (Adams et al., 2016; Alshbili & Elamer, 2020; Chaurasia et al., 2020; Cillo et al., 2019; Roberts, Hassan, et al., 2021; Roberts, Nandy, et al., 2021). These have concentrated on environmental assessments of construction firms and the impact on market competition (Tan et al., 2011; Ye et al., 2015), firm performance (Chen et al., 2016b; Xiong et al., 2016), internationalization (Chen et al., 2016a), energy consumption (Dietz et al., 2020; Kamal et al., 2019), reporting quality (Isaksson & Steimle, 2009; Moseñe et al., 2013), recycling and lifecycle assessment (Liu & Qian, 2019), and green building (El-Diraby et al., 2017; Illankoon et al., 2017). However, to the best of our knowledge, no study has reviewed the literature on SR in this sector. As Adams and Frost (2008) highlighted, reporting on sustainability activities is vital. Reporting on sustainability and corporate social responsibility (CSR) allows businesses to share their performance with stakeholders and assess, measure, and monitor their actions. Therefore, interest in reporting on these practices in the construction sector has increased (Glass, 2012). Several studies have highlighted the need for a systematic review of the literature exploring sustainability in the construction sector, synthesizing studies in terms of measurement, assessment, and disclosure (Chang et al., 2015; Goh et al., 2020; Lima et al., 2021).

We address this need by systematically reviewing the SR research in the construction industry to synthesize trends and appraise and elaborate on gaps in the literature. Our study contributes to the field of SR by being the first, to the best of our knowledge, to use a systematic literature review (SLR) to provide a comprehensive and current evaluation of SR. While prior studies have carried out systematic and bibliometric reviews, analyzing various sustainability aspects in construction, an integrated SLR considering SR is lacking. Therefore, our study extends our knowledge of the field by analyzing current theoretical and empirical papers sourced from an exhaustive journal selection, including business and engineering journals.

Our SLR offers valuable insights into different aspects of construction sustainability and the measurement and assessment of disclosure. Our primary motivation was the absence of such an SLR synthesizing SR and disclosure. Many stakeholders, including management, regulators, and scholars, can benefit from our review and insight into the intellectual development of SR. Our SLR synthesizes the results of extensive, yet diverse and fragmented, studies into a comprehensive framework to provide a holistic picture. We rigorously analyze the following: journal yearly trends, geographic dispersion of the studies, the publishers, the most influential journals, journal outlines, research settings, theories, and themes. Our review also adds to the theoretical advancement of SR research by assisting scholars in identifying possibilities for future investigation and gaps in the literature. We analyze the gaps in the literature and suggest future research directions, including theoretical and methodological opportunities. Finally, we propose potential avenues for future SR research in the construction industry, comparing these with other sectors.

Our research questions are:

- (i) What studies are there on SR and sustainability performance in the construction industry?
- (ii) What are the key patterns in sustainability knowledge, regions investigated, annual publications, methodologies, and theoretical foundations?
- (iii) What are the themes in SR in the construction industry, and what are the associated gaps and limitations detected for future research directions?

The remainder of this paper is organized as follows. Section two provides an overview of the literature in the field and establishes the research background. Section three presents our methodology; section four provides an in-depth analysis of the literature reviewed; section five discusses prospective avenues for future research; and section six concludes.

## 2. Sustainability reporting

Sustainability is concerned with looking ahead and meeting the needs of both current and future generations. In a broad sense, it refers to how society will integrate economic, social, and environmental concerns over time (Amin et al., 2022; Boulhaga et al., 2023; Hassan et al., 2019, 2020, 2021; Hazaea et al., 2022; Khatib et al., 2021; Roberts, Hassan, et al., 2021; Roberts, Nandy, et al., 2021). A sustainability model, integrated with the “triple bottom line” (TBL) approach, was developed by Elkington (1999). It incorporated three elements of sustainability: economic, social, and environmental impacts (Abdelfattah et al., 2020; Alshbili et al., 2021; Selmeý & Elamer, 2023; Ullah et al., 2022, 2023). Targeting corporate stakeholder requirements without damaging their future or that of others, these could be met by considering those stakeholder communities simultaneously. The four p’s of sustainability are profit, people, planet, and price (Elkington, 1999; Isaksson & Steimle, 2009; Pham & Tran, 2020). Thus, sustainable development balances issues related to economic, social, and environmental performance (Adams & Frost, 2008; Bebbington & Larrinaga, 2014; Bebbington & Thomson, 2013).

As major countries have set SDGs and developed agendas for 2030, several organizations have emerged that provide international standards frameworks for SDGs and sustainability reporting. The Global Reporting Initiative (GRI) and International Organization for Standardization (ISO) are the most widely recognized. As a result of the increase in sustainability awareness, business interest in SR has escalated as a means of demonstrating business value alignment with SDGs and supporting assessment and evaluation of performance (KPMG, 2020). The IFRS Foundation recently proposed an international approach to SR to deal with the proliferation of standards and standard setters (IFRS 2020), including the GRI, the Sustainability Accounting Standards Board (SASB), the Climate Disclosure Standards Board (CDSB), and the Climate Disclosure Project (CDP).

Many studies have underlined the necessity for integrating sustainability concepts within the lifecycles of business models (Magni et al., 2022; Mazzucchelli et al., 2022), leadership (Lythreatis et al., 2021; Singh et al., 2020), management and control (Cillo et al., 2020), accounting (Gangi et al., 2018), culture (Cillo et al., 2021), and reporting for successful sustainability implementation (Adams & Frost, 2008; Lee & Wu, 2014; Maas et al., 2016). A stream of literature has been published on SR and CSR value creation and financial incentives (Broadstock et al., 2020; Chaurasia et al., 2020; Fafaliou et al., 2022; Lee et al., 2022; Patel et al., 2021). Although the necessity of reporting on sustainability and CSR initiatives has become more apparent, concerns about preventing greenwashing for financial benefit and value creation are also receiving greater attention. Organizational principles are sometimes applied inconsistently; for instance, some organizations appear committed to sustainability while also practicing harmful environmental activities (He et al., 2020; Higgins et al., 2020; Mahoney et al., 2013). Moreover, some businesses issue glowing sustainability and annual reports despite their harmful activities. The nature, causes, and implications of organizational hypocrisy have been studied extensively (Cho et al., 2015; Mahoney et al., 2013). This has resulted in many studies on double materiality and SR quality (Boiral et al., 2019; Cerbone & Maroun, 2020; Higgins et al., 2020).

### 2.1. Construction industry and sustainability reporting

The construction sector significantly impacts the environment in three major areas: the over extraction of environmental resources, such as fossil fuels and minerals; the over use of generic resources, such as land, water, air, and energy; and environmental pollution from disturbances, odors, dust, vibrations, chemical and particulate emissions, and solid waste and waste disposal. As such, scholars have highlighted the need for a systematic review of the studies exploring sustainability in the construction sector to synthesize the information on measurement,

assessment, and disclosure (Chang, Zillante, Zhao, & Zuo, 2015; Goh et al., 2020; Lima et al., 2021). While prior studies have conducted systematic and bibliometric reviews analyzing various sustainability aspects of construction, an integrated SLR considering SR is lacking.

Lima et al. (2021) conducted a bibliometric analysis of 433 studies and provided in-depth insights into environmental methodologies and sustainability certification. They pointed to a spike in interest in those topics in 2017, while areas such as materials, management, and assessment need further attention. Their bibliometric analysis focused on certification and measurement and excluded sustainable management accounting and reporting. Another meta-analysis of 828 articles by Araújo et al. (2020) on quantified construction sustainability methodologies discovered that most institutional research was from Chinese institutions. Their comprehensive review pointed out that only 2.54 % of the papers provided quantified sustainability assessment, as most were explanatory, highlighting gaps in the field. Their study was restricted mainly to empirical studies and excluded theoretical research.

Goh et al. (2020) attempted to establish a current research approach and develop an integrated framework for TBL to support improved sustainability practices within the sector by revisiting and reviewing TBL in the context of sustainable construction. Their work reviewed research published between 1980 and 2018 in 86 journals. They pointed out that TBL gained research interest and awareness over time, and identified and discussed the challenges and drivers of TBL within sustainable construction.

Zhang, Oo, and Lim (2019) conducted an SLR of 69 articles to conceptualize CSR adoption in the construction sector and identified three themes: legislative pressure, market pressure, and innovation and technological development. However, their review overlooked nonfinancial disclosure and internal management accounting. Xia et al. (2018) conceptualized CSR in the construction business by reviewing 68 papers on CSR interpretation, dimensions, implementation, and efficiency. Their review focused on sustainable building, but their exclusion/inclusion criteria were missing. Similarly, Johnsson et al. (2020) examined papers and conducted a case study to develop a methodology for evaluating sustainable development in this sector. They suggested the need for SDG evaluation to prevent greenwashing and enhance legitimacy. Their review was based only on 12 publications, and again, their inclusion/exclusion criteria were absent.

Goel et al. (2019) identified 130 papers on the management approach to integrating sustainability. They created a framework with seven dimensions: motivation, stakeholder orientation, organizational, temporal, benefit, barriers, and risk. Although their review contributed to the field of sustainability management, more insight could be gained if management accounting and SR were also included. In the same vein, Zhao et al. (2012) reviewed worldwide principles and norms from 2001 to 2010 to construct a CSR performance indicator system and categorized nine stakeholder typologies. They created a framework for CSR adoption in the construction sector that would allow enterprises to monitor CSR successes and achieve long-term market growth. However, their study was confined to indicators, omitting measurement, assessment, and reporting, and the review did not include recent studies. Zuo and Zhao (2014) reviewed articles on green building and implementation. They clustered prior study areas into definitions, quantification, and approaches to green building. However, the studies reviewed neglected other vital aspects of sustainability, such as nonfinancial issues, reporting, disclosure, greenwashing, control, and management accounting practices. They did highlight the need for a comprehensive review of nonfinancial disclosure.

Most studies have also been limited by size, intensity, scope, or length of time. For example, some have merely focused on one area, whereas more comprehensive study could include all aspects of sustainability assessment, measurement, management, and accounting. Additionally, further study could extend our knowledge by covering theoretical and empirical papers and include a more exhaustive journal selection with business and engineering journals. Although scholar

attention on sustainability issues has increased in recent years (Adams et al., 2016; Alshbili & Elamer, 2020; Roberts, Hassan, et al., 2021; Roberts, Nandy, et al., 2021), few studies have conducted SLRs that cover sustainability disclosure and reporting in the construction field. Our review fills this gap in the literature.

### 3. Methodology

We chose to conduct an SLR to ensure we were able to include comprehensive research findings. This broad approach limits the degree of bias and provides a detailed outcome with more accuracy and thoroughness than traditional reviews do (Khatib et al., 2021; Leonidou et al., 2020; Tranfield et al., 2003). SLRs enable synthesis and create meaning from independent and accelerating knowledge production, especially in interdisciplinary business research. An SLR is governed by a protocol that outlines the actions and steps and ensures transparency and reproducibility, as opposed to alternative reviews (such as critical reviews) that do not utilize any systematic procedure or technology (Kumar et al., 2022; Palmaccio et al., 2021; Siachou et al., 2021).

For example, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol has been used in SLRs in the past (Lim et al., 2021). However, the notable increase in SLRs in the social sciences, where entrepreneurship and business are studied, has prompted the creation of new review protocols for business research, such as Scientific Procedures and Rationales for Systematic Literature Reviews (SPAR-4-SLR). The SPAR-4-SLR procedure places the SLR process into three phases: assembling, arranging, and assessing the literature (Paul et al., 2021). The protocol also specifies criteria for including and excluding articles, improving the openness of the scientific reasoning guiding the review decisions (Paul et al., 2021).

#### 3.1. Assembling

Identification and collection are crucial components of the review assembly stage. Our aim was to identify articles on SR in the construction industry and shed light on the research trends, themes, and conceptual frameworks (RQ1, RQ2, and RQ3). To optimize our inclusion criteria to ensure coverage and adequate review size, we used two leading journal ranking guides. Based on the Association of Business Schools (ABS, 2018) journal ranking system, we included papers rated 3, 4, and 4\*; and based on the Scimago Journal & Country Rank (SJR), we included papers rated Q1 and Q2 (source quality). Our approach aligned with the SPAR-4-SLR recommendations by Paul et al. (2021) and earlier reviews (Lim et al., 2021; Lima et al., 2021; Palmaccio et al., 2021). Thus, our identification step established the parameters for the review's scope.

We selected databases based on prior SLR studies (Araújo et al., 2020; Xia et al., 2018; Zhang, Oo, & Lim, 2019), collecting our data from Scopus, Web of Science, and ScienceDirect (search mechanism and material acquisition). These databases were able to provide information for all publication source indices and allow us to filter the information systematically (which is not available in alternative databases, such as Google Scholar). These also included efficient ways to download all the information and the full text of the publications at once. We used these databases to ensure comprehensive coverage of the research in the field, encompassing studies in various disciplines, such as business and management, engineering and construction, and sustainability. In contrast to other publications (e.g., conference proceedings, which may be a work in progress, or books and book chapters, which may be more explanatory than exploratory), we focused on journals, since most journal papers discuss completed research and have undergone rigorous peer review.

We conducted our SLR search in these three academic databases as of December 2020. We kept the search start date open to ensure we reviewed all relevant articles, but used the end date of December 2020 (search period). Based on a preliminary review of past material by topic

experts (Araújo et al., 2020; Cillo et al., 2019; Goh et al., 2020), we used the macro keywords (“sustainability report\*” OR “CSR report\*” OR “disclosure”) AND “construction”). The first 80 search results were screened for frequently used or synonymous keywords. This early review included forward and backward screening and found that past research frequently included certain keywords (“disclosure” AND “construction”), ((sustain\* OR CSR) AND (report\* OR disclosure) AND (“construction firm\*” OR “construction compan\*” OR “construction industr\*”). The total article number from Scopus (713), ScienceDirect (215), and Web of Science (395) was 1,323.

### 3.2. Arranging

Arranging the articles comprised purification and organization. Our evaluation relied on database category filters for the first-stage organization of our search results (language, document type, source type, and topic area), duplication of journal and study relevance, and journal ranking for second-stage organization (organizing codes). Our approach followed Paul et al. (2021) SPAR-4-SLR protocol guidelines. Purification was done in two stages. Specifically, the first-stage purification included only “articles” (document type) written in “English” (language), since the authors were only proficient in that language, and published in “journals” (source type). After the initial stage of limiting the search to English language and peer-reviewed articles, 198 papers were excluded and duplicates were removed (288). A total of 837 articles were retained. The full texts were reviewed to assess the relevance of the research focus to our study, including sustainability/CSR disclosure/reporting in the construction industry, and issues related to measurement and approaches to indicate/improve sustainability performance. We chose to include studies on the collection, measurement, and analysis of sustainable activities embedded in internal accounting, including data linked to reporting (Burritt & Schaltegger, 2010; Maas et al., 2016; Maas et al., 2016). At this stage, after excluding 655 articles, we retained 184 papers.

The second stage of purification (source quality) identified articles that appeared in the ABS (3, 4, and 4\*) and SJC (Q1 and Q2) rankings, resulting in 150 papers being retained. The PRISMA chart is presented in Fig. 1, and the stages of the SPAR-4-SLR are shown in Fig. 2.

### 3.3. Assessing

This step included assessment and reporting. We examined the 150 articles and combined performance and the mapping of knowledge (knowledge clusters in the intellectual structure) contributing to SR in the construction sector. Specifically, we conducted performance analysis using Microsoft Excel to delineate trends (RQ1), top journals, articles, authors, countries, and institutions in the field (RQ2), and used science mapping to place themes into an intellectual structure through VOS-viewer and Excel (RQ3) (see Fig. 3).

## 4. Results

### 4.1. Statistical results

#### 4.1.1. Publication year

Fig. 2 presents the number of SR construction sector-related studies each year. The earliest study to meet our inclusion criteria was by Ball (1999). Subsequently, sustainability in the construction sector attracted increasing attention. The years 2016, 2017, and 2019 saw the highest number of studies published. From 1999 to 2015, the number of articles ranged from one to nine per year. Before 2013, businesses were busy creating financial and SR systems. We also observed a gradual increase in papers after 2009, with a peak in 2013. This increase coincides with the economic crisis that began in 2008. Following the International Integrated Reporting Council (IIRC) framework (2013), research has concentrated on model creation and implementation in several countries. However, although the research gradually diminished, it regained momentum after 2015. The 2015 Paris Climate Agreement may have led

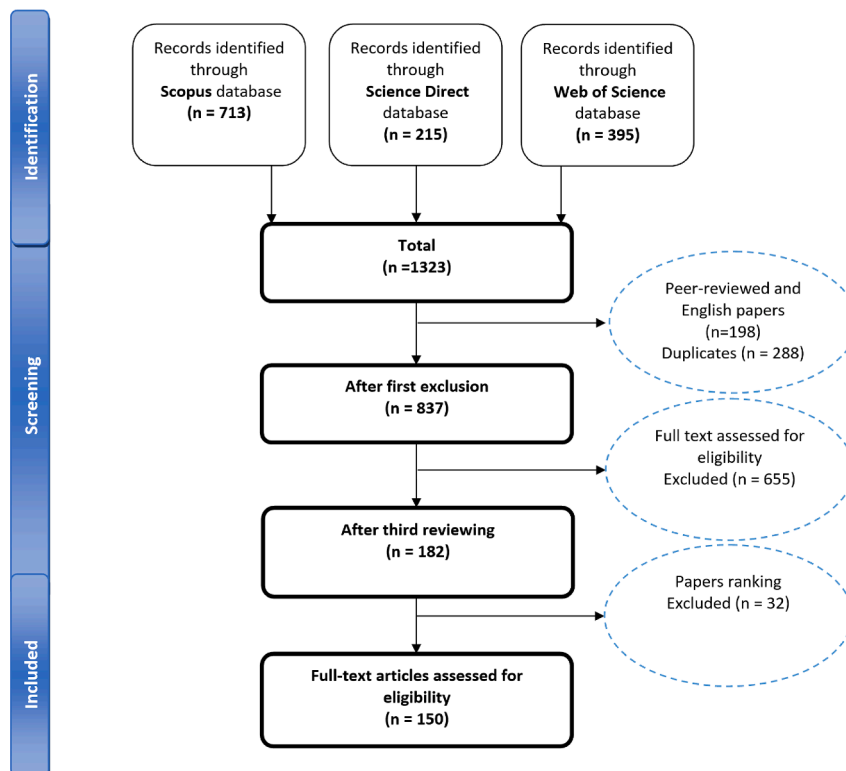


Fig. 1. PRISMA chart.

<ul style="list-style-type: none"> <li>• <b>Assembling</b></li> <li><b>Identification</b> <ul style="list-style-type: none"> <li>➤ Research questions: Sustainability reporting trends in construction industry literature.</li> <li>➤ Domain: Sustainability reporting and Construction industry</li> <li>➤ Source: Journals</li> <li>➤ Source quality: Scopus, Web of Science and Science Direct (ABS ranking 3, 4 and 4*) And SJC (Q1 and Q2)</li> </ul> </li> <li><b>Acquisition</b> <ul style="list-style-type: none"> <li>➤ Searching mechanism and material acquisition: Scopus, Web of Science and Science Direct</li> <li>➤ Searching period: Up to Jan 2021</li> <li>➤ Searching keywords: (“sustainability report*” OR “CSR report* OR “disclosure”) AND “construction”). To make sure that all the papers are covered, we also divided the keywords and searched for (“disclosure” AND “construction”), ((sustain* OR CSR) AND (report* OR disclosure) AND (“construction firm*” OR “construction compan*” OR “construction industr*”).</li> </ul> </li> </ul> <p><b>Total documents returned from assembling stage: 1323</b></p>
<ul style="list-style-type: none"> <li>• <b>Arranging</b></li> <li><b>Organisation</b> <ul style="list-style-type: none"> <li>➤ Organisation code: language, documents type, source type and subject area</li> </ul> </li> <li><b>Purification</b> <ul style="list-style-type: none"> <li>➤ Language: English</li> <li>➤ Document type: article</li> <li>➤ Source type: Journals</li> <li>➤ Source relevance: Research relevancy</li> <li>➤ Source quality: ABS ranking (3, 4 and 4*) And SJC (Q1 and Q2)</li> </ul> </li> </ul> <p><b>Total paper for analysis 150</b></p>
<ul style="list-style-type: none"> <li>• <b>Assessing</b></li> <li><b>Evaluation</b> <ul style="list-style-type: none"> <li>➤ Total documents for analysis 184 documents</li> <li>➤ Performance analysis: analysis for publication trend (RQ1 and RQ2) number of studies yearly, top journals, methodologies applied, regions, and theories applied.</li> <li>➤ Science mapping: Analysis to create theme in an intellectual structure</li> </ul> </li> <li><b>Reporting</b> <ul style="list-style-type: none"> <li>➤ Convention: Figures, tables, and words</li> <li>➤ Limitation: completeness and studies data in Scopus, Web of Science and Science Direct</li> <li>➤ Source of support: No financial support received for this study.</li> </ul> </li> </ul>

Fig. 2. Procedure for reviewing using the SPAR-4-SLR protocol.

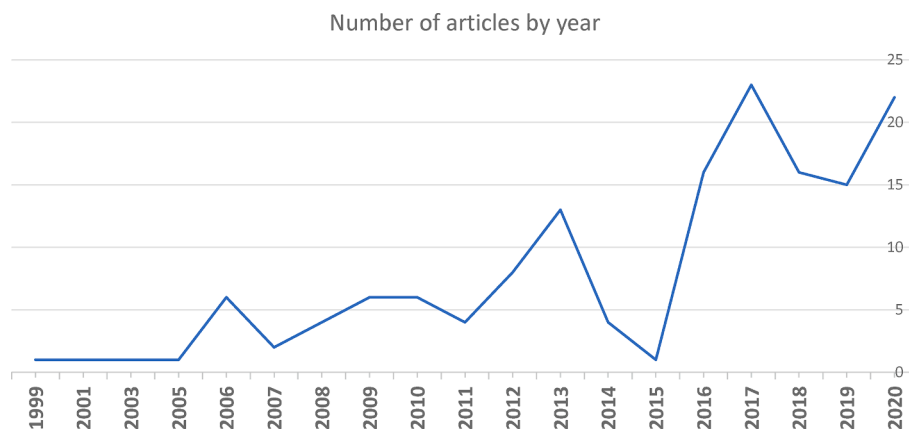


Fig. 3. The publication trend per year.

to growing interest in the field and the increase in papers after 2017. Our review highlights that nations have been openly adopting SR, while verifying the legal reliability of such reports. Construction industry SR

has caught the attention of scholars in the last five years, as indicated by the number of published studies. This may have contributed to recent government support for sustainability through legislation and relevant

initiatives (Bamgbade et al., 2017). Construction corporations play a crucial role in sustaining employment and social sustainability. Research on construction SR is still evolving, so our findings were similar to early SR development in other research areas (Heras-Rosas & Herrera, 2020; Zhang et al., 2019).

4.1.2. Journal analysis

The 150 papers we reviewed were distributed across 73 journals. Of these, 56 journals published only one paper. The fragmented nature of the field is evidenced by the number of journals that published only one article. The *Journal of Cleaner Production* published a remarkably high number of articles, with 44 papers, followed by *Construction Management and Economics* and *Renewable and Sustainable Energy Reviews*, with 7 papers each. The impact of the field is evidenced in the 44 papers, each with more than 150 citations. Of these, the following 10 were cited the most (Zuo & Zhao, 2014; Shen et al., 2010; Isaksson & Steimle, 2009; Lapinski et al., 2006; Tan et al., 2011; Jaillon & Poon, 2008; Cooper, 2001; Kolk & Pinkse, 2006; Zhao et al., 2012; Myers, 2005).

4.1.3. Regional analysis

We found that most SR investigations in the construction sector were cross-country, accounting for 42 % of the literature reviewed. In addition to the 53 papers using multi-country data, 99 empirical papers were based on a single market. As Table 1 shows, China led in terms of number of papers published, with 22. In contrast, 21 countries had only one paper, including Iran, Japan, and Malaysia. Moreover, only 13 markets were the subject of more than one study, including the UK (18 articles), the US (11 articles), and Australia (6 articles). Some multi-country empirical studies utilized evidence from as many as 21 countries (Olawumi & Chan, 2020). The yearly trends show that research in the UK started earlier than that in other countries, with most studies in developing countries conducted during the last five years.

4.1.4. Methodology analysis

The results reveal a divergence of methodologies applied to study construction firms' SR. Of the 150 papers, 65 used a quantitative approach. These investigated data from surveys and questionnaires (e.g., Lin et al., 2017; Niroumand et al., 2013; Sakr et al., 2010), secondary data (e.g., Chen et al., 2016b; Xiong et al., 2016; Ye et al., 2015), and seven case studies (e.g., McLellan & Corder, 2013; Oude Hengel et al., 2012). Even the earliest study (Ball, 1999) applied a quantitative approach to investigate SR in the industrial property market. Fig. 4 shows the growing interest among scholars in using qualitative methods in the last five years in 49 articles. Similarly, 38 articles employed qualitative and quantitative data in mixed-method studies for their analyses. The increase in quantitative and mixed-method research may be attributed to mandatory environmental policies, regulations, guidance,

requirements, or initiatives of local governments to enhance the industry's environmental and sustainable development recently.

4.1.5. Theoretical perspectives

Surprisingly, more than half of the studies (61 %) had no theoretical foundation. The second largest grouping of studies was those with a mono-theory framework at 26 %. Literature based on two theories represented 11 %, and those based on three theories represented 2 % of the literature. We categorized the theories into *economic and corporate governance theories* and *sociology and psychology theories* (Table 2). The investigation showed that scholars focused on economic and agency theories, neglecting psychological ones, with the stakeholder theory being the one most applied (Table 2). A summary of the articles applying economic and corporate governance theories and their outcomes is presented in Table 3; the articles applying sociology and psychology theories, a mix of theories, or other theories are presented in Table 4.

4.2. Thematic analysis

Using keywords that appeared at least four times in the articles, we created a network visualization map of keywords using the VOSviewer, as shown in Fig. 5. The figure depicts the breadth of SR in the construction industry in the early research. However, the literature does not specifically address how SR may be implemented. We explored this further by using sensemaking and reviewing the articles in which keywords were structured logically to express the core of the study and create themes.

The following discussion provides an in-depth analysis of the reviewed literature based on their themes. Our review confirmed that there were many extensively explored themes. Based on the clustering patterns, we categorized these into four topics: 1. assessment and performance measures for reporting, 2. determinants, 3. management and implementation; and 4. outcomes of SR (see Table 5, Table 6, Table 7, Table 8).

4.2.1. Assessment and performance indicators

These studies noted the importance of measurement and assessment tools. Internal accounting is needed to compile, assess, and analyze sustainable practices for truthful reporting (Burritt & Schaltegger, 2010; Maas et al., 2016). Ness et al. (2007) highlighted the importance of sustainability assessment as a crucial instrument to facilitate SR. We found that most of the literature investigated key indicators, assessments, and measurements, as shown in Table 2. The construction industry has many internationally recognized green building certifications, such as LEED, BREEAM, and GBCA, to assess green building, mainly in terms of environmental aspects. In addition, some articles discussed assessment tools for earth architecture and building

**Table 1**  
The regional distribution of the literature.

Countries/Years	2021–2015	2014–2010	2009–2005	2004–1999	Total	Total percentage
Cross-countries	39	10	3		53	41 %
China	15	6	1		22	17 %
UK	4	3	8	3	18	14 %
USA	4	4	2		11	9 %
Australia	2	3	1		6	5 %
Canada	2		1		3	2 %
Indonesia	3				3	2 %
Singapore	3				3	2 %
Brazil	1	1			2	2 %
Chile	1	1			2	2 %
India	1	1			2	2 %
Malaysia	2				2	2 %
New Zealand	1		1		2	2 %
Finland	2				2	2 %

\*Other countries subject to one study only: Slovenia, Egypt, Finland, France, German, Iceland, Iran, Japan, Korea, Netherlands, Cyprus, Pakistan, Portugal, Qatar, Spain, Turkey, UAE, Mexico, Yemen.



Fig. 4. Journal outlets.

**Table 2**  
Theoretical perspectives applied on SR.

Theory name	Number
Economic and corporate governance theories	
Stakeholder	19
Stakeholder power theory	1
Stakeholder salience	1
Institutional theory	3
Resource or asset-based	4
Slack Resource theory	1
Economic theory	2
New institutional theory	2
Agency theory	1
Legitimacy Theory	2
Signalling theory	1
Sociology and psychology theories	
Social value chain approach	1
Social Learning Theory	1
Self-determination theory	1
Reciprocal model	1
Other theories	8

\*Other theories used only once including Power theory, Private cost theory, Agenda-building theory, Capital theory, Evolving theory, Fuzzy set theory, Grey theory, Organizational cultural theory, Self-determination, Shared perception, Value-added theory, Two-stage game theory, Signalling theory, and Trade-off theory, Rough set and Diffusion of Innovations theory.

(Le et al., 2019; Niroumand et al., 2013, 2017), green building rating tools (El-Diraby et al., 2017), and sustainability assessments (Myllyviita et al., 2017). Most studies covered all three sustainability pillars—environmental, social, and economic impacts—although a few focused on only one. Several studies developed indicators, benchmarks, and key activity areas for sustainability assessment. Jiang and Wong (2016) identified the key activity areas that improve CSR performance in Chinese construction companies: environmental protection, quality and safety, employees and community, and management.

Many papers on this theme investigated lifecycle assessments (LCAs). Liu and Qian (2019) acknowledged the need for social assessment tools and developed a social LCA that considered four key stakeholders in Singapore. Segura-Salazar et al. (2019) evaluated the LCA in mining using simulation technology. They proposed an LCA to support tactical and operational-level decisions. Edwards et al. (2019) assessed the feasibility of integrating energy LCAs into building information modeling (BIM). Their study indicated that the total capacity of BIM, such as an energy LCA, had not yet been encompassed. They suggested

an integrated library within BIM to assist designers with materials and planning to facilitate decision making and measure environmental costs.

**4.2.1.1. Environmental assessment, measurement, and SR.** Environmental assessment and measurement refers to the various actions of capturing, measuring, and monitoring environmental impacts and performance for reporting purposes. Several countries have seen escalated commercial and residential building energy consumption in the last two decades. Regarding energy aspects, the literature covered zero-energy homes (Saman, 2013), recurrent embodied energy (Dixit, 2019), energy-efficient HVAC systems (Dietz et al., 2020), energy-efficiency policies (Kamal et al., 2019), demand for building refurbishments (Ghose et al., 2017), the building itself and its design and construction (Glass et al., 2008), and renewable energy (Chang et al., 2017; Yuan et al., 2013).

**4.2.1.2. Social performance, measurement, and SR.** The social pillar is a main element of SR. However, many large-scale studies have focused more on environmental aspects than on social ones (Liu & Qian, 2019). Social sustainability entails diverse social values that are influenced by many stakeholders (Caputo et al., 2021). Therefore, a socially sustainable construction plan is expected to meet the needs of multiple stakeholders. Hossain et al. (2018) developed a tool based on GRI and UN guidelines to assess social sustainability. They identified that health and safety, working hours, forced work, training, social benefits for workers, and the quality of materials and information disclosure to the public still needed attention. Bamgbade et al. (2017) used a resource-based viewpoint and market-oriented ethos to evaluate Malaysian firms' social sustainability. Their study confirmed the critical role of the market-oriented approach as a strategic resource in this field, resulting in a competitive edge.

**4.2.2. SR determinants**

We identified many studies that covered the leverage and influence of sustainability practices and reporting, as presented in Table 3. Understanding the determining factors that encourage or discourage SR is vital to enhancing knowledge and improving reporting quality (Hahn & Kühnen, 2013). Therefore, many studies pointed to the role of various influential factors, drivers, and barriers in shaping corporate sustainability adaptation and reporting ethos.

**4.2.2.1. Governance and stakeholders.** Although achieving the sustainability goals set out for the construction project is critical, sustainability remains a complex issue for stakeholders. Several studies underlined the

**Table 3**  
Prior studies applied theories - Economic and corporate governance theories.

	Theory	Authors	Key Outcomes
Economic and corporate governance theories	Stakeholder Theory	(Amaratunga et al., 2018; Bal et al., 2013; Brown et al., 2009; Harymawan, Nasih, et al., 2020; Herazo & Lizarralde, 2016; Isaksson & Steimle, 2009; Jones, Comfort, & Hillier, 2006; Khan et al., 2014; Liao et al., 2018; Liu & Qian, 2019; Lu et al., 2016; Myllyviita et al., 2017; Olawumi & Chan, 2020; Petrovic-Lazarevic, 2010; Purnomo & Rizki, 2020; Xie et al., 2020; Zhao et al., 2012)	Proposed theoretical framework for social life-cycle performance assessment with the definition of stakeholders and relevancy improving stakeholder input will improve companies' image and hence economic performance. There is vagueness on CSR due to the absence of a consensus definition CSR issues for each stakeholder are generated, and indicators are then extracted to disclose particular contents covered in these performance issues. Provided suggestions for government agencies, stakeholders, and others to ensure BIM can be used to fulfil the full potential of sustainable practises in the building sector. The GRI rules do not adequately reflect consumer demands. Identified the salient stakeholders in the Indian construction sector as the community people affected by the project, the end-user, and the employee.
	Stakeholder salience	(Goel et al., 2019)	Classified stakeholders to assess their resource to improve sustainability activities and performance.
	Resource-based view	(Bamgbade et al., 2017; Chen et al., 2016a; Lin et al., 2019; Purnomo & Rizki, 2020)	confirms the key role of market-oriented culture as a strategic resource in this field, resulting in a competitive edge. a positive relationship between proactive environmental management strategies and internationalisation
	Slack resources theory	(Xiong et al., 2016)	This study confirmed this theory and illustrated that Chinese construction firms interacted with society with a reciprocal CSP-CFP agenda.
	Institutional theory	(He et al., 2020; Ju et al., 2018; Sultan, 2017)	Confirms that adaptation of health and safety programmes in Chinese construction firms is driven by institutional pressure and market competition. External and governmental policies to eliminate greenwashing behaviour.

**Table 3 (continued)**

	Theory	Authors	Key Outcomes
	New Institutional theory	(Moseñe et al., 2013)	Proposed this theory as a new conceptual approach to increasing the culture of sustainability and reporting. Companies are mimicking each other's practices, which replace the initial institutional forces.
	Legitimacy Theory	(Lu et al., 2016; Watts et al., 2019)	CSR disclosure would allow a firm to enhance its image, gain a competitive edge, and increase competitiveness and employee support and satisfaction.
	Economic theory	(Myers, 2003; Pearce, 2006)	Attempting to propose a comprehensive value-added and capital concept exclusively for the construction industry.

impact of stakeholders on a culture of sustainability and disclosure. To create such a culture, there needs to be a systematic way to engage high-priority stakeholders in sustainability. Aside from the client and primary contractor, suppliers and several different layers of key players are often overlooked. Their exclusion from decision-making processes may lead to the failure to address sustainability concerns. Bal et al. (2013) indicated six phases of stakeholder engagement: identification, aligning stakeholders with sustainability targets, prioritization, management, performance measurement, and implementation. Their findings imply that defining stakeholder sustainability objectives and tracking progress using key performance indicators (KPIs) are critical steps in stakeholder engagement. Lin et al. (2019) drew attention to various stakeholder perceptions of sustainability. They highlighted the importance of having a platform for stakeholders to share knowledge to improve collaboration and enhance sustainability performance and approaches. They identified that stakeholders need to collaborate and use their power and resources to achieve social responsibility in construction projects. Kolk and Pinkse (2006) highlighted the importance of allocating power to various stakeholders. Similarly, Goel et al. (2019) emphasized the need to include silent stakeholders in the feasibility planning of construction projects. Zhang, Oo, and Lim (2019) also identified the main barrier to CSR adaptation from the perspective of government policies and stakeholders, and found that the key motive for adopting CSR was financial incentive.

**4.2.2.2. External factors.** The literature has underlined several external factors impacting and influencing SR, including government, policies, market demand, and competitiveness. Moseñe et al. (2013) analyzed the SR content of Spanish wind energy providers to explore the institutional impact. They demonstrated institutional influences and how companies mimicked each other in terms of environmental practice. Ng et al. (2013) found that Chinese building contractors' main drivers for reducing carbon emissions were financial aid and government incentives. Ye et al. (2015) examined the impact of market competition on economic, social, and environmental performance. They suggested that the construction industry addressed the TBL of sustainability by controlling market competition. Ju et al. (2018) confirmed that the adaptation of health and safety programs in Chinese construction firms was driven by institutional pressure and market competition. He et al. (2020) evaluated greenwashing governance behavior and the link to external policies. Their study emphasized the need for external and governmental policies to eliminate such behavior. Bamgbade et al. (2017),



**Table 4**  
Prior studies applied theories Sociology and Psychology theories.

	Theory	Authors	Key Outcomes
Sociology and psychology theories	Social Value Chain	(Jiang & Wong, 2016)	Firms need to be congruent with society and institutions' ethical and legal demands to be able to operate successfully and gain endorsement.
	Self-determination theory	(Zhang et al., 2019)	Drivers are mostly external influences such as policy; however, incentives to adopt the CSR concept are mainly innate willingness.
	Reciprocal model	(Cooper & Owen, 2019)	Various approaches which influence safety culture and CSR, including safety science construction performance, law, and legislation.
	trade-off theory	(Liao et al., 2018)	There is a negative correlation in the short term within six years, and they recommended direction of focuses on CSR activities for these firms in their literature.
	Grey theory	(Heravi et al., 2017)	Developed a framework to facilitate decision-making under uncertainty
Mix theories	Market Oriented approach and Resources-Base	(Bamgbade et al., 2017)	Confirmed the critical role of market-oriented culture on the social sustainability performance
	Game theory and institutional theory	(He et al., 2020)	"Dishonesty list disclosure" and "unified green certification" function well in avoiding GWBs, but only when government regulating capability is adequate.
	Stakeholder, Institutional, and Self-determination theories	(Zhang et al., 2019)	Identified that the main driver is the external stakeholder's influence, such as government policies. On the other hand, the stakeholder's perspective was also identified as a fundamental barrier.
	Agency, Stakeholder, and Institutional theories	(Kolk & Pinkse, 2006)	Focusing on stakeholder such as customers resulted in mismanagement and neglect of other stakeholders.
	Stakeholder power and Stakeholder theory	(Lin et al., 2017)	All stakeholders need to collaborate and use their power and resources to achieve social responsibility in construction projects and improve performance.
	Signalling theory and Resource base	(Chen et al., 2016b)	Result shows that proactive environmental management leads to higher performance.
	Good management theory and slack resources	(Xiong et al., 2016)	Confirmed that Chinese construction firms interact with society

**Table 4 (continued)**

Theory	Authors	Key Outcomes
Diffusion of Innovations	(Darko, Chan, Ameyaw, et al., 2017)	with a reciprocal CSP- CFP agenda Barriers and drivers of Green Building Technology GBT adaptation evaluated and strategies to promote GBT
Rough Set Theory	(Shi et al., 2016)	Assessed the degree of conflict between the project's goals.

using a resource-based view, provided empirical evidence that the relationship between sustainability performance and government support was indirect and significantly mediated by a market-oriented culture. Their study confirmed that a market-oriented culture played a critical role in this field. Additionally, drawing on institutional and two-stage game theories, He et al. (2020) evaluated greenwashing governance behavior and its link to external policies.

**4.2.2.3. Internal factors.** The literature has also highlighted internal organizational influences, such as behavior, attitude, culture, organization size, revenue, and corporate policy. Chang et al. (2018) identified a positive relationship between sustainability attitudes and performance. Loosemore et al. (2018) compared CSR practices in construction firms in Australia, Singapore, and New Zealand to identify the role of culture and formal and informal policies in different countries. Serpell et al. (2013) reported that sustainable construction practices depended significantly on firm size and core business. Certain factors, such as financial incentives, the lack of integrated designs, and affordability related to investment effort in sustainable development activities, were highlighted as areas that required further evaluation in future studies. Studies on SR internal determinants in construction also examined culture and attitude, governance, company value and vision, awareness, training, and commitment.

**4.2.3. Strategic operation and management**

**4.2.3.1. Environment management system.** Recent studies have referenced the environment management system (EMS) as an emerging approach. Lam et al. (2011) attempted to enhance green performance, integrated green specifications, and EMS. However, their study found that EMS alone did not address the issues faced by Hong Kong's construction firms. Thus, they proposed a framework to implement green specifications along with EMS adaptation. Similarly, Petrovic-Lazarovic's (2010) investigation of Australian companies implementing EMS showed that improving stakeholder collaboration enhanced company image. Selih (2007) indicated that a documentation barrier was the main obstacle to implementing EMS, and addressing this issue was a strategy to promote EMS in this sector.

Chen et al. (2016) investigated environmental strategies and internationalization and showed a positive relationship with proactive management. However, deploying additional aggressive efforts had no association. Chang et al. (2018) indicated that quality management and customer service were the main areas of managerial consideration in Chinese construction firms, with the least favorable being community support. Furthermore, Siltaloppi et al. (2020) highlighted the importance of understanding tension at different levels, including organization and action. They designed a tension-centric CSR assessment to facilitate the alignment of business strategies with day-to-day actions.

**4.2.3.2. Technology and innovation.** Using advanced technologies and innovation can be vital for improving SR. However, few articles examined technology and innovation as a means of improving sustainability

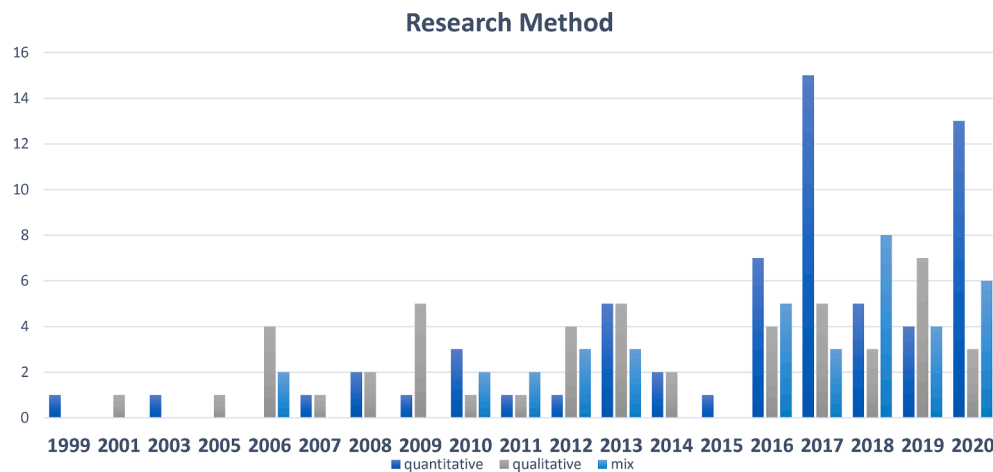


Fig. 5. The methods applied in the sample literature per year.

performance and reporting in the construction industry. Ghosh et al. (2020) identified how adapting the IoT effectively affected reporting ability, monitoring and control, and ethical and legal expectations. Olawumi and Chan (2020) examined innovative sustainable practices, the use of BIM, and the obstacles to its implementation. They recommended training, funding, government support, education, and innovative concepts for smart and sustainable construction. Several studies provided decision-making tools for green and sustainable construction. The SLR by Heravi et al. (2017) contextualized decision-making methods for sustainability. Their study identified several gaps in waste management, project collection optimization, and social concerns. They suggested integrating LCAs with mathematical programming, along with multi-criteria decision methods. However, they reviewed and analyzed only a small number of papers. Additionally, Pimentel et al. (2016) reviewed the literature to provide a model to quantify decision making in the implementation of sustainability in the mining industry.

#### 4.2.4. Sustainability outcomes

One literature stream examined the nexus between sustainability performance and corporate financial performance (CFP) (see Table 4). Chen et al. (2016) demonstrated the positive impact of proactive environmental management practices on business performance in construction firms in developed countries from 2009 to 2011. Additionally, they found a curvilinear relationship between population and product innovation. Wang et al. (2016) also found a curvilinear correlation between CSR performance and return on assets and earnings per share, creating a win-win situation. Petrovic-Lazarevic (2010) found a correlation among Australia's EMS, exemplary citizens, and corporate image creation.

However, Tan et al. (2011) found no unique correlation between sustainable construction and competitiveness. Therefore, they developed a framework to support contractors in gaining a long-term competitive advantage. Correspondingly, Liao et al. (2018) analyzed global contractor reports from 2009 to 2014 and found a negative relationship between corporate social performance (CSP) and CFP in the short term.

#### 4.3. Results summary

Our statistical analysis indicated a growing interest among scholars in sustainability practices and reporting within the construction sector since 2016. This increase may be due to current government regulations and activities promoting SDGs. Our regional analysis showed that SR research in the construction sector was mostly cross-country, amounting to 42 % of the total literature, with China, the UK, and the US having the highest numbers of papers. The majority of studies adopted quantitative

approaches; however, in the last five years, the number of scholars adopting qualitative methods increased. Considering the common use of theoretical frameworks, surprisingly, over half of the studies (61 %) had no theoretical foundation.

Based on our thematic analysis, we categorized the literature into four topics: 1. assessment and performance measures for reporting; 2. determinants; 3. management and implementation; and 4. SR outcomes. We then designed an integrated framework (see Fig. 6) to highlight possible gaps and requirements for promoting SR in the construction sector, as well as future practices. The suggested framework incorporates assessment and lifecycle thinking that when applied, can enhance the achievement of SDGs. Measurement and assessment are the initial steps supporting the inherent multidimensional and interdisciplinary characteristics of sustainability. These aid stakeholders in considering long-term environmental, social, and economic impacts and the adoption of SR. While determinant areas have been investigated comprehensively, areas integrating managerial strategies, technology, and SR outcomes require additional focus. Our review indicates that most studies investigated key indicators, assessments, and measurements. The assessment and performance measures were mainly based on internationally recognized certifications that assess green building, primarily related to environmental aspects. The most interesting aspect was the use of cloud-based computing, such as BIM, to assess and measure sustainability and lifecycle performance (see Fig. 7).

Additionally, many studies identified the determinants of SR focused on governance, stakeholder power, and institutional environment. These related to level of importance, considering company decision-makers and the internal and external environments the businesses operated in to adopt sustainability and disclosure. Another theme focused on combining organizational strategy, control, procedures, and management for sustainable accounting and reporting. Notably, technology and innovation can be vital for improving SR. However, few articles examined how technology and innovation could improve sustainability performance and reporting in the construction industry. We found the results on the relationship between company sustainability performance and financial performance were not consistent. This could be due to several reasons, including that measurements in the studies differed. In addition, the outcome and value creation for sustainability would be different considering country and institutional environments.

## 5. Future directions

### 5.1. Future research methodology and settings

Our investigation highlighted several methodological directions for future research, such as using interviews in developing economies and

**Table 5**  
The prior studies of the assessment and performance measure (58 research articles).

Themes	Sub theme	Authors	Theories applied
Assessment and Indicators	Green building rating tools	(El-Diraby et al., 2017; Illankoon et al., 2017;	Economic theory
	Sustainability assessment	Johnsson et al., 2020; Lamé et al., 2017; Myllyviita et al., 2017;	value-added, Stakeholder, fuzzy set theory
	Sustainable Goal Development Assessment/Earth Architecture assessment	Niroumand et al., 2013, 2017; Pearce, 2006; Pylsy et al., 2020; Saman, 2013; Shi et al., 2016; Zuo & Zhao, 2014; McLellan & Corder, 2013; Qazi et al., 2020) <b>16</b>	-
	Risk Assessment	(Fearnside, 2016; Shen & yin, Tam, V. W. Y., Tam, L., & Ji, Y. bo., 2010; Tan et al., 2019; Xia et al., 2018; Yao et al., 2011) <b>6</b>	-
Sustainability performance	Life Cycle Assessment	(Dixit, 2019; Gelowitz & McArthur, 2018; Ghose et al., 2017; Mohammadi & South, 2017; Moretti & Caro, 2017; Myllyviita et al., 2017; Segura-Salazar et al., 2019) <b>7</b>	stakeholders
	Indicators/KPI Benchmark Metric	(; Cooper, 2001; Elkington, 1999; Jiang & Wong, 2016; Jones, Comfort, & Hillier, 2006; Lu et al., 2016; Oliveira et al., 2019; Rankin et al., 2008; Rogmans & Ghunaim, 2016; Yang et al., 2018; Zhao et al., 2012) <b>11</b>	Stakeholder, social value
Environmental assessment	Energy/environment footprint/assessment	(Edwards et al., 2019; Glass et al., 2008; Lundie et al., 2019; Neppach et al., 2017; Pylsy et al., 2020) <b>7</b>	-
	Environmental performance	(Jaillon & Poon, 2008; Liu et al., 2013; Xing et al., 2009) <b>3</b>	-
Social assessment	Social life cycle Assessment / health& safety assessment	(Jo et al., 2017; Hossain et al., 2018; Li et al., 2018; Liu & Qian, 2019; Ness et al., 2012; Oude Hengel et al., 2012; Schwatka et al., 2012; Schwatka et al., 2012) <b>8</b>	Stakeholder

employing larger sample sizes (Lim et al., 2021; Zhao et al., 2012; Chen et al., 2016; Lu et al., 2016). In addition, our findings on the regional studies differed slightly from those of Zuo et al. (2012). Their SR analysis showed that Japan, the US, Spain, and Italy had the highest number of studies. In contrast, we found the highest number of studies in China, the UK, the US, and Australia. The disparity may be attributed to the fact that our analysis was based on more recent literature. Our analysis indicated that most single-country studies concentrated on developed markets except China, while other developing markets were under researched. The developing markets investigated were the subject of only a single study, while several economies in Latin American and African regions have not been explored yet. Lu et al. (2016) also highlighted that the level of SR is lower in developing countries, where country-level antecedents, such as government policy and market culture, are significant and important. Hence, future studies should focus on developing economies (Ghose et al., 2017; Qazi et al., 2020).

5.2. Future research: Thematic directions

Our review pointed to the need for further research in the assessment and measurement area. Therefore, we encourage scholars to investigate the use of green technology to assess sustainability performance in the construction sector as well as SR quality. The quality and materiality of SR in this sector require critical attention. With the rise of the industrial revolution 5.0, a fruitful area for further study is to measure and analyze the impact of disruptive technologies, sustainability assessments, and LCA (Cooper, 2019). Some novel studies have investigated sustainable innovation in the organization. We believe this is an area that should be examined and applied in the construction sector (Chaurasia et al., 2020; Cillo et al., 2019). We found few studies attempting to evaluate the emerging technologies and sustainability in this sector, such as the IoT (Ghosh et al., 2020) and cloud-based software (Edwards et al., 2019; El-Diraby et al., 2017; Lamé et al., 2017).

In terms of SR determinants, more studies are needed that examine organizational decisionmakers, their inclinations, and SR (Oliveira et al., 2019; Siltaloppi et al., 2020). Market cultural, institutional factors (Loosemore et al., 2018), and organizational strategic behavior (Jiang & Wong, 2016) should receive closer attention. These themes align with recent studies, but more detailed study is needed (Cillo et al., 2021; Lythreatis et al., 2021; Singh et al., 2020). We also found few studies on other mediators, such as firm policies and workforce differences. Hossain et al. (2018), one of the few studies on the topic, highlighted worker health and safety, working hours, forced work, training, and social benefits.

Furthermore, we encourage research to evaluate the effect of the recent pandemic (COVID-19) on sustainability practices and managerial attitudes. Such studies could examine how the pandemic has affected various corporate processes and reporting (Bae et al., 2021).

We found that the construction industry relies heavily on green certifications, such as LEED and BREEAM. Therefore, the need for SR at the company level is not reflected (Gelowitz & McArthur, 2018; Lam et al., 2011). However, these certifications are limited to building and project environmental issues. Future studies should encourage a shift in the construction industry to embed SR, especially for social and governance aspects that have been disregarded. Additionally, there has been no research on SR quality and materiality in the construction industry, although a growing body of literature recognizes its importance (Boiral et al., 2019; Cerbone & Maroun, 2020; Higgins et al., 2020; Safari & Areeb, 2020). Future research should investigate relevant distinctive features of construction companies and develop an appropriate conceptual framework for SR quality (Isaksson & Steimle, 2009).

Additional studies are also required that explore sustainability and company performance. For example, although most research we found reflected a positive relationship between sustainability and financial performance (Chen et al., 2016b; Wang et al., 2016), some found a negative relationship or no correlation (Liao et al., 2018; Tan et al.,

**Table 6**  
The prior studies of the determinants of SR (35 research articles).

Themes	Sub theme	Authors	Theories applied
Governance and Stakeholders	Perception	(Bal et al., 2013; Chong et al., 2009; Herazo & Lizarralde, 2016; Kolk & Pinkse, 2006; Lin et al., 2017, 2019; Purnomo & Rizki, 2020; Xie et al., 2020; Zou & Alam, 2020) <b>11</b>	Power theory, Stakeholder, Resource Dependence theory, Agency theory, Stakeholder Saliency, Legitimacy, Institutional, Self-determination theories.
	PowerMismanagement		
External Factors	Engagement	(Athapaththu & Karunasena, 2018; Chan et al., 2017; Darko, Chan, Ameyaw, et al., 2017; Chang, Zillante, Zhao, & Zuo, 2016; Cooper & Owen, 2019; Darko et al., 2017; Ju et al., 2018; Moseñe et al., 2013; Ng et al., 2013; Petrovic-Lazarevic, 2008; Tan, Shuai, Shen, Hou, & Zhang, 2011; Yang et al., 2018; Serpell et al., 2013) <b>15</b>	New institutional, Social Learning Theory, Revised reciprocal, diffusion of innovations theory
	Control		
	Decision-makers		
	Board Diversity		
	Policy		
Internal Factors	Institutional	(Athapaththu & Karunasena, 2018; Chang et al., 2018; Darko, Chan, Ameyaw, et al., 2017; Kowalczyk & Kucharska, 2020; Loosemore et al., 2018; Ma et al., 2017; Myers, 2003; Purnomo & Rizki, 2020; Xie et al., 2020; Yin et al., 2018) <b>9</b>	New Institutional Theory, Economic theory
	Market competitiveness		
	Image and reputation		
	Technology		
	Resilience		
Internal Factors	Culture	(Athapaththu & Karunasena, 2018; Chang et al., 2018; Darko, Chan, Ameyaw, et al., 2017; Kowalczyk & Kucharska, 2020; Loosemore et al., 2018; Ma et al., 2017; Myers, 2003; Purnomo & Rizki, 2020; Xie et al., 2020; Yin et al., 2018) <b>9</b>	New Institutional Theory, Economic theory
	Attitude		
	Governance		
	Value and Vision		
	Awareness		
Training			
	Commitment		

**Table 7**  
The prior studies of the management and implementation strategies (46 research articles).

	Sub theme	Aurthors	Theories applied		
Strategical Operation and Management	Environment Management	(Lam et al., 2011; Petrovic-Lazarevic, 2010; Sakr et al., 2010; Selih, 2007) <b>4</b>	stakeholder		
	System EMS				
Technology and Innovation	Strategic environmental management	(Ali et al., 2019; Araújo et al., 2020; Ball, 1999; Bamgbade et al., 2017; Chang et al., 2017; He et al., 2020; Jones et al., 2010; Saenz & Brown, 2018; Shelbourn et al., 2006; Sijakovic & Peric, 2020; Sitaloppi et al., 2020; Watts et al., 2019) <b>15</b>	resource-based view theory, market orientation, organizational cultural theory, institutional theory two-stage game theory		
	Sustainable Design				
	Waste management				
	Mismanagement and Knowledge Management				
	Sustainable Supply Chain CSR				
	Tension Management				
	Material Mix				
	Internationalization			(Chen et al., 2016; Ye et al., 2020) <b>2</b>	resource-based view
	Lean concept			(Khodeir & Othman, 2018; Lapinski et al., 2006) <b>2</b>	
	Policy			(Kamal et al., 2019; Yuan et al., 2013; Zuo et al., 2012) <b>3</b>	Capital theory, Resource-Based approach, Stakeholder
Circular Economy	(Cruz Netro et al., 2016; Núñez-Cacho Utrilla et al., 2020) <b>2</b>				
Reverse Logistic	(; Brown et al., 2009; Isaksson & Steimle, 2009; Khan et al., 2014; Kohler, 2006; Liao et al., 2017, 2018; Lu et al., 2016; Watts et al., 2019) <b>11</b>				
Communication and disclosure method					
Greenwashing	(Darko et al., 2017; Dietz et al., 2020; Ghosh et al., 2020; Heravi et al., 2017; Pimentel et al., 2016) <b>5</b>	Stakeholder			
Decision making tools	(Becerik-Gerber & Kensek, 2010; Olawumi & Chan, 2020) <b>2</b>				
	Building Information Modelling				

**Table 8**  
The prior studies of the Outcome of SR (8 research articles).

Economic performance	Economic performance	(Chen et al., 2016; Jones et al., 2009; Liao et al., 2018; Shan et al., 2020; Tan et al., 2011; Wang et al., 2016; Xiong et al., 2016) <b>8</b>	Trade-off hypothesis, Private Cost theory, Signalling theory, Stakeholder, Social Capital
Project bids	Cost		

2011).

The economic benefits of construction firms and the outcomes of adopting sustainable practices also offer exciting directions for future research. These directions include competitive advantage, reputation and image, CSR knowledge, and firm performance.

### 5.3. Future research: Theoretical directions

The nuances and complexities of SR in the construction industry are not well served by the theoretical and ontological paradigms that prevail in the current literature. The theoretical sophistication in the field has only improved in recent years since 2016. However, few studies applied multiple theoretical perspectives (Bamgbade et al., 2017; Zhang, Oo, & Lim, 2019), which may have restricted practice innovations. This opens many avenues for future research. The lack of research using multidisciplinary theories to assess construction SR underscores the necessity for further study (Zhang, Oo, & Lim, 2019). Namely, potential studies could benefit from multiple theories that touch on cultural, behavioral, psychological, and management disciplines to broaden our understanding of implementation methods and determine other influences and leverage factors in applying SR in this sector.

We found that the dominant theoretical aspects discussed included first stakeholder theory, resource dependency theory, and institutional theory. While these theories justify organizational strategies toward sustainability, more theoretical research on disclosure is needed. Only

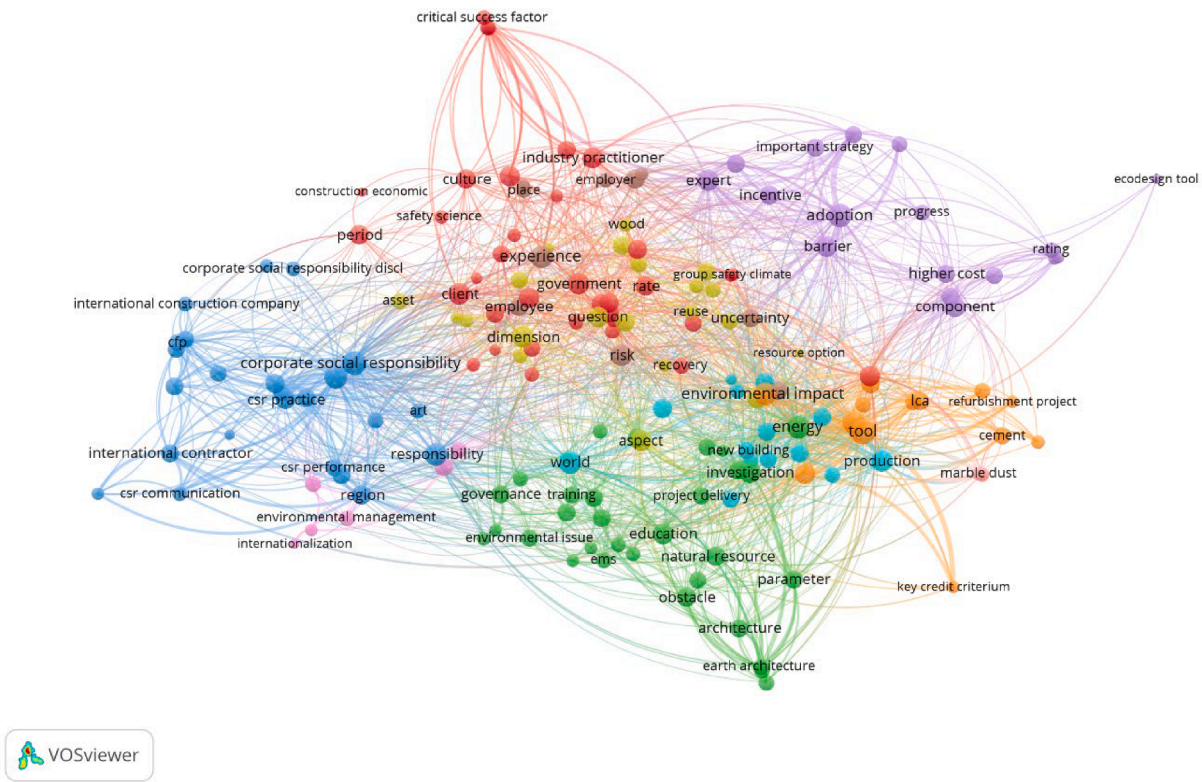


Fig. 6. Keywords distribution in 150 literatures on sustainability reporting and construction industry.



Fig. 7. Integrated Framework Sustainability reporting and Construction industry.

one empirical study used legitimacy combined with stakeholder theory to evaluate the impact of disclosure, and no study applied voluntary disclosure theory. In addition, few studies investigated organizational intention and psychological and cultural readiness to adopt SR. Thus, various theories, such as planned behavior, voluntary disclosure, and reasoning action, should be applied to examine the impact of corporate governance motives and behavior on SR (Shima & Fung, 2019).

## 6. Conclusion

The construction sector plays a vital role in ensuring human survival and enhancing the standard of living, however, it has also been criticized for its focus on profit. While sustainability in construction firms has been subject of extensive research, we found few studies focused on SR and disclosure. To the best of our knowledge, ours is the first SLR that holds promise for reinvigorating SR scholarship in the construction industry context. Our findings provide fruitful insights in addressing the research questions, trends, gaps, and themes in the context of SR in the construction industry. The studies we reviewed shed light on the contemporary challenges and motivations for applying sustainability elements and reporting. We synthesized 150 published studies on sustainability performance, assessment, application, and disclosure to present a comprehensive geographical, methodological, and theoretical analysis. Our thematic classification provides in-depth insights into research motivations, gaps, and avenues for future studies.

Our study makes significant practical and theoretical contributions. Practically, we provide a comprehensive analysis of the current state of SR in the industry, offering insights into the challenges and motivations for the application of sustainability elements and reporting. Our analysis and framework can be used by project managers, environmentalists, governmental organizations, and regulatory bodies as a foundation for generating novel theoretical ideas, informing key participants, and indicating new directions for sustainability implementation. Practitioners can use the recommended SR assessment and measurement dimensions to incorporate SR within their organizations, effectively verify their firms' sustainability plans, and consider the tools and drivers of SR.

Our study also offers opportunities for the theoretical advancement of SR research, identifying possibilities for further investigation and gaps in the literature. It advances our understanding of how SR has emerged in the construction industry and provides a panorama of genealogies for the construction sector. Our study contributes by being the first, to the best of our knowledge, to use the SLR to provide a comprehensive and recent evaluation of SR in the construction field, holding promise for reinvigorating SR scholarship in this industry context. Our research provides a unique focus on SR and disclosure in the construction industry, as previous studies have concentrated on an environmental assessment of construction firms and the impacts on market competition, firm performance, internationalization, energy consumption, recycling and lifecycle assessment, and green building. Transdisciplinary action research, policy actors, and strategic planners concerned with a firm's ability to adopt new practices that align with societal needs can use our findings and framework to inform their decisions. Additionally, policymakers can review the strategies for prospective sustainability implementation causes and consequences. Governmental and nongovernmental institutes can consider academic research trends that emerge in this SLR to enact laws and standards.

Despite our contributions and insights, our study has limitations. First, we limited ourselves to three datasets. Second, we limited journal selection to peer-reviewed articles in English, which affected the outcome of the findings, especially the geographic dispersion of the results. Owing to a lack of SLRs on this topic, we aimed to provide holistic insight into this area. Therefore, we included studies that provided all related information supporting SR in the construction sector, such as sustainability measurements, assessments, and performance (Burritt & Schaltegger, 2010; Maas et al., 2016). Future studies could extend this knowledge by focusing only on SR and disclosure in this sector. Finally,

although our keywords were chosen based on prior leading studies, additional keywords could extend the review to other related topics.

## 7. Ethics approval statement

This article does not contain any studies with human participants or animals performed by any of the authors.

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## CRediT authorship contribution statement

**Maha Zadeh Kazemi:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Ahmed A. Elamer:** Writing – review & editing, Conceptualization, Supervision, Methodology, Investigation. **Grigorios Theodosopoulos:** Writing – review & editing, Supervision, Methodology. **Saleh F.A. Khatib:** Visualization, Initial analysis.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data available on request from the authors.

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