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## ESG IN SUSTAINABLE CONSTRUCTION: A SCOPUS-BASED BIBLIOMETRIC ANALYSIS

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### Abstract:

The incorporation of Environmental, Social, and Governance (ESG) principles into sustainable construction has gained increasing attention as the built environment faces mounting pressure to align with global sustainability goals. Despite this growing interest, the field's intellectual architecture, progression of research, as well as thematic trajectories concerning ESG within sustainable construction remain fragmented and insufficiently synthesized. This research seeks to bridge this deficiency by undertaking an extensive bibliometric examination to chart the development, key contributors, and emerging trends in this domain. A systematic data retrieval process was performed using Scopus, applying an advanced search strategy based on the keywords "ESG," "sustainable construction," and "eco-friendly construction." The dataset, limited to the period from 2005 to May 2026, yielded a total of 164 relevant publications. The analysis was conducted employing Scopus Analyzer to perform an initial evaluation of research performance, OpenRefine to facilitate data cleaning and preparation, and VOSviewer to generate visualizations and map the resulting networks. The results demonstrate a pronounced increase in publication output, especially from 2020 onward, indicating the rapid emergence of ESG as a central research focus. Influential articles are predominantly review-based, contributing

to the conceptual consolidation of the field. At the same time, leading countries such as China, Australia, and the United States demonstrate strong publication and citation performance. Keyword co-occurrence analysis further identifies “sustainability,” “green building,” and “corporate social responsibility” as dominant themes, alongside emerging topics such as ESG integration, stakeholder decision-making, and digital technologies. Overall, the study underscores a distinct shift away from conventional sustainability discourse toward a more integrated ESG framework, emphasizing the growing importance of multidisciplinary approaches in advancing sustainable construction practices. The findings offer meaningful insights for both practitioners and researchers by outlining current research trajectories and identifying future directions for ESG implementation in the construction sector.

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ESG, Sustainable Construction, Eco-Friendly Construction



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## Introduction

Sustainable construction and environmental, social, and governance (ESG) performance have emerged as intertwined agendas shaping how the construction industry creates long-term value. Sustainable construction emphasizes life-cycle resource efficiency, low carbon, and social well-being, while ESG adds explicit metrics, disclosure, and investor expectations around environmental impact, social responsibility, and governance quality (Bezerra et al., 2025; Bhuiyan & Hammad, 2024; Hua & Erkal, 2024; Park et al., 2023; Roukoz & Ersenkhal, 2023). Bridging these two concepts means aligning design, engineering, and project delivery practices with ESG-driven corporate strategies, reporting systems, and financial incentives (Cortés et al., 2023; Kazemi et al., 2023; Kryvomaz et al., 2023; Matveeva & Kozma, 2022; Tovar et al., 2025). This integrated perspective is increasingly critical in a sector responsible for high emissions, waste, and social risks but also central to achieving global sustainability goals (Bezerra et al., 2025; Bhuiyan & Hammad, 2024; Candido et al., 2023; Udomsap & Hallinger, 2020).

Research on sustainable construction has experienced substantial acceleration over the past twenty years, with bibliometric analyses showing a pronounced growth in publications since 2010 and highlighting dominant themes such as alternative materials, recycling and waste reduction, sustainable construction management, and social sustainability (Candido et al., 2023; Owajori et al., 2021). Sustainable construction is framed around the triple bottom line, which encompasses social, environmental, as well as economic dimensions of performance. In certain studies, this framework is further extended through the inclusion of a technical dimension for durability and service life (Bhuiyan & Hammad, 2024). Key themes include life

cycle assessment, innovative and low-carbon materials, energy efficiency, and circular strategies such as adaptive reuse (Bhuiyan & Hammad, 2024; Candido et al., 2023; Owojori et al., 2021; Udomsap & Hallinger, 2020). Yet, social aspects remain comparatively underdeveloped, and the literature stresses the need for holistic integration of multiple factors—technical, organizational, and policy-related—to move from isolated green projects toward systemic sustainability transitions (Bhuiyan & Hammad, 2024; Candido et al., 2023; Owojori et al., 2021; Udomsap & Hallinger, 2020).

Simultaneously, ESG has emerged as a key framework through which corporate sustainability, risk, as well as value are addressed, but its adoption in construction remains uneven and conceptually fragmented. Exploratory work in the construction industry shows that ESG reporting and practices are driven by stakeholder pressure and investor expectations, yet disclosure topics, depth, and implementation vary widely across firms (Hua & Erkal, 2024; Monteiro et al., 2024; Nováková, 2025; Park et al., 2023; Roukoz & Ersenkal, 2023). Research on sustainability reporting (SR) within the construction sector highlights SR and ESG disclosures as essential mechanisms for conveying and governing sustainability performance. Still, they also identify large gaps: reporting is often motivated by instrumental or political reasons, report quality and content differ substantially, and links to strategy and management systems are weak (Kazemi et al., 2023; Kryvomaz et al., 2023). Systematic reviews highlight four main SR themes, comprising assessment and indicators, determinants, strategic management, and outcomes, and argue for more diversified theoretical perspectives and standardized frameworks tailored to construction's specific impacts and value chains (Cortés et al., 2023; Tovar et al., 2025).

Recent research explicitly seeks to connect ESG frameworks with sustainable construction practice at multiple scales. At the firm level, case-based and quantitative studies develop multidimensional ESG evaluation systems for construction companies that integrate economic, technological, environmental, social, and governance dimensions, often using advanced methods (e.g., entropy-weight TOPSIS) to track performance over time (Lei & Zhao, 2024). Findings emphasize the importance of corporate governance and technology capabilities in enabling sustained improvements in environmental stewardship, social engagement, and economic performance, and in supporting green transformation pathways for enterprises (Hu et al., 2023; Lei & Zhao, 2024; Martin et al., 2025). Cross-border analyses of construction firms in different institutional contexts show that financial metrics such as profitability and liquidity may serve as important determinants of ESG performance, although their effects are shaped by regulatory environments and market pressures (Bezerra et al., 2025). At the sector and policy level, work on ESG and construction links corporate ESG implementation with regional green economic efficiency and advancements in green technological innovation, suggesting that stronger ESG practices can enhance green development, especially in high-polluting industries, while interacting in complex ways with environmental regulation (Hu et al., 2023). Emerging frameworks provide detailed ESG indicator sets and KPIs for construction, aligning with standards such as GRI and GRESB to support consistent measurement, compliance, and benchmarking, including sector-specific tools for European and Italian construction firms (Park et al., 2023; Tovar et al., 2025).

Despite these advances, implementation gaps remain large, especially when ESG expectations are translated into project-level sustainable construction practices and into contexts with emerging economies or smaller firms. Surveys and sectoral studies reveal substantial differences in ESG awareness and reporting practices when comparing large construction firms

with smaller counterparts, as well as domestic enterprises with foreign-owned companies, with a considerable proportion of small and micro-scale businesses perceiving ESG as having little or no relevance to their operations (Park et al., 2023; Nováková, 2025). In emerging economies such as Brazil, practitioners identify strategic ESG actions, such as the management of waste alongside sustainable material use, the conservation and recycling of water resources, and the promotion of employee health and well-being as the most influential drivers of sustainability progress, whereas environmental certifications and diversity related programs are frequently regarded as comparatively less significant in practical application (Bezerra et al., 2025; Cruz et al., 2023). Other work on innovation and ESG in civil construction shows that, although there is a growing body of literature and some advanced practices (e.g., prefabrication, wood construction), many innovative materials and methods remain experimental, and global knowledge flows are fragmented, with strong regional clustering of research and limited cross-context replication (Daouk & Castro, 2025; Matveeva & Kozma, 2022). Studies of national or regional contexts, such as Korea, Ukraine, Russia, Italy, Brazil, and the Czech Republic, underline that ESG-driven sustainable construction is mediated by local regulations, post-crisis reconstruction agendas, markets, and institutional capacity, and that consistent ESG reporting and standardization are still evolving (Daouk & Castro, 2025; Kryvomaz et al., 2023; Nováková, 2025).

In conclusion, the literature indicates that bridging ESG and sustainable construction requires integrating life-cycle-oriented design and engineering practices with robust ESG metrics, reporting, and governance mechanisms that reflect the construction sector's specific environmental and social footprints. Sustainable construction research offers technical and management approaches focused on materials, energy, waste, and circularity, while ESG research brings structured criteria, disclosure frameworks, financial linkages, and stakeholder expectations. The two strands increasingly intersect in studies that design ESG indicator systems for construction, evaluate corporate performance and strategic actions, and link firm-level ESG to regional green economic outcomes. However, persistent challenges include fragmented standards, weak alignment between reporting and corporate strategy, underdeveloped social dimensions, uneven adoption among smaller firms and in emerging economies, and limited empirical evidence on the effectiveness of specific practices. Future work can strengthen this bridge by developing sector-specific ESG frameworks grounded in sustainable construction science, empirically testing how ESG-driven strategies transform project-level practices and outcomes, and exploring governance, financial, and policy levers that make ESG both a driver and a credible reflection of sustainable construction across diverse contexts.

### Research Question

1. How has the number of scholarly publications on ESG in sustainable construction changed from 2005 to May 2026?
2. Which articles are most influential in ESG in sustainable construction based on citation impact?
3. Which countries lead ESG in sustainable construction in terms of publication output and citation impact?
4. What are the dominant and emerging research themes in ESG in sustainable construction based on keyword co-occurrence analysis?

## Methodology

Bibliometric analysis refers to the structured process of gathering, arranging, and critically evaluating bibliographic information extracted from academic literature (Alves et al., 2021; Assyakur & Rosa, 2022; Verbeek et al., 2002). Beyond fundamental descriptive measures such as determining publication venues, chronological publication patterns, and influential researchers (Wu & Wu, 2017), bibliometrics further extends to sophisticated evaluative methods, including co-citation analysis at the document level. Conducting a comprehensive literature review necessitates a cyclical and disciplined procedure that encompasses meticulous keyword identification, exhaustive database exploration, and in-depth interpretive assessment. Such a structured methodology facilitates the construction of a reliable bibliographic foundation while reinforcing the credibility of the resulting conclusions (Fahimnia et al., 2015). Consequently, this research focused primarily on publications of high scholarly impact, given their significant contribution to the conceptual and theoretical underpinnings of the field. For the purpose of maintaining data precision and uniformity, the Scopus database was selected as the principal source for information retrieval (Al-Khoury et al., 2022; di Stefano et al., 2010; Khiste & Paithankar, 2017). In addition, to preserve academic rigor, the dataset was restricted exclusively to peer-reviewed journal articles, with books and lecture materials deliberately omitted from consideration (Gu et al., 2019). Utilizing Elsevier's Scopus platform, which is widely acknowledged for its comprehensive indexing coverage, pertinent literature spanning the period from 2005 through May 2026 was compiled for subsequent analytical processing.

### *Data Search Strategy*

The data acquisition procedure was carried out through the Scopus database, utilizing a systematic and reproducible search framework as outlined in Table 1. The search string TITLE-ABS-KEY ("sustainable construction" OR "green building" OR "eco-friendly construction" OR "sustainable building" OR "sustainable design") AND ( ESG OR "environmental social governance" OR "sustainability reporting" OR "corporate social responsibility" ) AND ( LIMIT-TO ( SUBJAREA , "ENGI" ) OR LIMIT-TO ( SUBJAREA , "ENVI" ) OR LIMIT-TO ( SUBJAREA , "SOCP" ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ) was deliberately constructed to retrieve pertinent scholarly works situated at the convergence of sustainable construction and Environmental, Social, and Governance (ESG) frameworks. The application of the TITLE-ABS-KEY field guaranteed that the retrieved publications explicitly addressed the core research themes within their titles, abstracts, or keywords, thereby enhancing the relevance and precision of the dataset. Furthermore, restricting the subject areas to environmental science, engineering, as well as social science enabled a focused yet multidisciplinary perspective aligned with the study objectives. This systematic query yielded a total of 164 documents, forming the initial dataset for subsequent analysis.

Following the retrieval stage, a screening procedure was conducted to refine the dataset based on the predetermined inclusion and exclusion parameters specified in Table 2. These screening requirements were implemented to uphold methodological rigor and ensure consistency by restricting the dataset to English-language publications and to the designated disciplinary areas, specifically engineering, environmental science, and social science, while excluding studies published in other languages and those falling outside the selected fields. This stage was crucial for preserving the comparability and overall quality of the bibliometric analysis, as well as for confirming that the retained studies were directly aligned with the scope of the research. Through the systematic application of the criteria presented in Table 2, only records deemed

high-quality and contextually relevant were preserved, thereby enhancing the dependability and validity of the subsequent bibliometric mapping and interpretative analysis.

**Table 1: The Search String**

<b>Scopus</b>	TITLE-ABS-KEY ( (“sustainable construction” OR “green building” OR “eco-friendly construction” OR “sustainable building” OR “sustainable design”) AND ( ESG OR “environmental social governance” OR “sustainability reporting” OR “corporate social responsibility”) ) AND ( LIMIT-TO ( SUBJAREA , “ENGI”) OR LIMIT-TO ( SUBJAREA , “ENVI”) OR LIMIT-TO ( SUBJAREA , “SOCI”) ) AND ( LIMIT-TO ( LANGUAGE , “English”) )
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**Table 2: The Selection Criterion is Searching**

<b>Criterion</b>	<b>Inclusion</b>	<b>Exclusion</b>
Language	English	Non-English
Subject	Engineering, Environmental Science, & Social Science	Others
Timeline	2005 – 2026	

### *Data Analysis*

VOSviewer is a broadly utilized and highly user-oriented bibliometric analysis application created by Nees Jan van Eck and Ludo Waltman at Leiden University (van Eck & Waltman, 2010, 2017). This software is purpose-built for both the visualization and quantitative assessment of scholarly literature, providing sophisticated capabilities for the construction of network maps, the grouping of related items through clustering techniques, and the production of density-based visual representations. Its methodological versatility allows for the exploration of multiple forms of bibliometric relationships, such as co-authorship patterns, co-citation linkages, and keyword co-occurrence structures, thereby supporting an extensive examination of scientific research domains. With the assistance of an accessible interface and ongoing developmental enhancements, VOSviewer supports efficient, scalable, and interactive evaluation of extensive bibliometric datasets. Its functionality to calculate bibliometric metrics, customize visual presentation outputs, and combine data from multiple sources further strengthens its role as a powerful instrument for academic and scientific investigation.

A key advantage of VOSviewer is its capacity to convert intricate bibliometric datasets into clear and logically structured visual forms that are readily interpretable. The tool is especially effective in conducting network-oriented analyses, such as detecting patterns of keyword co-occurrence, grouping closely related elements into coherent clusters, and generating density visualizations that illustrate concentration and distribution within the data. Its user-oriented design accommodates both beginning as well as experienced researchers in systematically exploring and interpreting research trends. Continuous updates ensure that VOSviewer remains methodologically relevant, offering adaptable analytical capabilities across a broad range of bibliometric datasets, encompassing citation, authorship, as well as collaboration networks.

In the present investigation, bibliographic records were obtained from Scopus in Plain Text format, including publication year, article titles, author details, source journals, citation indicators, and keywords, covering the period from 2005 through May 2026. Subsequent data processing was performed using VOSviewer (version 1.6.20), whereby VOS mapping and clustering procedures were implemented to generate and analyze bibliometric networks. In contrast to traditional Multidimensional Scaling (MDS), VOSviewer adopts a mapping strategy that situates items within a reduced-dimensional representation such that the spatial separation between any two items corresponds proportionally to their level of relatedness (van Eck & Waltman, 2010). The VOS framework is differentiated by its use of specialized normalization schemes tailored specifically for co-occurrence data, most notably the association strength measure ( $AS_{ij}$ ), defined as follows (Van Eck & Waltman, 2007).

$$AS_{ij} = \frac{c_{ij}}{w_i w_j},$$

which represents the quotient between the empirically observed co-occurrence frequency of items  $i$  and  $j$  and the frequency that would be anticipated under an assumption of statistical independence between the two items (Van Eck & Waltman, 2007).

## Result and Discussion

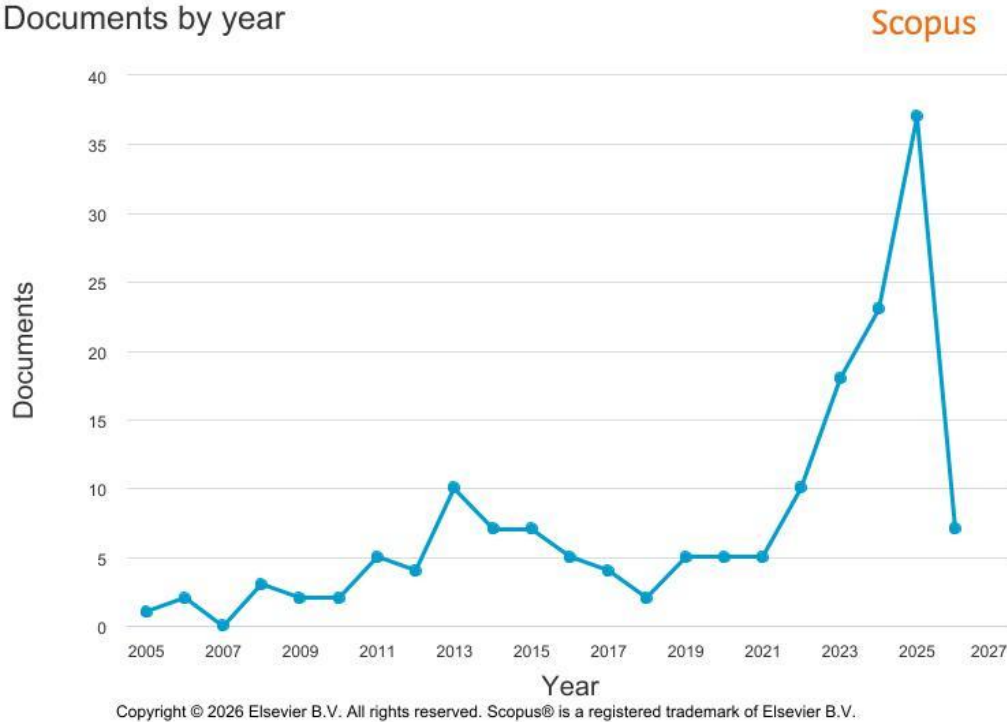
### ***RQ1: How Has the Number of Scholarly Publications on ESG In Sustainable Construction Changed From 2005 To May 2026?***

The temporal pattern of scholarly publications demonstrates a pronounced progression in academic attention toward ESG within sustainable construction, characterized by three distinct phases. The early stage (2005–2012) demonstrates a nascent and exploratory research landscape, with consistently low publication outputs (1–5 publications annually,  $\leq 3.05\%$ ). This subdued level of activity is largely explained by the then-fragmented conceptualization of sustainability concepts during that period, where environmental considerations were often addressed in isolation rather than through an integrated ESG framework. The gradual increase observed between 2013 and 2016, including a notable rise to 10 publications in 2013 (6.10%), suggests the beginning of conceptual convergence, driven by growing global awareness of sustainability challenges and the need for more holistic construction practices. However, the subsequent fluctuation between 2016 and 2021 indicates that ESG had not yet been fully institutionalized within construction research, remaining an emerging rather than dominant theme.

A significant surge is evident from 2022 onwards, culminating in a peak in 2025 with 37 publications (22.56%), followed by sustained high output in 2024 (14.02%) and 2023 (10.98%). This sharp upward trajectory reflects the rapid mainstreaming of ESG principles, largely influenced by intensified global policy frameworks, investor pressure for sustainable reporting, and the convergence of construction methodologies with wider sustainability priorities, including climate mitigation as well as responsible development. The construction sector, being resource-intensive and environmentally impactful, has increasingly been scrutinized under ESG criteria, prompting a surge in academic inquiry. The slight decline in 2026 (4.27%) is likely not indicative of reduced interest but rather reflects partial-year data or publication lag. Overall, the trend demonstrates a transition from fragmented sustainability discussions to a mature, ESG-driven research domain, highlighting the increasing significance

of the combined social, environmental, as well as governance dimensions in influencing the direction of sustainable construction in the future.

### Documents by year



**Figure 1: Trend of Research on ESG in Sustainable Construction by Years**

**Table 3: Number of Publications**

Year	Number of Publications	Percentage (%)
2026	7	4.27
2025	37	22.56
2024	23	14.02
2023	18	10.98
2022	10	6.10
2021	5	3.05
2020	5	3.05
2019	5	3.05
2018	2	1.22
2017	4	2.44
2016	5	3.05
2015	7	4.27
2014	7	4.27
2013	10	6.10
2012	4	2.44
2011	5	3.05
2010	2	1.22
2009	2	1.22
2008	3	1.83

2006	2	1.22
2005	1	0.61

**RQ2: Which Articles Are Most Influential in ESG In Sustainable Construction Based on Citation Impact?**

The most cited articles in Table 4 reveal that foundational and review-based studies dominate the core intellectual framework underpinning ESG-focused research within sustainable construction. The highest-cited paper by Zhao X. et al. (2019), with 302 citations, exemplifies the strong influence of bibliometric and review articles in consolidating fragmented knowledge and guiding subsequent research directions. Similarly, highly cited works published in leading journals, including the Journal of Environmental Management as well as the Journal of Cleaner Production, highlight the central role of sustainability-focused outlets in disseminating impactful research. Studies addressing material innovation (e.g., wood in green buildings), corporate social responsibility (CSR), and sustainability reporting tools also feature prominently, indicating that early high-impact contributions were largely centered on environmental and social dimensions rather than explicitly framed ESG integration. The presence of older publications, such as David Myers (2005), among the most cited, further suggests that pioneering works continue to serve as key theoretical references due to their early exploration of sustainability attitudes within the construction sector.

Moreover, the citation patterns indicate a transition from general sustainability discourse toward more specialized and financially oriented ESG themes. Recent contributions, such as Wu R. and Liu B.-Y. (2023), reflect the growing integration of climate policy, investor sentiment, and green finance into construction-related research, albeit with comparatively lower citation counts due to their recency. The dominance of review papers and conceptual studies suggests that the field is still evolving, with scholars relying heavily on synthesized knowledge to frame emerging research agendas. Additionally, the diversity of topics, including frugal innovation, prefabrication costs, and urban political ecology, demonstrates the multidisciplinary nature of ESG in sustainable construction. This breadth indicates that high-impact research is not confined to a single thematic area but instead reflects the convergence of environmental performance, social responsibility, and economic considerations, reinforcing the complexity and expanding scope of ESG-driven inquiry in the built environment.

**Table 4: Most Cited Author**

No.	Authors	Title	Year	Source title	Cited by
1	Zhao et al. (2019)	A bibliometric review of green building research 2000–2016	2019	Architectural Science Review	302
2	Wang et al. (2014)	Use of wood in green building: A study of expert perspectives from the UK	2014	Journal of Cleaner Production	190
3	Jiang & Wong (2016)	Key activity areas of corporate social responsibility (CSR) in	2016	Journal of Cleaner Production	173

		the construction industry: A study of China			
4	Myers (2005)	A review of construction companies' attitudes to sustainability	2005	Construction Management and Economics	117
5	R. Wu & Liu (2023)	Do climate policy uncertainty and investor sentiment drive the dynamic spillovers among green finance markets?	2023	Journal of Environmental Management	106
6	Siew et al. (2013)	A review of building/infrastructure sustainability reporting tools (SRTs)	2013	Smart and Sustainable Built Environment	85
7	Knuth (2016)	Seeing Green in San Francisco: City as Resource Frontier	2016	Antipode	75
8	Thomé et al. (2016)	Sustainable infrastructure: A review and a research agenda	2016	Journal of Environmental Management	74
9	Ebolor et al. (2022)	Sustainable development in the construction industry: The role of frugal innovation	2022	Journal of Cleaner Production	70
10	Xue et al. (2017)	Factors affecting the capital cost of prefabrication: A case study of China	2017	Sustainability (Switzerland)	67

***RQ3: Which Countries Lead ESG In Sustainable Construction in Terms of Publication Output and Citation Impact?***

Figure 2 illustrates the country-level collaboration network derived from the co-occurrence analysis, revealing both research productivity and influence within the ESG–sustainable construction domain. Nations including China (21 documents; 701 citations; total link strength = 16) and Australia (22 documents; 669 citations; total link strength = 15) stand out as leading contributors, reflecting both substantial scholarly productivity and notable citation impact, as well as a high degree of collaborative connectivity. This indicates that these nations occupy a pivotal position in directing the research agenda, likely driven by proactive national sustainability policies, rapid construction development, and institutional emphasis on ESG integration. Similarly, the United States as well as the United Kingdom continue to hold prominent standings in citation impact (538 and 308, respectively), indicating the global influence of their research despite relatively moderate total link strength values. This pattern suggests that, while these countries produce highly impactful work, their collaboration networks may be more regionally concentrated or less interconnected than those of China and Australia.

In contrast, countries such as India, Malaysia, and Hong Kong demonstrate moderate publication outputs, but comparatively lower citation counts and link strengths, reflecting emerging participation in the research field. For instance, India records 14 documents but only 68 citations, suggesting that while research activity is increasing, its global impact and visibility remain limited. European countries such as Spain, Greece, and Poland exhibit lower performance across all indicators, particularly in total link strength, indicating weaker integration into the global research network. This disparity can be attributed to differences in research funding, policy prioritization, and the maturity of ESG implementation across regions. Overall, Figure 2 highlights a geographically uneven research landscape, where leading countries dominate both knowledge production and collaboration networks, while others are still in the process of strengthening their academic influence and international research linkages.

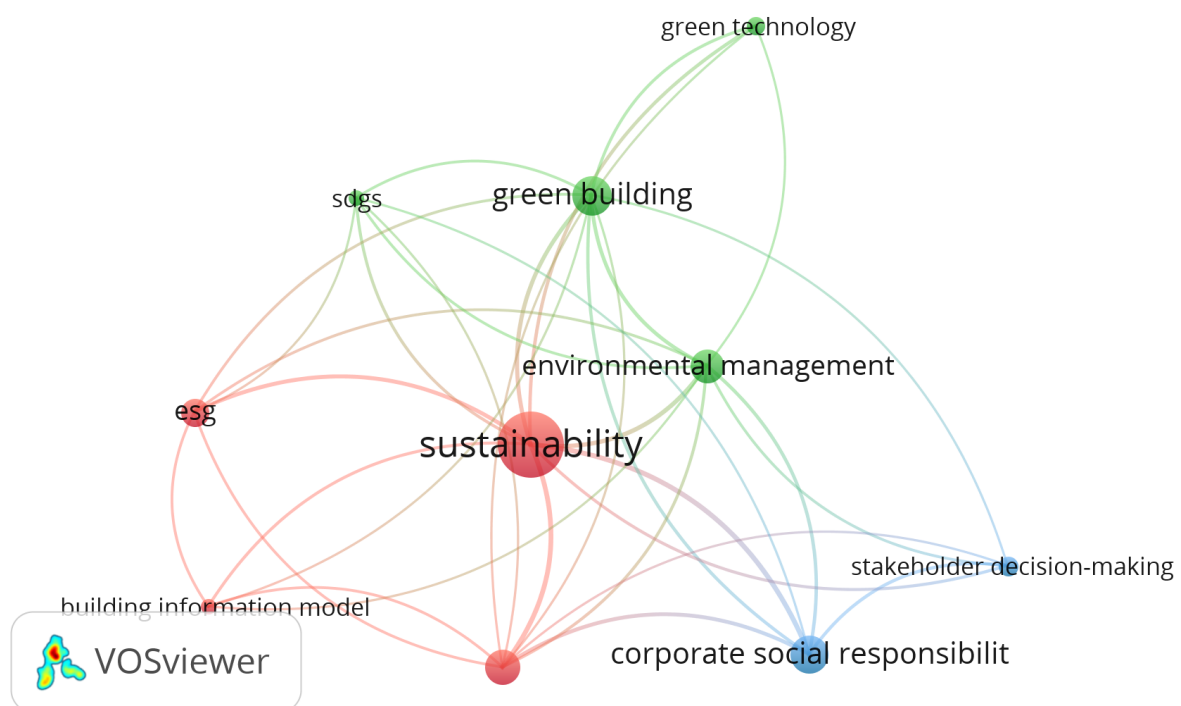


**Figure 2: Co-author by Countries**

***RQ4: What Are the Dominant and Emerging Research Themes in ESG In Sustainable Construction Based on Keyword Co-Occurrence Analysis?***

Figure 3's keyword co-occurrence network illustrates the intellectual architecture as well as the thematic focal points of ESG scholarship in the domain of sustainable construction. The dominance of "sustainability" (84 occurrences; total link strength = 91) indicates that it serves as the central integrating concept, linking multiple research streams across the network. Closely connected keywords such as "green building" (29 occurrences) and "corporate social responsibility" (28 occurrences) suggest that the field has been historically anchored in environmental performance and social accountability dimensions. The relatively strong link strengths among "construction industry," "environmental management," and "corporate social responsibility" further reinforce the argument that early research primarily emphasized operational sustainability practices and organizational responsibilities rather than a fully integrated ESG framework. This pattern reflects the evolutionary nature of the field, where sustainability served as the foundational concept before ESG emerged as a more structured and comprehensive paradigm.

Notably, “ESG” is present with a comparatively lower frequency of occurrence (15) alongside a total link strength of 19, indicating that it is a relatively recent but growing research focus. Its connections with emerging keywords such as “stakeholder decision-making,” “SDGs,” and “green technology” suggest a shift toward more strategic, governance-oriented, and impact-driven perspectives. The presence of “building information model” (BIM) also signals increasing integration of digital technologies in advancing ESG objectives within construction practices. The comparatively lower frequencies of these newer keywords imply that while ESG is gaining traction, it is still in a developmental phase compared to the well-established sustainability discourse. Overall, Figure 3 illustrates a transition from traditional sustainability-focused research toward a more holistic ESG-oriented framework, driven by the need for integrated decision-making, technological innovation, and coherence with global initiatives, including the Sustainable Development Goals.



**Figure 3: Network Visualization Map of Keywords' Co-Occurrence**

## Conclusion

This study aimed to investigate the progression, conceptual organization, and scholarly trajectories of ESG within the domain of sustainable construction using a bibliometric methodology, with emphasis on publication growth, influential studies, leading countries, and thematic evolution between 2005 and May 2026. The analytical framework was constructed to address central inquiries about the progression of scholarly output, the identification of highly cited contributions, the spatial distribution of research productivity across different regions, and the identification of both established and emerging research themes shaping the discipline. Through the use of systematic data acquisition procedures combined with visualization-based analytical techniques, the study delivers a coherent and organized depiction of the manner in which ESG has been positioned within sustainable construction research over time.

The results demonstrate a pronounced upward trend in publication output, most notably following 2020, which reflects the growing global prioritization of ESG practices within the construction sector. Early research was limited and fragmented, mainly focusing on environmental sustainability, while more recent studies demonstrate a shift toward integrated ESG perspectives. Highly cited articles are largely review-based, suggesting that the field is still consolidating its theoretical foundation. In terms of geographical contribution, a small number of countries dominate both publication output and citation impact, indicating an uneven global research landscape. Thematic analysis further reveals that sustainability, green building, and corporate social responsibility remain central topics, while newer themes such as ESG integration, stakeholder decision-making, and digital technologies are gradually emerging.

This study advances the field by delivering a thorough mapping of ESG-focused research within sustainable construction, offering insights into its intellectual structure and development patterns. The results highlight the transition from traditional sustainability approaches toward a more holistic ESG framework, which integrates environmental, social, and governance considerations. From a pragmatic standpoint, the results indicate that stronger alignment between policy, industry practices, and research is required to support effective ESG implementation in construction. The study also indicates the need for improved collaboration across regions to enhance knowledge sharing and research impact.

Several limitations should be acknowledged, including the dependence on only one database and the limitation to publications written solely in English, which may result in the omission of pertinent studies available through other sources. Subsequent research could broaden this scope by integrating a wider range of databases, undertaking more in-depth qualitative investigations, as well as examining the application of ESG principles at the project level. In conclusion, this study highlights the usefulness of bibliometric analysis as a systematic approach to comprehending the progression and trajectory of ESG within sustainable construction, while also establishing a basis for future investigations directed at strengthening sustainable practices in the built environment.

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