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An analysis of ESG studies in the Construction Industry from the perspective of Performance Measurement and Management

Uma análise dos estudos em ESG na Indústria da Construção Civil sob o prisma da Avaliação de Desempenho

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ABSTRACT: The concept of Environmental, Social, and Governance (ESG) has become an international benchmark for highlighting organizations' commitment to sustainable development, social responsibility, and corporate transparency. Despite its growing prominence in global discussions, implementing ESG remains challenging, especially in the Construction Industry (CI). In this context, the present study aimed to identify and analyse potentialities and opportunities for improvement in ESG performance assessment systems applied to the CI. An integrative review method was conducted, gathering studies on ESG from different approaches. Subsequently, specific performance assessment studies were analysed and classified according to the expected attributes of management and performance measurement systems, identifying existing potential and opportunities for enhancement. The findings highlight not only the need to develop new indicator systems but also the importance of conducting benchmarking studies and formulating measurable goals. Another gap identified concerns the subjectivity of certain indicator systems, which undermines the reliability of the resulting indicators.

KEYWORDS: ESG, Performance Measurement and Management, Civil Construction.

RESUMO: O conceito de *Environmental, Social and Governance* (ESG) consolidou-se como referencial internacional para destacar o compromisso das organizações com o desenvolvimento sustentável, a responsabilidade social e a transparência corporativa. Apesar de seu crescente destaque nas discussões internacionais, a implementação de ESG é desafiadora, principalmente na Indústria da Construção Civil (ICC). Diante desse contexto, o presente estudo teve como objetivo levantar e analisar potencialidades e oportunidades de aprimoramento em sistemas de avaliação de desempenho de ESG dedicados à ICC. Para tanto, foi desenvolvido o método de revisão integrativa, levantando-se estudos relativos à ESG em diferentes abordagens. Após, os estudos específicos de avaliação de desempenho foram analisados e classificados conforme atributos esperados de sistemas de gestão e medição de desempenho, levantando-se os potenciais existentes e as oportunidades de melhoria, ressaltando-se não só a criação de novos sistemas de indicadores, mas a devida realização de estudos de *benchmarking* e formulação de metas. Outra lacuna destacada é a subjetividade de alguns sistemas de indicadores, o que prejudica a

confiabilidade dos indicadores resultantes.

PALAVRAS CHAVE: ESG; Sistemas de Gestão e Medição de Desempenho; Construção Civil.

1. INTRODUCTION

The concept of Environmental, Social, and Governance (ESG) has established itself as an international benchmark for highlighting organizations' commitment to sustainable development, social responsibility, and corporate transparency. The term was introduced by the "Who Cares Wins" report, prepared by the United Nations Global Compact (2004), which defined four main objectives:

i. strengthen financial markets;
ii. contribute to sustainable development;
iii. promote awareness among stakeholders; and
iv. increase trust in institutions.

ESG is structured around three interdependent dimensions: environmental (E), focused on mitigating impacts and using resources efficiently; social (S), related to the health, safety, and well-being of stakeholders; and governance (G), which involves ethics, integrity, and responsible management (Marx, 2023). Despite the global dissemination of the concept since 2013 (Souza; Kuniyoshi; Freitas, 2023), its practical application still faces challenges. According to Paul (2008), the main limitation lies in the difficulty of converting sustainability commitments into effective actions, particularly due to implementation costs. Ferreira *et al*. (2023) note that many organizations focus their efforts solely on the environmental sphere, limiting themselves to complying with legal requirements, while social and governance aspects remain underdeveloped. Other recurring obstacles include the absence of standardized indicators, resistance to organizational change, and a lack of senior management support, all of which compromise the consolidation of an ESG culture within companies (Rivatto, 2024).

Within the sector, the Construction Industry (CI) stands out for its economic relevance and significant environmental and social impacts. The sector employs approximately 10 % of formal workers in Brazil (CBIC, 2022) and accounts for approximately 40 % of natural resource consumption and solid waste generation worldwide (Backes; Traverso, 2021). Despite this, it exhibits conservative behavior regarding the adoption of sustainable innovations (Gil, 2021). The incorporation of ESG practices, therefore, represents a strategic opportunity to increase the operational efficiency, governance, and competitiveness of the CI.

Various tools and methods have been employed to promote the three spheres of ESG in the CI. Notable among these are environmental certifications that guide sustainable construction (Devine; Meagan; Svetlana, 2022) and technological tools such as Building Information Modeling (BIM), capable of optimizing the environmental

and social performance of projects (Rahim *et al*., 2023). Complementary practices include just-in-time (Ajayi, 2017; Zighan; Abualqumboz, 2021) and contractual sustainability clauses (Mahmoud; Beheiry, 2021), as well as knowledge management strategies and industry-university partnerships that foster innovation and the dissemination of best practices (Yang *et al*., 2015; Lavikka *et al*., 2020).

ESG performance management and measurement based on indicators are also worth mentioning. According to Cândido (2015), indicator systems allow to obtain several benefits, such as establishing specific criteria as success factors, supporting management, setting goals, motivating, and making comparisons.

This research, based on a literature review, provided a comprehensive overview of these tools, methods, and indicator systems. After examining the potential of indicator systems for performance management and measurement, if specific requirements are met (which will be explained in the following sections) this article aimed to identify and analyze potentialities and opportunities for improvement in ESG performance evaluation systems dedicated to the CI.

The first section discusses aspects related to ESG, its historical evolution, and tools. The objective is then defined. The second section addresses the implications of ESG in the CI, followed by basic aspects of indicators and benchmarking. The method is explained in the third section, followed by the results and discussion in the following section. The fifth section brings the conclusions, limitations faced, and future studies suggested.

2. LITERATURE REVIEW

The presence of ESG in the CI is highlighted in the first subsection of the literature review. The subsequent subsection addresses aspects related to performance measurement and management, using mechanisms such as indicator systems and benchmarking studies.

2.1 ESG IN THE CIVIL CONSTRUCTION INDUSTRY

The CI has a significant impact on global energy consumption (33 %), raw material use (40 %), and solid waste generation (40 %), consolidating its position as one of the most resource-intensive sectors on the planet (Backes; Traverso, 2021). In the Brazilian context, the CI represents one of the main economic drivers: in 2022, the sector registered 6.9 % GDP growth and accounted for 10 % of the formal jobs in the country (IBGE, 2023; CBIC, 2022).

Despite its socioeconomic relevance, the CI still faces structural obstacles to the effective adoption of the ESG agenda. Gil (2021) emphasizes that the sector maintains a conservative posture in the face of transformations required by new market demands and

consumer pressure for ethical and sustainable practices. This resistance is exacerbated by high rates of workplace accidents, especially in developing countries, reflecting poorly systematized and poorly standardized safety management (Wu *et al*., 2019; Zhou *et al*., 2019; Liu *et al*., 2022).

Another key challenge lies in governance. Estimates indicate that corruption and mismanagement can compromise 10 % to 30 % of the sector's global production value, generating annual losses of up to six trillion dollars (Matthews, 2016). Structural complexity and the extensive chain of participants increase the propensity for corruption (Stansbury, 2005), which brings the need for a more transparent and professional contractual governance (Ke *et al*., 2015).

In this scenario, the adoption of green certifications and sustainable performance practices, such as those observed in European and American companies (Afzal *et al*., 2017; Devine *et al*., 2022), proves to be strategic for aligning efficiency, ethics, and innovation, promoting the consolidation of the ESG agenda as an indispensable guideline for the future of the CI.

2.2 INDICATORS AND BENCHMARKING

Melnik *et al*. (2014) point out that indicators or metrics are measures used to evaluate the performance of an element, project, part, or the entire organization. This performance can be measured from different perspectives, such as accounting, quality, sustainability, productivity, among others. This defines the classification of such indicators as managerial (when they monitor the implementation of strategies), or operational (when calculated based on objectives and tasks related to each process) (Lantelme, 1994).

According to Lantelme (1994), indicators must meet certain requirements, such as:

a) Selectivity: they must be linked to essential or critical aspects.
b) Simplicity: they must be easy to understand and apply.
c) Low cost: the cost of implementing them should not exceed the savings provided.
d) Accessibility: data for calculation must be easily accessible.
e) Representativeness: they must represent the reality of the process/product to which they refer.
f) Stability: they should have routine procedures, with a good validity period.
g) Traceability: they must be adequately documented - calculation records, personnel involved, etc.
h) Experimental approach: they must be developed and tested to verify their true relevance.

The most traditional indicator systems were based on financial and accounting

metrics, based on the previous year's financial statements. This approach had shortcomings, as it did not allow for adequate identification of strategic factors and had a long-time lag, representing only past data and not the company's current situation or analysis element. Flanagan *et al*. (2005) report that these systems evolved by encompassing the “iron triangle”, with cost, time, and quality metrics and, later, more dimensions, *e.g.*, satisfaction of interpersonal relationships with the project team; absence of legal claims; transfer of technology; environmental friendliness; and health and safety.

Evaluating ESG practices using traditional indicator systems based solely on the financial statement was not possible. Currently, with several dimensions being assessed beyond the financial one, the weight given to each and the number of indicators per dimension varies depending on the organization (Bourne *et al*., 2000).

Franco-Santos *et al*. (2007) conducted a review study of over three hundred articles on indicator systems. Based on this study, they established that the three essential components of an indicator system are, in addition to the indicators and dimensions (i), also the business resources (ii), that is, the tools to enable the collection and analysis of indicators, and the existence of goals (iii), which are intermediate expected values on the scale of individual indicators and/or the system as a whole, allowing for the analysis of performance within the global scale of each indicator.

According to Caribé (2009), goal definition can occur through different parameters, such as: baseline, best competitor, international standard, industry average, and benchmark of excellence. Within these parameters, industry averages and benchmarks of excellence are obtained from benchmarking studies. Camp (1992, p. 3) defines benchmarking as:

> the continuous process of evaluating competitors' products, services, and practices [...] identifying how success was achieved and adapting strategies.

It can be conducted in various sectors, such as the construction industry, where Li *et al*. (2021) emphasize that benchmarking assists building managers or construction companies in decision-making when faced with limited resources.

Benchmarking can be conducted in different ways, as explained by Albertin, Kohl, and Elias (2015) (Table 1). According to Albertin, Kohl, and Elias (2015), the most effective types of benchmarking are external (*e.g*. related to other companies) and performance-based, that is, they are indicator-based. Therefore, this type of benchmarking leads to appropriate goals for indicators such as ESG.

At the CI, Flanagan *et al*. (2005) report some efforts toward external and performance benchmarking, as well as best practices. These authors cite as an

example Rethinking Construction, now called Constructing Excellence, which defined the construction industry 's national benchmarks in the United Kingdom. In other countries, such as Brazil, the relevance of performance measurement and benchmark definition is also considered (Librelotto, 2005; Abreu; Marchiori, 2023).

3. METHOD

A literature review can take different formats, varying according to the objectives and level of systematization of the study. According to Ferenhof and Fernandes (2016), there are three main types: narrative review, systematic review, and integrative review.

Table 1 – Benchmarking types

According to…	Types	Comparison
objects	Product	Among the company's own products and those of its competitors.
	Process	Among business processes, either within the same sector or across different sectors.
	Strategies	Strategies aimed at obtaining new competitive advantages.
parameter	Performance	Objective, based on indicator systems.
	Best practices	Lists of best practices and their frequency of occurrence.
application	Sectorial	Across different sectors (*e.g.*, supermarkets and automotive industry).
	Internal (company)	Data from the same company, both current and historical.
	External (company)	Among different companies, with a competitive focus.
	Structural	Among companies in different locations, economic contexts or production chains.

Source: Albertin, Kohl and Elias (2015)

A narrative review, also called exploratory review, is characterized by the absence of rigorous source selection criteria, being conducted freely, without prior definition of keywords or delimitation of databases (Cordeiro *et al.*, 2007). A systematic review, on the other hand, adopts a structured and replicable method, with the search, selection, and analysis of studies documented in a transparent manner, often conducted by more than one researcher to ensure validity and reduce bias (Ercole; Melo; Alcoforado, 2014).

An integrative review, the method used in this study, is the most comprehensive,

as it synthesizes the results of different studies on a specific topic in an orderly and critical manner (Ercole; Melo; Alcoforado, 2014). This approach allows a single researcher to carry out the process, from the systematic search to the analysis and interpretation of findings, organizing the results into a Bibliographic Portfolio (Ferenhof; Fernandes, 2016).

To conduct an integrative review, six steps must be followed: (1) identifying the topic and selecting the hypotheses or research question; (2) establishing inclusion and exclusion criteria for the sample or literature search; (3) defining the information to be extracted; (4) analysing the resulting studies; (5) interpreting the results (Mendes; Silveira; Galvão, 2008); and (6) conducting a detailed analysis of the performance assessment tools. Figure 1 shows a flowchart of the method.

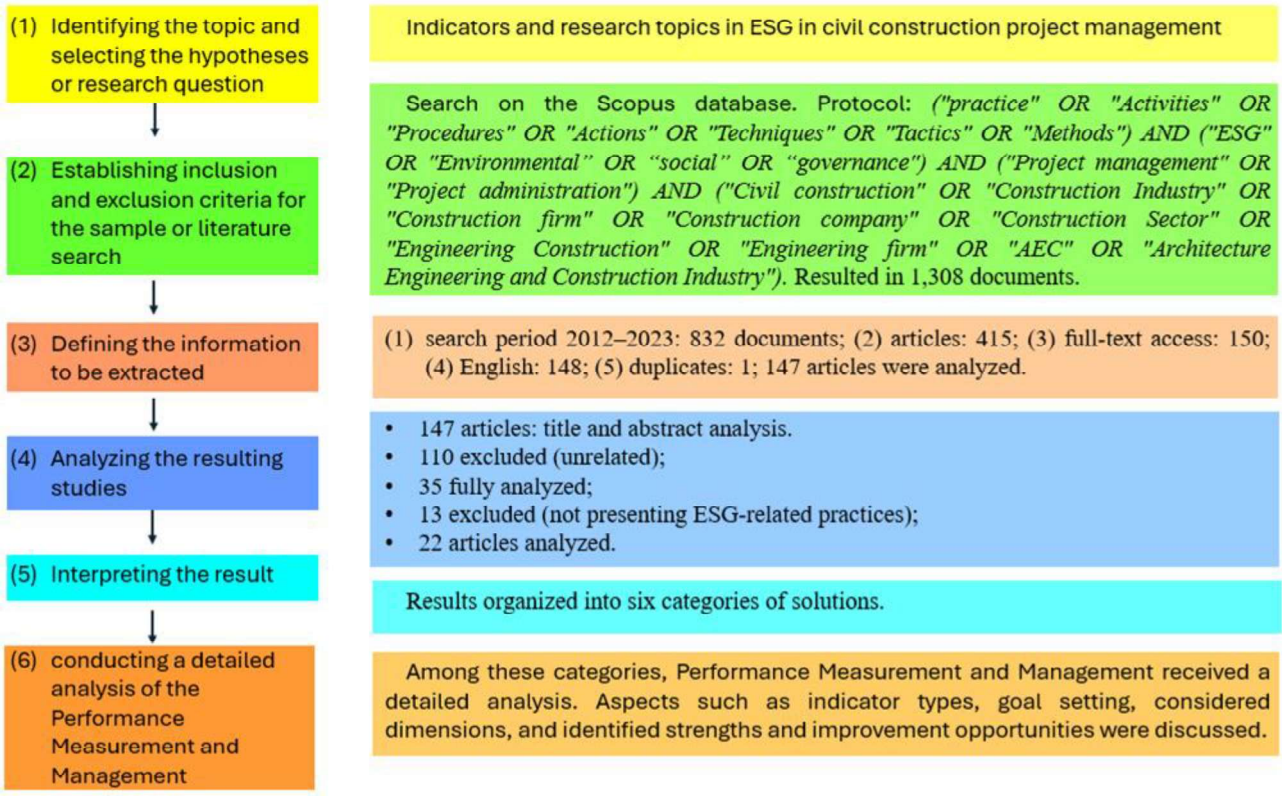

Figure 1: Flowchart of the research method.
Source: Authors (2025).

In the search stage, keywords, databases, and Boolean operators were selected, in addition to inclusion and exclusion filters (Ferenhof; Fernandes, 2016). The search carried out in the Scopus database resulted in 1,308 documents. As exclusion criteria, sequential filters were applied in the Scopus platform, in this order: (1) year: 832 were included in the search period from 2012 to 2023; (2) document: 415 were articles; (3) access: 150 articles had full access; (4) language: 148 were in English, 1 in Chinese, and 1 in Russian; only articles in English were accepted; (5) duplicates: only 1 article was duplicated, leaving 147 articles for title and abstract analysis. The 147 articles were imported into the Rayyan platform for title and abstract analysis, which resulted in the

exclusion of 110 articles unrelated to the topic of this study. The remaining 35 articles were read in full, and 22 remained for analysis of practices linked to the ESG agenda. The resulting information was compiled in an Excel spreadsheet, considering authors, journals, year, country, and key practices identified. After synthesizing the bibliography, the obtained data was condensed and critically interpreted, grouping the practices into six thematic categories according to their dominant focus. The results were then organized and described to highlight the main trends in the portfolio.

Subsequently, based on the study topic, a more in-depth evaluation of the performance evaluation category was prioritized. Performance evaluation requires a system of appropriate indicators and benchmarking for a consistent assessment. The four articles in this category were then evaluated, verifying the following aspects:

- Whether the metrics are quantitative (continuous or discrete scale) or qualitative/Likert/dichotomous.
- Whether the scales have specified goals.
- The possible existence of external quantitative benchmarking data.
- Amount of data used.
- Whether the analysis involves projects or companies.
- Whether the analysis involves ESG spheres.
- Verification of apparent validity.

Martins (2006) indicates that validity represents how well an instrument can measure something, such as how an indicator system can effectively describe ESG. Of the different types of validity, the analysis of apparent validity begins with the comparison between the theoretical definition of ESG and what is intended to be measured in the indicator systems. This methodological structure enabled the development of a comprehensive overview of ESG practices in the management of civil construction projects, ensuring rigor and scientific coherence to the study (Ferenhof; Fernandes, 2016; Mendes; Silveira; Galvão, 2008).

4. RESULTS AND DISCUSSION

This section begins by presenting the general characteristics of the bibliographic portfolio resulting from the review, which highlights general aspects and research trends in ESG. A more detailed analysis of research involving performance evaluation is then presented.

4.1 GENERAL CHARACTERISTICS OF THE BIBLIOGRAPHIC PORTFOLIO

The bibliographic portfolio formed is represented in Figure 2. In it, the identified practices were classified into six distinct categories, according to the predominant focus

of the studies:

1. Occupational Safety – research related to the safety and occupational hygiene of workers in the workplace.
2. Performance Measurement and Management – articles focused on measuring and improving ESG performance.
3. Project Management – studies that seek sustainable management at various project stages.
4. Waste Management – focus on waste management before, during, and after construction.
5. Technology – tools used in the design and construction phases.
6. Innovations – means for the sustainable development of the construction industry.

Of these categories, the most representative were Occupational Safety (5 articles), followed by Project Management, Waste Management, and Performance Evaluation, each with 4 articles. This predominance reveals that international literature has prioritized dimensions associated with operations, productivity, and risk mitigation, while topics focused on measurement and governance are still in their initial stages.

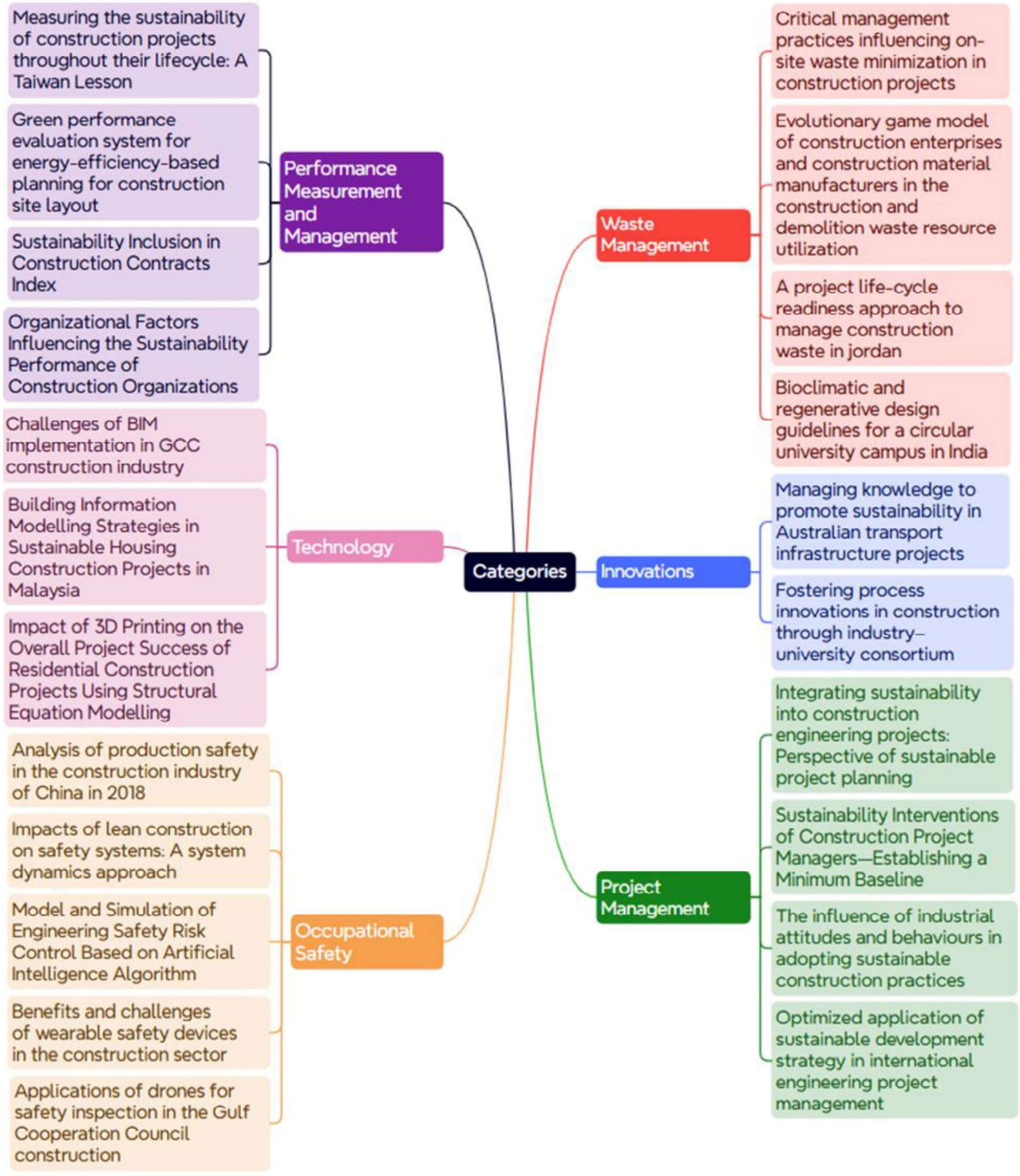

Figure 2: Bibliographic portfolio by categories.
Source: Authors (2025).

The analysis also allowed mapping the geographic distribution of the studies, covering 12 countries (Figure 3). This mapping indicates regions with the highest concentration of ESG research in the construction industry, with the United Kingdom as the leading centre of scientific production, with papers addressing safety, project management, waste management, and technologies. China, on the other hand, has a

strong concentration in the occupational safety category, with three of its five articles focusing on this topic.

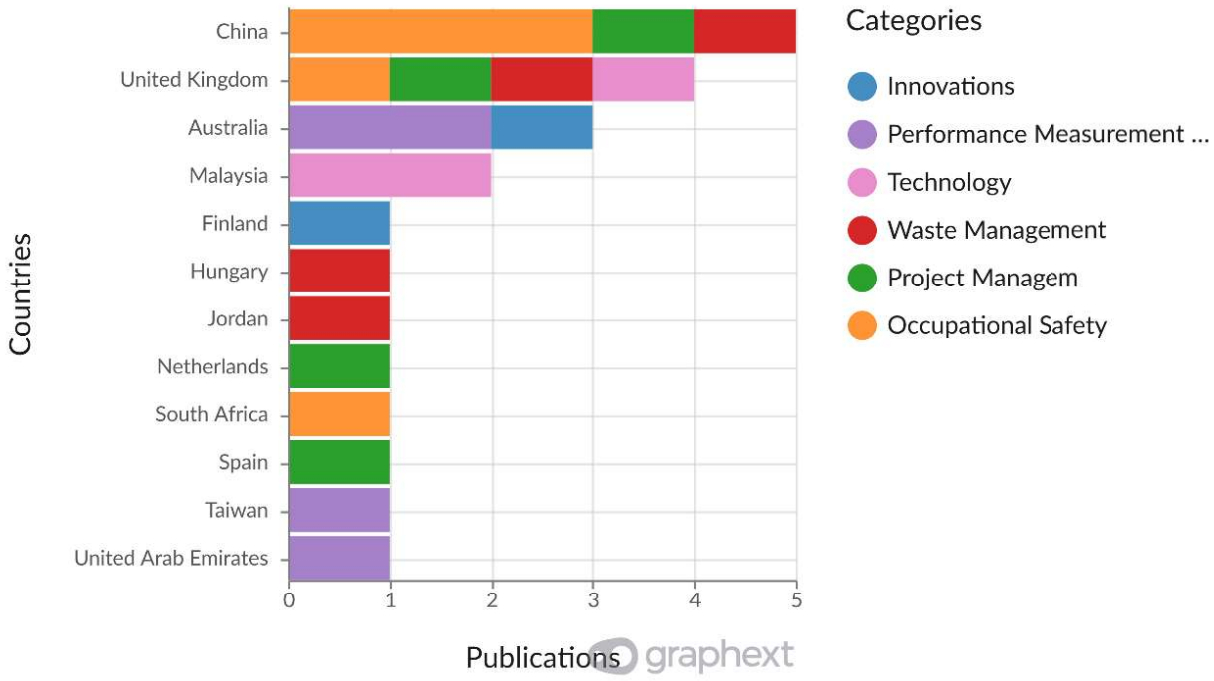

Figure 3: Nationalities and publications according to the categories of the portfolio.
Source: Authors (2025).

The number of citations was used as a metric for assessing the relevance of studies. The ten most cited articles are shown in Table 2, in which the work of Ajayi *et al*. (2017) is highlighted. The referred work identified key construction site management practices aimed at minimizing waste. Next, the article "Measuring the sustainability of construction projects throughout their lifecycle: A Taiwan Lesson" (Yu *et al*., 2018) presents the Construction Project Sustainability Assessment System (CPSAS), an assessment system that allows monitoring the sustainability of construction projects throughout their lifecycle.

The temporal evolution of publications, presented in Figure 4, demonstrates that, although the research time frame began in 2012, the oldest article included dates from 2015. A growing trend in scientific production was observed between 2018 and 2023, interrupted only by a brief decline in 2020, possibly associated with restrictions resulting from the COVID-19 pandemic. This observed pattern confirms the continued growth of global interest in the ESG agenda in recent years.

Regarding journals of publication (Figure 5), adherence to Bradford's Law (1934) was observed, according to which a small number of journals concentrate most of the relevant publications on a given topic. The Journal Sustainability (Switzerland) was the main journal of publication, accounting for 36.36% of publications, followed by the

International Journal of Environmental Research and Public Health and Engineering, Construction and Architectural Management, both with two publications each. The predominance of Sustainability reflects Switzerland's consolidation as a centre of international debate on sustainability and governance, reinforced by the country's role as host of the World Economic Forum (WEF) Annual Meeting in Davos, where topics such as the economy, climate, innovation, and ESG practices are discussed.

Table 2 - Top 10 publications with the higher number of citations

Title	Citations	Cathegory
Critical management practices influencing on-site waste minimization in construction projects	119	**Waste management**
Measuring the sustainability of construction projects throughout their lifecycle: A Taiwan Lesson	59	**Performance measurement and management**
Integrating sustainability into construction engineering projects: Perspective of sustainable project planning	44	**Project management**
Impacts of lean construction on safety systems: A system dynamics approach	30	**Occupational safety**
Green performance evaluation system for energy-efficiency-based planning for construction site layout	27	**Performance measurement and management**
Analysis of production safety in the construction industry of China in 2018	25	**Occupational safety**
Managing knowledge to promote sustainability in Australian transport infrastructure projects	18	**Innovations**
Challenges of BIM implementation in GCC construction industry	17	**Technology**
Impact of 3D Printing on the Overall Project Success of Residential Construction Projects Using Structural Equation Modelling	15	**Technology**
Applications of drones for safety inspection in the Gulf Cooperation Council construction	14	**Occupational safety**

Source: Authors, based on data from Scopus. Note: number of citations can vary in other databases.

In the set of studies analysed, 31 distinct ESG practices were identified, the most frequently mentioned being project management (4 mentions), contractual clauses (3), just-in-time (3), Building Information Modelling (BIM) (2), and reward systems (2). These practices combine technical and managerial aspects, promoting environmental efficiency, reducing waste, and improving working conditions. When applied in an integrated manner, they contribute to consolidating an organizational culture focused on the sustainable development of the construction industry.

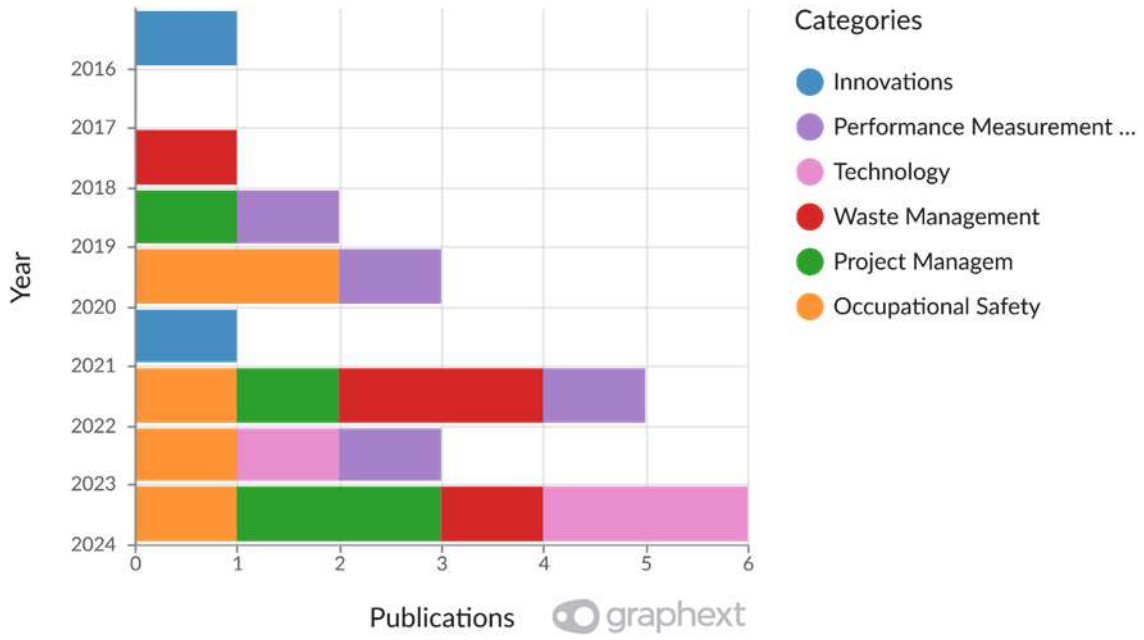

Figure 4: Temporal distribution of portfolio studies (research).
Source: Authors (2025).

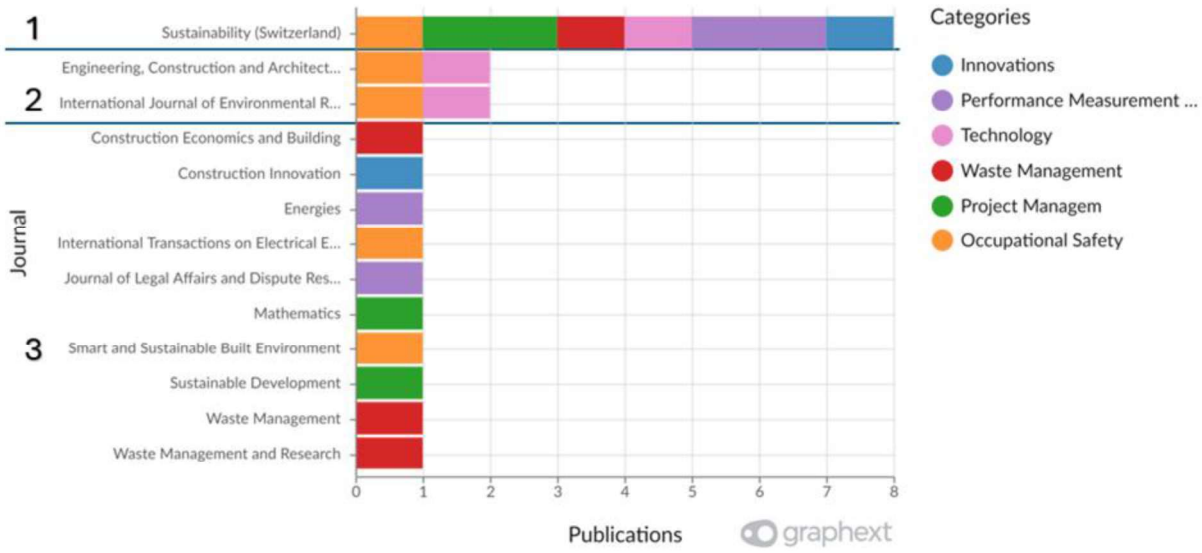

Figure 5: Distribution by journal of publication, category and Bradford strip.
Source: Authors (2025).

4.2 STUDIES OF THE CATHEGORY PERFORMANCE MEASUREMENT AND MANAGEMENT: CHARACTERISTICS AND OPPORTUNITIES FOR ENHANCEMENT

The Performance Measurement and Management category is particularly relevant because it focuses on studies that employ measurement systems and indicators to assess ESG in the construction industry. This category comprises four studies with different methodological approaches.

The first set of contributions focuses on the creation of structured indicator systems. Among them, the Construction Project Sustainability Assessment System (CPSAS) model, proposed by Yu *et al*. (2018), stands out, establishing a tool for monitoring sustainable performance throughout the project lifecycle. Complementarily, Wang *et al*. (2019) present an environmental performance assessment system focused on energy efficiency and construction site layout, highlighting the potential of quantitative indicators in continuous process improvement.

Two other studies address organizational and contractual dimensions of performance. Mahmoud and Beheiry (2021) propose an index for including sustainability in construction contracts, emphasizing governance and formal commitment to sustainability goals. Afzal and Lim (2022) analyze cultural and strategic factors that influence the environmental and social performance of companies, highlighting the importance of organizational culture, continuous learning, and employee participation.

More characteristics of these studies are summarized on table 3.

Table 3 – Characteristics of the papers related to the performance measurement and management category

Papers on the Performance measurement and management category	Indicators					Benchmarking				Analysis		Spheres		
	Quantitative	Qualitative	Likert	Dichotomous	Continuous scale	Are goals specified?	External quantitative	Other	Data	Projects	Companies	E	S	G
Yu *et al*. (2018)	■			■	■	■	■		5	■		■	■	
Wang *et al*. (2019)	■	■	■		■				1	■		■	■	
Mahmoud e Beheiry (2021)		■	■						1	■		■	■	■
Afzal e Lim (2022)		■	■						0		■	■	■	■

Source: Authors (2025).

It can be observed, from Table 3, that the studies by Yu *et al*. (2018) and Wang *et al*. (2019) present quantitative indicators, some with continuous scales. This favors the establishment of intermediate-level targets, fostering improvements based on the analysis of the indicators obtained in a given project.

Specifically, in the study by Yu *et al*. (2018), some goals are suggested for the general indicator (PSI), which establish four sustainability classes (low, bronze, silver,

and gold). Nevertheless, to promote improvements, it is important to know a performance benchmark for each indicator, and this would require a benchmarking study. The existing data presented by Yu *et al*. (2018) cover a total of five projects, three of them building construction projects and two infrastructure projects, with different characteristics. This constitutes a limited sample size and would not allow statistical significance for the indicators obtained to be considered benchmarks. This problem is repeated in the other studies highlighted in Table 3, with only one or no case studies and significant benchmarks. Although Afzal and Lim (2022) based their analyses on forty-two questionnaires, they do not provide goals or benchmarks that would allow for the evaluation of more projects (making inferences) based on the initial data.

In addition to quantitative indicators, which can be obtained from historical records and construction site data, Wang *et al*. (2019) provide some four-point Likert--type indicators (excellent, good, poor, pass). Although numerical conversion to mathematical operations is involved, these authors emphasize the subjectivity involved in defining these indicators, which led them to consider the opinions of ten experts for mathematical weighting in the case study.

This subjective aspect represents an opportunity for improvement in the indicator system developed by Wang *et al*. (2019). In their current form, Likert-type indicators not only hinder the necessary traceability (Lantelme, 1994) but also affect the reliability of the indicators, as they depend on the person conducting the indicator survey and the experts consulted.

It can also be seen in Table 3 that the studies by Mahmoud and Beheiry (2021) and Afzal and Lim (2022) are based on Likert-type scales as well - although they consider them quantitative measures - and thus equally subjective in their determination. It is also possible to note that three of the four studies address assessments based on construction projects, with ESG assessment from the perspective of the construction company being less frequent.

Although all four studies address the ESG dimensions to some extent, the balance between them is limited and the depth of analysis varies depending on the approach adopted. Yu *et al*. (2018) and Wang *et al*. (2019) prioritize the environmental dimension, addressing energy efficiency, material use, and impact mitigation. These approaches address specific social aspects such as safety and comfort on construction sites, but do not address governance mechanisms, resulting in assessments focused on the environmental sustainability of projects.

Mahmoud and Beheiry (2021) propose a model that explicitly encompasses the three spheres, with an emphasis on governance, through the inclusion of contractual clauses aligned with the Sustainable Development Goals (SDGs). However, the index developed measures the formal presence of these practices, without assessing the

effectiveness of environmental and social actions, which limits its use as a results monitoring tool.

The study by Afzal and Lim (2022) also integrates the three dimensions of ESG by analyzing organizational and strategic factors that influence sustainable performance. The social dimension is strongly represented by aspects of culture, engagement, and people development, whereas environmental and governance dimensions are approached more conceptually, without objective indicators of impact or compliance.

In summary, it is observed that, although all models present apparent validity within their specific purposes, they do not yet achieve full conceptual validity for the ESG construct. They lack effective and balanced integration between the three dimensions and the existence of comparable and verifiable metrics capable of translating the environmental, social and governance performance of the construction industry into management parameters.

5. CONCLUSION

This study achieves the aim to identify and analyze potential and opportunities for improvement in ESG performance measurement and management systems for the construction sector. This analysis reveals that not only will the creation of new ESG assessment indicator systems in the construction industry be necessary, but also the creation of appropriate benchmarking and goal formulation studies. Another gap highlighted by this study is the subjectivity of some performance assessment systems, which undermines the reliability of the resulting indicators.

It was found that the models analyzed do not yet integrate the three dimensions of ESG in a balanced manner. The emphasis is on the environmental sphere, while social and governance aspects are addressed in a limited or subjective manner. This asymmetry reinforces the need for more comprehensive methodologies that make it possible to translate environmental, social, and institutional results into comparable and verifiable metrics.

As limitations, this study's results are tied to the design of the integrative review conducted to map the literature on ESG in the CI. Future studies will involve further research using more databases to determine whether the gaps observed in performance evaluation studies are also observed in other measurement systems. Further research, building on this study, will focus on benchmarking and defining appropriate targets for ESG indicators in Brazilian construction projects.

The conclusion is that advancing ESG measurement in the construction industry depends on the balanced integration of the three spheres and reducing the subjectivity of indicators, making evaluation a strategic tool for managing and continuously

improving sustainable performance.

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