

Environmental, social and governance (ESG) in the built environment: science mapping of present and future trends

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Abstract

Purpose – The increasing urgency to embed environmental, social and governance (ESG) within the built environment is driven by escalating climate threats, regulatory demands and stakeholder expectations. However, the absence of a unified understanding and the fragmented nature of ESG applications pose significant challenges to effective integration. To address these inefficiencies, quantitatively mapping current and future trends in scientific literature through bibliometric analysis is crucial. Therefore, this study aims to evaluate the knowledge structure of ESG research within the built environment.

Design/methodology/approach – A bibliometric analysis was conducted on 563 articles in the Web of Science database using the science mapping method, consisting of citation analysis, co-citation analysis and co-word analysis.

Findings – The citation analysis revealed three themes, the co-citation analysis identified four clusters, and the co-word analysis produced five clusters. Additionally, five key themes were identified regarding the knowledge structure of the ESG research within the built environment.

Originality/value – This study provides a comprehensive science mapping of ESG research within the built environment. By synthesising diverse streams of research, it offers a structured understanding of how ESG is conceptualised and operationalised across spatial, institutional and policy domains. The findings serve as a roadmap for advancing ESG through academic research, professional practice and policy design.

Keywords ESG, Built environment, Bibliometric analysis, Science mapping

Paper type Literature review

Introduction

Environmental, Social, and Governance (ESG) is a strategic framework that evaluates organisational sustainability across three dimensions: environmental performance, social responsibility, and governance quality (Meiden and Silaban, 2023). Within the built environment, ESG provides a critical mechanism for aligning industry practices with global sustainability goals (Adewumi *et al.*, 2024). Failure to embed ESG as an integrated priority can generate negative consequences for organisations, industry, society, and future generations (Baratta *et al.*, 2023). The built environment is a significant contributor to global carbon emissions, and continued neglect will exacerbate climate-driven hazards (Shen *et al.*, 2022). Social inequalities will worsen as development continues without attention to inclusive access, housing equity, and health outcomes (Gibson *et al.*, 2011). Simultaneously, the absence of robust governance frameworks will expose organisations to rising legal, financial, and reputational risks amid tightening regulatory regimes (Da Silveira and Dias Jr, 2010).



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Moreover, as sustainable finance becomes increasingly tied to ESG disclosures, organisations that lag in ESG integration will be excluded from investment flows and procurement opportunities (Dye *et al.*, 2021). Inaction will not only worsen climate change but will also endanger the long-term resilience and competitiveness of the built environment (Bezerra *et al.*, 2024).

Despite its growing prominence, integrating ESG into the built environment remains challenging in both concept and practice (Villabruna *et al.*, 2024). The complexity stems from the absence of a universally accepted operational definition of ESG within the built environment contexts. Although the environmental dimension is often better understood through carbon accounting, resource efficiency, and green certifications, the social and governance components remain inconsistently addressed. For example, the social dimension involves multifaceted issues such as community engagement, occupant well-being, and labour rights, which are difficult to quantify (Bezerra *et al.*, 2024). Likewise, governance indicators such as board structure, transparency, and ethical procurement are rarely embedded in construction delivery models (Daszyńska-Żygadło *et al.*, 2022). In addition, professionals across the built environment often lack the interdisciplinary expertise required to interpret and operationalise ESG principles, particularly when it comes to aligning them with regulatory and investor expectations (Ure *et al.*, 2024). The resulting inconsistency in practice has led to superficial adoption often reduced to tick-box compliance rather than genuine transformation (Hua and Oguz Erkal, 2024). Without addressing these systemic challenges, the built environment risks undermining the integrity and purpose of ESG, despite widespread recognition of its necessity.

To overcome these challenges, there is a pressing need for systematic knowledge consolidation. Science mapping is a bibliometric method that analyses the structure and evolution of academic literature to identify dominant themes, emerging trends, and existing knowledge gaps (Donthu *et al.*, 2021). This method enables stakeholders to visualise how the field has developed, identify well-researched areas, and pinpoint where significant blind spots persist (Nilsson *et al.*, 2016). It also fosters interdisciplinary convergence by identifying how ESG dimensions intersect in the literature, supporting integrated and holistic frameworks. Moreover, trend analyses and network visualisations generated through science mapping can guide future research directions, influence funding strategies, and inform curriculum development (Wu *et al.*, 2021). Moreover, science mapping not only advances academic inquiry; it equips professionals and policymakers with the insights needed to accelerate ESG transformation across the built environment.

Therefore, the present study aims to evaluate the knowledge structure of ESG research within the built environment using a comprehensive bibliometric science mapping method. Beyond mapping the field, this study makes three additional contributions. First, it offers a visual synthesis of ESG knowledge that supports strategic decision-making by scholars, professionals, and policymakers. Second, it establishes a benchmark for assessing the maturity and interdisciplinarity of ESG research in the built environment, enabling comparative analysis across time and industries. Third, the findings uncover underexplored areas, thereby directing attention to critical but neglected ESG dimensions. Collectively, this study provides a roadmap for more coherent, accountable, and impactful ESG integration, supporting the broader transition to sustainable and equitable built environments. The originality of this study lies in its methodological depth and analytical scope through citation, co-citation, and keyword co-occurrence analyses of 563 peer-reviewed articles, which identify key thematic clusters, intellectual foundations, and future directions.

Literature review

This section presents a comprehensive review of existing literature on ESG within the context of the built environment. Given the growing significance of ESG research, this review synthesises key academic contributions across different areas. Additionally, a subsection is included to critically assess the current knowledge gaps and limitations in the literature.

ESG in the built environment

The concept of ESG emerged in the early 2000s as an evolution of corporate social responsibility and sustainable development practices (Wang and Phillips-Fein, 2023). It gained formal recognition in the United Nations report *Who Cares Wins* (2004), which highlighted the importance of integrating ESG into financial decision-making to achieve long-term economic and social benefits (Zhao, 2022). Since then, ESG has developed into a global framework widely adopted across industries to evaluate organisational performance beyond financial outcomes (Veenstra and Ellemers, 2020).

In the built environment industry, ESG has become increasingly significant due to the high environmental footprint through building operations and construction processes (Yap *et al.*, 2024). The environmental dimension evaluates organisational performance in relation to the natural environment, including impacts on air quality, biodiversity, carbon footprint, greenhouse gas emissions, waste, and water quality (Senadheera *et al.*, 2021). The social dimension concerns how organisations manage relationships with employees, suppliers, customers, and communities, with particular attention to human rights, privacy, and community welfare initiatives (Baratta *et al.*, 2023). The governance dimension addresses corporate leadership, internal controls, audits, board composition and diversity, anti-corruption measures, executive compensation, and policy frameworks (Baratta *et al.*, 2023). As such, ESG provides an essential framework for advancing sustainability, attracting responsible investment, and supporting policy reforms within the construction industry (Wang and Xue, 2023).

Prior review papers on ESG in the built environment

A growing body of review-based research has explored how ESG principles are understood within the built environment. Table 1 summarises existing review papers on ESG in the built environment. These works span domains such as the construction industry, real estate, building projects, and sustainable construction materials. Most works employed systematic literature reviews (Cruz *et al.*, 2023; Akomea-Frimpong *et al.*, 2024; Wang and Xue, 2023; Xiang *et al.*, 2025), with Xiang *et al.* (2025) explicitly adopting the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. Others relied on traditional literature reviews (Kim and Chang, 2022; Kempenaer *et al.*, 2021; Robinson and McIntosh, 2022; Yap *et al.*, 2024), and Zheng and Lee (2025) applied a meta-analysis to synthesise findings. A notable gap exists in the absence of bibliometric analysis on ESG in the built environment. Given the capacity of bibliometric analysis to map research patterns, citation structures, and thematic evolution, it offers valuable insights that could advance understanding of ESG in the built environment.

Table 1. Prior review papers on ESG in the built environment

Sources	Scope	Systematic review	Literature review	Meta-analysis
Cruz <i>et al.</i> (2023)	Construction industry	✓	✗	✗
Kim and Chang (2022)		✗	✓	✗
Akomea-Frimpong <i>et al.</i> (2024)		✓	✗	✗
Wang and Xue (2023)		✓	✗	✗
Kempenaer <i>et al.</i> (2021)	Real estate	✗	✓	✗
Zheng and Lee (2025)		✗	✗	✓
Robinson and McIntosh (2022)		✗	✓	✗
Xiang <i>et al.</i> (2025)		✓	✗	✗
Yap <i>et al.</i> (2024)	Building project	✗	✓	✗
	Sustainable construction materials	✗	✓	✗
Source(s): Authors' own work				

Knowledge gap and positioning the study

Prior reviews papers on ESG in the built environment have employed systematic reviews, literature reviews, and meta-analysis. Although these methods provide structured evidence and interpretive insights, they remain limited in capturing the broader knowledge structure of the field, such as intellectual foundations, citation networks, and thematic evolution. Therefore, the present study addresses this gap by employing a bibliometric science mapping method to evaluate the knowledge structure of ESG research within the built environment.

Methodology

This study employs a bibliometric analysis to explore the intellectual structure and emerging trends of ESG research within the built environment. Bibliometric analysis is a quantitative method widely used to synthesise large volumes of academic literature, providing a data-driven understanding of how research fields evolve over time (Donthu *et al.*, 2021). To achieve this, three science mapping methods were applied: citation analysis, co-citation analysis, and co-word analysis. Citation analysis was used to identify the most influential articles in the field, and co-citation analysis uncovered foundational documents and thematic clusters. Co-word analysis, in turn, examined the frequency and co-occurrence of keywords to reveal emerging research trends. Collectively, these methods offer a comprehensive understanding of the ESG research landscape. All analyses were performed using VOS viewer software version 1.6.20 (Van Eck and Waltman, 2014), which is specifically designed for constructing and visualising bibliometric networks. Although bibliometric analysis is effective for synthesising existing literature, it also has some limitations (Wallin, 2005; Gaur and Kumar, 2018). To minimise these limitations, this study followed the latest bibliometric guidelines by Donthu *et al.* (2021). This decision is consistent with recent works in the built environment field (Toyin and Mewomo, 2023; Lok *et al.*, 2024; Shi and Antwi-Afari, 2025).

Data collection

The data for this study were extracted from the Web of Science (WoS) core collection, a widely recognised and high-quality bibliographic database known for indexing peer-reviewed, impactful scientific literature. The WoS database currently indexes more than 21,100 scholarly journals across 254 disciplines and houses over 74.8 million records (Web of Science, 2022; Singh *et al.*, 2021). To ensure relevance and reliability, the search was limited to journal articles, as they are considered the most rigorous and peer-reviewed forms of academic output (Mingers *et al.*, 2012). The search query was applied to the “topic” field, which includes the title, abstract, author keywords, and keyword plus and constructed as follows: ((TS = (environmental) AND TS = (social) AND TS = (governance)) OR (TS = ESG)) AND TS = (built environment). This query was designed to capture comprehensive research outputs related to ESG in the built environment. As a result, 563 journal articles were retrieved for analysis.

Data analysis: bibliometric science mapping

To analyse the retrieved articles, a science mapping method was adopted. Science mapping is a branch of bibliometric analysis that focuses on identifying the structural and thematic relationships among different elements in the academic literature, such as documents, authors, institutions, or keywords, within a given domain (Baker *et al.*, 2020). This method enables a systematic exploration of both established and emerging areas within the ESG research landscape.

Citation analysis. Citation analysis identifies influential articles based on the number of times other articles have cited them. This method operates under the premise that frequently cited documents represent foundational contributions to a field (Appio *et al.*, 2014). By analysing citation patterns, this study highlights the intellectual anchors of ESG research in the

built environment, revealing the articles that have shaped scholarly discourse and influenced subsequent works (Donthu *et al.*, 2021).

Co-citation analysis. Co-citation analysis further deepens the understanding of a field's structure by examining how often a third source cites two documents together. The assumption here is that articles frequently co-cited are thematically related (Hjørland, 2013). This method allows for the identification of thematic clusters and core research areas within ESG literature. Each cluster represents a subfield or theoretical foundation, offering insights into how different ESG dimensions such as sustainability governance, social equity, or green financing are intellectually interconnected (Liu *et al.*, 2015).

Co-word analysis. In contrast to citation-based methods, co-word analysis focuses on the semantic content of the literature. It examines the frequency and co-occurrence of specific terms, such as author keywords, to identify emerging research themes. The assumption here is that keywords appearing together across multiple articles likely reflect shared or evolving conceptual areas (Donthu *et al.*, 2021). This method is effective in identifying emerging trends, providing a forward-looking perspective on where the ESG discourse in the built environment is headed.

Results

Descriptive analysis

The annual distribution of publications and citations illustrates the evolution of ESG research within the built environment from 1992 to 2025 (Figure 1). Early academic attention was minimal, with only sporadic publications and negligible citation impact up to the early 2000s. A notable shift occurred around 2005–2006, marked by a sharp spike in citations primarily attributable to a few highly influential articles published during that period. Specifically, in 2006, the number of citations reached an exceptional peak of 5,678 despite only four articles being published that year, indicating the presence of seminal work that significantly shaped the field. This spike also reflects wider developments in global sustainability discourse, such as the launch of the United Nations Principles for Responsible Investment (UNPRI) in 2006, alongside growing corporate reporting requirements and heightened awareness of climate-related risks, which helped bring ESG into mainstream academic and industry debates (UNPRI, 2006).

From 2010 onward, the field began to gain sustained traction. A consistent increase in the number of articles is observed between 2016 and 2024, reflecting growing academic interest driven by global sustainability goals, regulatory changes, and increased industry engagement

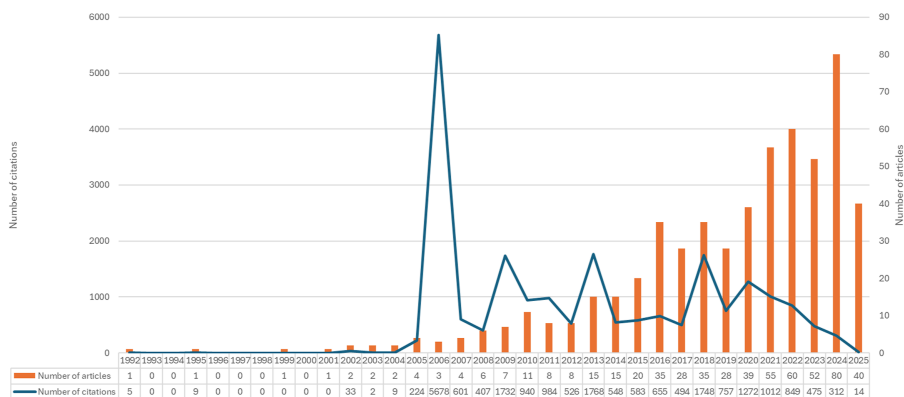


Figure 1. Number of publications and citations from 1992 to 2025. Source: Author's own work

with ESG frameworks. The highest number of publications was recorded in 2023, with 80 articles, followed closely by 2022 and 2021. Although publication counts have remained high, the citation trend shows a gradual decline in recent years, which can be explained not only by the citation lag effect, where newer publications have had less time to accumulate citations, but also by the growing volume of publications, which disperses citations across a wider set of articles. The dip in citations in 2024 and 2025 should, therefore, not be interpreted as reduced impact but rather a reflection of temporal citation patterns. Overall, this trend confirms the accelerating interest and scholarly output in ESG within the built environment, specifically post-2015, aligning with global policy milestones such as the adoption of the UN Sustainable Development Goals.

Citation analysis

The citation analysis provides a critical overview of the most influential, highly cited articles on ESG in the built environment. A minimum citation threshold was set at 20 to filter out less-cited documents to focus on the most influential articles. As a result, 152 documents met this threshold and were included in the citation network visualisation. Figure 2 presents a citation network map, where Folke (2006) appears as a central node, indicating its high citation frequency and influence. This document is connected to several other works, such as Bodin and Tengö (2012), Ratner et al. (2013), Marchese et al. (2018), and Holland et al. (2022), through citation or co-citation links. The colours represent different clusters or thematic areas in the literature, and the size and position of each node reflect citation strength and relevance.

Table 2 presents the top ten highly cited sources from the dataset of 563 articles. Leading the list is Folke (2006), with 4,537 citations and 6 citation links, signifying its foundational role in the study of social-ecological systems. This work is significant because it introduced and consolidated the resilience perspective, moving beyond the traditional equilibrium view of ecosystems to highlight thresholds, uncertainty, adaptive governance, and the integration of social and ecological dimensions. Its influence extends well beyond the built environment, as reflected in its broad uptake across ecology, environmental science, and sustainability research. Terjesen et al. (2009) and Sayer et al. (2013) follow, with 985 and 876 citations, respectively. Armitage et al. (2011) and Cui et al. (2018) also rank highly, with 596 and 493 citations. Dougill et al. (2010), Marchese et al. (2018), and Pelling et al. (2008) have made significant contributions to the discourse on resilience and climate adaptation, with citations ranging from 322 to 367. Lastly, James et al. (2009) and Luo (2007) round out the list, indicating interest in green infrastructure and strategic management in uncertain environments.

Based on the inductive interpretation of these articles, several core themes emerge related to ESG in the built environment.

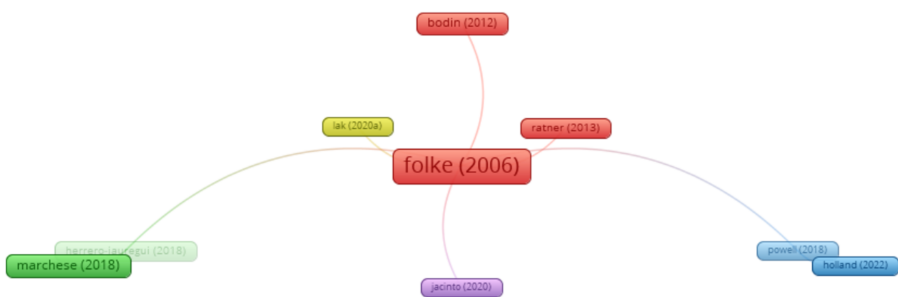


Figure 2. Citation analysis. Source: Author’s own work

Table 2. Top ten highly cited sources

Rank	Sources	Titles	Citations	Links
1	Folke (2006)	Resilience: The emergence of a perspective for social–ecological systems analyses	4,537	6
2	Terjesen et al. (2009)	Women Directors on Corporate Boards: A Review and Research Agenda	985	0
3	Sayer et al. (2013)	Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses	876	0
4	Armitage et al. (2011)	Co-management and the co-production of knowledge: Learning to adapt in Canada’s Arctic	596	3
5	Cui et al. (2018)	Does Corporate Social Responsibility Affect Information Asymmetry?	493	0
6	Dougill et al. (2010)	Anticipating Vulnerability to Climate Change in Dryland Pastoral Systems: Using Dynamic Systems Models for the Kalahari	367	0
7	Marchese et al. (2018)	Resilience and sustainability: Similarities and differences in environmental management applications	340	1
8	Pelling et al. (2008)	Shadow Spaces for Social Learning: A Relational Understanding of Adaptive Capacity to Climate Change within Organisations	322	1
9	James et al. (2009)	Towards an integrated understanding of green space in the European built environment	296	0
10	Luo (2007)	Are joint venture partners more opportunistic in a more volatile environment?	272	0

Source(s): Authors’ own work

Theme 1: resilience governance. This theme emphasises institutional and policy mechanisms that enhance the capacity of systems to absorb disturbances and adapt to change, an essential element of environmental governance. [Folke \(2006\)](#) lays the foundation by conceptualising resilience in social–ecological systems, highlighting adaptive governance, thresholds, and systems thinking. [Dougill et al. \(2010\)](#) reinforce this through dynamic systems modelling of climate vulnerability in dryland regions, integrating ecosystem resilience with institutional responses. [Marchese et al. \(2018\)](#) further clarify how resilience and sustainability are applied in environmental management. On the contrary, [Pelling et al. \(2008\)](#) demonstrate how organisational structures and learning pathways influence adaptive capacity. Together, these works highlight the critical need for governance frameworks that are flexible, cross-scalar, and inclusive of environmental uncertainties in the built environment.

Theme 2: knowledge inclusion. This theme addresses the co-production of knowledge, social learning, and stakeholder participation in environmental and urban planning, central to the “S” (social) component of ESG. [Armitage et al. \(2011\)](#) explicitly illustrate how co-management and local-traditional knowledge integration foster adaptation in Canada’s Arctic. [Sayer et al. \(2013\)](#) extend this to landscape-level planning by advocating for multi-stakeholder engagement and adaptive management in competing land-use scenarios. [James et al. \(2009\)](#) also contribute by developing a framework for interdisciplinary research on urban green spaces, stressing the importance of diverse epistemologies to improve urban sustainability. These works collectively emphasise how inclusive, pluralistic knowledge systems can inform context-sensitive solutions in the built environment.

Theme 3: socioeconomic justice. This theme encapsulates the equity, diversity, and ethical aspects of governance and economic operations in the built environment, aligning closely with both social and governance dimensions of ESG. [Terjesen et al. \(2009\)](#) critically explore gender diversity in corporate boards, revealing institutional pressures and the business case for equity. [Cui et al. \(2018\)](#) link corporate social responsibility (CSR) with improved information transparency and reduced reputational risk, showcasing the governance benefits of ethical

business conduct. [Luo \(2007\)](#) examines opportunistic behaviour in volatile environments, exposing how governance quality influences joint venture dynamics. These contributions illustrate that robust ESG performance in the built environment must integrate fairness, accountability, and inclusivity at both strategic and operational levels.

Co-citation analysis

The threshold citation of the co-citation analysis was determined at five, which resulted in the number of cited documents being 111. [Table 3](#) shows the top ten documents with the highest co-citations and total link strength.

Co-citation analysis produces four main clusters. The contents of the documents are reviewed based on the abstract to produce each cluster’s label based on inductive interpretation. [Table 4](#) presents the co-citation analysis summary comprising cluster number, colour, name, number of articles, and representative documents for each cluster. [Figure 3](#) presents the co-citation analysis.

Cluster 1 (red): corporate sustainability through ESG performance. This cluster focuses on the relationship between corporate sustainability practices, such as ESG factors, and organisational performance. It compiles empirical and theoretical works that demonstrate how ESG practices enhance long-term financial and reputational outcomes. Works by [Eccles et al. \(2014\)](#), [Friede et al. \(2015\)](#), and [Fatemi et al. \(2018\)](#) offer large-scale meta-analyses. In contrast, [Barney \(1991\)](#) and [Campbell \(2007\)](#) contribute theoretical foundations on competitive advantage and institutional influences. Overall, the cluster supports the business case for sustainability by showcasing the strategic and financial benefits of responsible corporate behaviour.

Cluster 2 (green): hybrid governance for environmental participation. This cluster emphasises governance frameworks that integrate state, market, and community roles. It highlights collaborative and participatory governance approaches such as co-management, public-private partnerships, and citizen engagement. Works like [Arnstein’s \(1969\)](#) typology of participation and [Ansell and Gash’s \(2008\)](#) model of collaborative governance are central, alongside perspectives on the valuation of ecosystem services ([Costanza et al., 1997](#)) and critiques of traditional governance paradigms ([Lemos and Agrawal, 2006](#)). The cluster foregrounds institutional complexity, decentralised decision-making, and stakeholder inclusion in environmental management.

Cluster 3 (blue): adaptive governance for social-ecological systems. This cluster revolves around the conceptualisation of resilience in coupled social–ecological systems. It explores how societies adapt to environmental change and shocks through mechanisms like adaptive

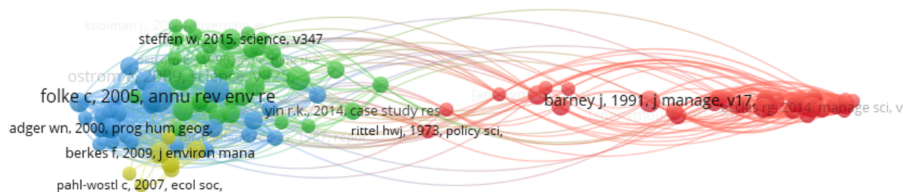
Table 3. Top ten sources with the highest co-citations and total link strength

Rank	Author	Citations	Total link strength
1	Folke et al. (2005)	23	146
2	Ostrom (2009)	16	57
3	Folke (2006)	15	82
4	Hardin (1968)	14	45
5	Barney (1991)	11	12
6	Adger (2000)	10	61
7	Berkes (2009)	10	60
8	Eccles et al. (2014)	10	35
9	Lemos and Agrawal (2006)	10	50
10	Steffen et al. (2015)	10	29
Source(s): Authors’ own work			

Table 4. Co-citation analysis summary

Cluster			Number of articles	Representatives' articles
Number	Colour	Name		
1	Red	Corporate Sustainability through ESG Performance	41	Friede et al. (2015) , Barney (1991) , Eccles et al. (2014) , Campbell (2007) , Fatemi et al. (2018)
2	Green	Hybrid Governance for Environmental Participation	37	Hardin (1968) , Lemos and Agrawal (2006) , Armstein (1969) , Costanza et al. (1997) , Ansell and Gash (2008)
3	Blue	Adaptive Governance for Social-Ecological Systems	26	Folke et al. (2005) , Ostrom (2009) , Folke (2006) , Adger (2000) , Steffen et al. (2015)
4	Yellow	Adaptive Co-Management through Social Learning	7	Berkes (2009) , Armitage et al. (2009) , Muro and Jeffrey (2008) , Armitage et al. (2012) , Berkes (2009)

Source(s): Authors' own work


Figure 3. Co-citation analysis. Source: Author's own work

governance, social learning, and collaborative institutions. Key contributions include the development of frameworks to understand self-organisation, leadership, and institutional flexibility in managing ecological crises. Authors such as [Folke et al. \(2005\)](#), [Ostrom \(2009\)](#), [Adger \(2000\)](#), and [Steffen et al. \(2015\)](#) provide interdisciplinary insights, merging ecology with social theory to propose systemic solutions for sustainability and resilience across various scales.

Cluster 4 (yellow): adaptive co-management through social learning. The fourth cluster centres on adaptive co-management as a dynamic approach to environmental governance. It stresses the role of bridging organisations, iterative learning, institutional innovation, and trust-building in managing ecological resources. The works of [Berkes \(2009\)](#), [Armitage et al. \(2009\)](#), and [Muro and Jeffrey \(2008\)](#) highlight the importance of social learning, multi-scale collaboration, and co-production of knowledge. The cluster offers a pragmatic framework for governing complex environmental issues through reflexive, adaptive, participatory processes that link science with policy.

Co-word analysis

The same database was used for the co-word analysis. Of the 3,164 keywords, 118 keywords met the threshold of appearing at least 6 times. This threshold was chosen after several trials to create the clearest and most reliable network visualisation ([Fauzi et al., 2025](#)). In this study, the keywords that have the highest co-occurrence are governance (175), sustainability (89), and management (73). [Table 5](#) summarises the top 15 keywords, their number of occurrences, and total link strength. Moreover, the co-word analysis produced 5 clusters ([Figure 4](#)). Each cluster will be discussed in detail.

Cluster 1 (red): governance performance impact for sustainable development. This cluster synthesises the role of governance structures and institutional drivers in enabling

Table 5. Top 15 keywords in the co-word analysis

Rank	Keyword	Occurrences	Total link strength
1	Governance	175	669
2	Sustainability	89	335
3	Management	73	317
4	Environment	60	228
5	Resilience	42	183
6	Policy	40	178
7	Sustainable development	40	114
8	Performance	37	140
9	Climate-change	35	139
10	Impact	35	144
11	Cities	33	140
12	Participation	30	128
13	Framework	29	137
14	Built environment	28	76
15	ESG	26	82

Source(s): Authors’ own work

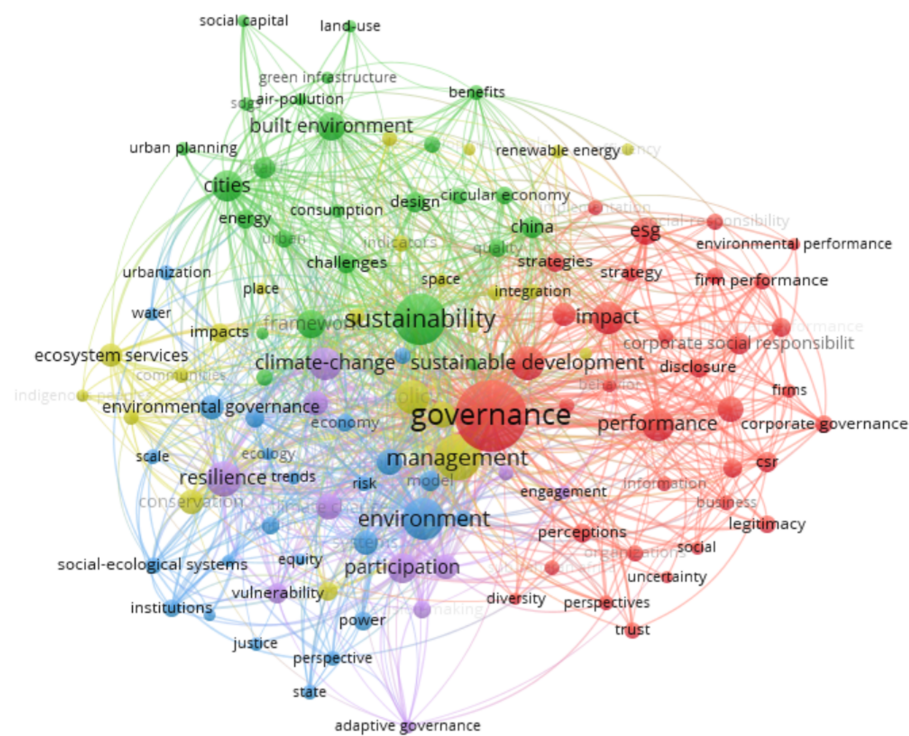


Figure 4. Co-word analysis. Source: Author’s own work

sustainability, accountability, and performance outcomes. Representative keywords such as “governance,” “sustainable development,” “performance,” and “impact” reflect this cluster’s emphasis on institutional mechanisms that drive responsible corporate behaviour. The focus is on how ESG, CSR, diversity, and corporate responsibility strategies produce measurable business impacts. [Terjesen et al. \(2009\)](#) explore how gender diversity on boards influences governance outcomes and performance, emphasising institutional impacts across multiple levels. [Cui et al. \(2018\)](#) find that CSR reduces information asymmetry, supporting organisational performance via reputation and stakeholder engagement. [Friede et al. \(2015\)](#) conducted a meta-analysis that confirms strong positive links between ESG criteria and corporate financial performance. Overall, the cluster underscores the strategic importance of responsible governance in enhancing corporate outcomes and advancing sustainable development goals.

Cluster 2 (green): sustainability framework for built environment cities. This cluster focuses on frameworks and strategies that integrate sustainability into urban and built environments. Representative keywords including “sustainability,” “cities,” “framework,” and “built environment” highlight the urban-centric and planning-oriented focus of this cluster. Research emphasises systems thinking, green infrastructure, stakeholder inclusion, and interdisciplinary methodologies to achieve sustainable urban futures. [James et al. \(2009\)](#) developed a research framework for urban green spaces that integrates ecosystem services, social valuation, and governance. [Marchese et al. \(2018\)](#) reviewed literature on sustainability and resilience, proposing three frameworks for integrated environmental management. [Sayer et al. \(2013\)](#) introduce the principles of the “landscape approach” to balance biodiversity, poverty alleviation, and development goals. Together, these works highlight the need for holistic and inclusive frameworks to support sustainable transformation in urban settings.

Cluster 3 (blue): environmental politics system governance. This cluster emphasises governance architectures for managing environmental systems under political and institutional complexity. It includes foundational and empirical work on participation, valuation, and hybrid governance models that address systemic environmental challenges. Representative keywords such as “environment,” “politics,” “environmental governance,” and “systems” reflect the macro-scale, institutional, and regulatory lens that defines this cluster. [Steffen et al. \(2015\)](#) updates the planetary boundaries framework, outlining global environmental risks and governance implications. [Hardin \(1968\)](#) offers a classic framing of the “tragedy of the commons,” arguing for moral solutions to environmental overuse. [Lemos and Agrawal \(2006\)](#) identify different approaches to environmental governance and show that hybrid models offer better capacity to tackle complex environmental challenges than traditional single-actor approaches. The cluster collectively demonstrates how multi-actor, value-driven governance systems are essential to tackling the systemic nature of environmental degradation.

Cluster 4 (yellow): knowledge policy conservation management. This cluster centres on the role of knowledge production and policy integration in environmental and conservation management. Emphasis is placed on co-management, social learning, adaptive policy, and the institutional prerequisites for effective conservation strategies. Keywords such as “management,” “policy,” “knowledge,” and “conservation” reveal this cluster’s focus on the mechanisms and capacities needed for informed and adaptive environmental governance. [Dougill et al. \(2010\)](#) used system dynamics to analyse how drought resilience, community assets, and governance shape the vulnerability of dryland pastoral systems. [Armitage et al. \(2011\)](#) studied knowledge co-production in Arctic co-management, showing how it fosters learning and adaptation. [Pelling et al. \(2008\)](#) analysed how institutional and social learning enable organisational adaptation to climate change. Altogether, these works demonstrate that integrating diverse knowledge systems and promoting institutional learning are crucial for developing responsive and resilient conservation policies.

Cluster 5 (purple): resilience, participation, climate-change adaptation. This cluster examines resilience as both a theoretical and operational tool for managing climate change and

uncertainty. It highlights participation, institutional flexibility, and adaptive co-management as crucial for enhancing community and ecosystem resilience. Representative keywords such as “resilience,” “climate-change,” and “participation” signify the cluster’s orientation toward transformation under uncertainty and inclusion of local actors in governance. [Folke et al. \(2005\)](#) and [Folke \(2006\)](#) introduce the resilience perspective and its application to adaptive governance in social-ecological systems. [Adger \(2000\)](#) defines social resilience and its links to ecological resilience in vulnerable communities. [Armitage et al. \(2009, 2012\)](#) discuss adaptive co-management as a response to multi-scale environmental challenges. In summary, the cluster confirms that participatory and adaptive governance mechanisms are essential for developing resilient responses to environmental risks and climate variability.

Discussion

The discussion builds on the results of the citation, co-citation, and co-word analyses, which together mapped the intellectual structure of ESG research in the built environment. By combining these methods, the study was able to identify recurring themes and influential clusters of knowledge that reflect how the field has evolved. These themes are identified through an inductive interpretation of the findings, reflecting the relationships and connections among influential articles, co-cited references, and recurring keywords.

Theme 1: institutional governance for sustainable development

Institutional governance is central to bringing together environmental, social, and economic goals in the built environment. It ensures that sustainability is not treated as an add-on but is built into policies, investments, and everyday practices. Strong governance provides oversight, accountability, and leadership to support ethical behaviour, clear reporting, and long-term planning. Previous works also highlight the importance of institutional conditions in promoting corporate responsibility and sustainable performance ([Campbell, 2007](#); [Eccles et al., 2014](#)). By incorporating sustainability into organisational mandates and performance measures, governance influences how decisions are made, risks are managed, and expectations from both markets and society are met.

Theme 2: participatory and hybrid environmental governance

Modern environmental governance increasingly depends on collaboration across multiple actors. Traditional top-down models alone cannot address the complexity of urban development and environmental management. Instead, participatory and hybrid approaches bring together governments, private organisations, civil society, and local communities. This idea builds on [Arnstein’s \(1969\)](#) classic ladder of participation and more recent works on co-management and public–private partnerships ([Lemos and Agrawal, 2006](#); [Berkes, 2009](#)). Such arrangements enhance transparency, encourage shared ownership of decisions, and strengthen the legitimacy of environmental initiatives. In the built environment, they support integrated planning, conflict resolution, and fair access to environmental benefits. By drawing on diverse knowledge and authority, these models are better equipped to address the social and ecological challenges of sustainable development.

Theme 3: adaptive governance for climate resilience

Governance in the built environment must be flexible and responsive to growing climate risks and uncertainties. Adaptive governance facilitates ongoing learning, iterative decision-making, and the capacity to adjust strategies in response to changing conditions. Prior works on social–ecological systems show how networks, leadership, and collective learning can strengthen resilience ([Folke et al., 2005](#); [Folke, 2006](#); [Armitage et al., 2009](#)). It emphasises cross-scale coordination, stakeholder participation, and institutional reflexivity. In urban planning and infrastructure, adaptive governance helps communities anticipate climate

impacts, reduce vulnerabilities, and recover more effectively from disruptions. This approach shifts attention from prediction and control to preparedness, transformation, and long-term resilience.

Theme 4: knowledge co-production and institutional learning

Strong environmental and urban governance relies on the ability to draw from multiple forms of knowledge. Co-production between experts, policymakers, professionals, and local communities helps ensure that solutions are relevant, legitimate, and practical. Research shows that co-production in co-management settings can strengthen adaptation and resilience (Armitage *et al.*, 2011; Berkes, 2009). Institutional learning builds on this by embedding feedback, reflection, and adaptation into governance processes. In the built environment, it means planning and policy are shaped not only by technical assessments but also by lived experiences, traditional practices, and stakeholder values. Such inclusive approaches create more equitable and responsive outcomes, especially in diverse or rapidly changing contexts.

Theme 5: integrated frameworks for urban sustainability

Achieving urban sustainability requires frameworks that address environmental protection, social equity, and economic viability in a unified manner. These frameworks must be holistic, linking industries such as housing, transport, water, and energy while also responding to spatial and community needs. They align short-term decisions with long-term goals to ensure present actions do not compromise future well-being. The landscape approach (Sayer *et al.*, 2013) and green infrastructure research (James *et al.*, 2009) illustrate how integration can connect ecological, social, and economic perspectives. In the built environment, integrated frameworks guide land use, infrastructure, and environmental management in ways that enhance synergies, minimise trade-offs, and foster inclusive, climate-resilient cities.

Conclusion

This study presents a comprehensive bibliometric science mapping of the evolving knowledge structure of ESG research within the built environment. Drawing on citation, co-citation, and co-word analyses of 563 peer-reviewed articles, five thematic domains were identified: institutional governance for sustainable development, participatory and hybrid environmental governance, adaptive governance for climate resilience, knowledge co-production and institutional learning, and integrated frameworks for urban sustainability. Collectively, these themes highlight the multidimensional and interdisciplinary nature of ESG research, capturing both established domains and emerging frontiers within the literature.

The findings demonstrate that although governance dimensions are well-established and often linked to organisational performance and regulatory compliance, social and environmental dimensions are gaining prominence through adaptive and participatory frameworks. Moreover, the co-word analysis reveals growing attention to concepts such as policy, resilience, participation, and climate adaptation, signalling an emerging convergence of research agendas across environmental, urban, and institutional contexts.

By mapping the intellectual foundations and thematic trajectories of ESG research, this study provides a critical reference point for scholars, professionals, and policymakers aiming to advance ESG integration in built environment systems. It also underscores the importance of interdisciplinary approaches and dynamic governance mechanisms to ensure that ESG efforts are not only measurable and accountable but also socially just and environmentally responsive. Moving forward, more empirical work is needed to bridge conceptual advancements with operational practice, especially in developing economies and complex urban systems. This study lays the groundwork for future research and policy development, contributing to a more sustainable, resilient, and equitable built environment.

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