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Safety climate in the construction industry (1980–2024): A bibliometric literature review

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Abstract: Safety climate in the construction industry is an academic research area with significant potential yet to be explored, particularly considering the high occupational risks and the economic and social relevance of this sector worldwide. This bibliometric review aimed to analyze the evolution and characteristics of the scientific literature on safety climate in the construction industry from 1980 to 2024. Data were collected from the Scopus database using predefined search terms and inclusion and exclusion criteria. The initial search retrieved 169 records, which were manually screened by two researchers, resulting in a final sample of 154 articles. The bibliometric analysis was conducted in two stages: scientific performance analysis and scientific network mapping. R/RStudio, the Bibliometrix package with the Biblioshiny interface, and VOSviewer were used to analyze publication trends, citations, leading authors, journals and institutions, keyword co-occurrence, and international collaboration networks. The results revealed an annual publication growth rate of 4.8%, with a marked increase in scientific production after 2015. *Safety Science* was the leading journal, while institutions from China and Australia showed prominent participation in the field. The findings identified three main areas of research: theoretical and conceptual aspects of safety climate, development of evaluation instruments, and psychological, social, and contextual factors influencing safety. The study also highlights research gaps and opportunities for developing measurement instruments and investigating the antecedents and consequences of safety climate, particularly in the construction industry and the Brazilian context.

Keywords: Safe work behavior; Bibliometric analysis; Safety climate; Safety culture; Construction industry.

Clima de segurança na indústria da construção (1980–2024): Uma revisão bibliométrica da literatura

Resumo: O clima de segurança na indústria da construção constitui uma área de pesquisa acadêmica com significativo potencial ainda a ser explorado, particularmente considerando os elevados riscos ocupacionais e a relevância econômica e social desse setor em âmbito mundial. Esta revisão bibliométrica teve como objetivo analisar a evolução e as características da literatura científica sobre clima de segurança na indústria da construção no período de 1980 a 2024. Os dados foram coletados na base Scopus, utilizando termos de busca previamente definidos e critérios de inclusão e exclusão. A busca inicial recuperou 169 registros, que foram submetidos à triagem manual por dois pesquisadores, resultando em uma amostra final de 154 artigos. A análise bibliométrica foi conduzida em duas etapas: análise do desempenho científico e mapeamento das

redes científicas. Foram utilizados R/RStudio, o pacote Bibliometrix com a interface Biblioshiny e o VOSviewer para analisar tendências de publicação, citações, principais autores, periódicos e instituições, coocorrência de palavras-chave e redes de colaboração internacional. Os resultados revelaram uma taxa anual de crescimento das publicações de 4,8%, com um aumento expressivo da produção científica após 2015. O periódico *Safety Science* apresentou o maior número de publicações, enquanto instituições da China e da Austrália destacaram-se no campo. Os resultados identificaram três principais áreas de pesquisa: aspectos teóricos e conceituais do clima de segurança, desenvolvimento de instrumentos de avaliação e fatores psicológicos, sociais e contextuais que influenciam a segurança. O estudo também evidencia lacunas e oportunidades para o desenvolvimento de instrumentos de mensuração e para a investigação dos antecedentes e das consequências do clima de segurança, particularmente na indústria da construção e no contexto brasileiro.

Palavras-chave: Comportamento seguro no trabalho; Análise bibliométrica; Clima de segurança; Cultura de segurança; Indústria da construção.

1. Introduction

The construction industry plays a fundamental role in economic and social development worldwide, contributing substantially to infrastructure development, employment generation, and economic growth. Despite its strategic importance, construction remains one of the most hazardous industries, characterized by high rates of occupational accidents, injuries, and fatalities. In Brazil, for example, the construction sector grew by 6.9% in 2022, outperforming the national Gross Domestic Product (GDP) growth of 2.9%, while generating 194,444 new formal jobs. Nevertheless, the sector continues to face structural challenges, including limited technological innovation, high workforce turnover, informal employment, and a workforce often characterized by limited levels of education and professional experience (IBGE, 2022; Ministry of Labor, 2022; DIEESE, 2022). These characteristics, combined with the dynamic and complex nature of construction activities, reinforce the importance of understanding the organizational and human factors associated with occupational safety.

The relevance of this issue becomes even more evident when accident and fatality indicators are considered. In Brazil, approximately one thousand construction workers became permanently disabled or experienced long-term limitations as a consequence of occupational accidents in 2017, representing 7.9% of the 12,651 cases recorded that year, in addition to 227 fatalities (ANAMT, 2019). Similar challenges have been reported internationally. In the United States, 976 construction-related fatalities were recorded in 2020, while China registered 11,362 accidents and 13,566 deaths in the construction industry between 2004 and 2019. In this context, occupational safety cannot be understood exclusively through technical standards and accident-prevention procedures, since workers' perceptions, organizational practices, leadership, and behavioral factors also influence safety outcomes. Previous research indicates that a positive safety climate is associated with preventive behaviors and improved safety performance, contributing to the reduction of occupational accidents and illnesses (Xia et al., 2023).

Within this perspective, safety climate has emerged as an important construct for understanding how workers collectively perceive the priority assigned to safety within organizations. Originating from the broader concept of organizational climate, safety climate refers to shared perceptions regarding the policies, practices, procedures, and behaviors promoted and rewarded by an organization in relation to workplace safety (Schneider, 1990; Zohar, 1980, 2000, 2003). Since the seminal contribution of Zohar (1980), the concept has evolved to incorporate individual perceptions and intangible aspects of organizational safety culture (Brown & Holmes, 1986; Xia et al., 2023). Safety climate can therefore be interpreted as a temporal manifestation of safety culture, shaped by organizational policies and practices and capable of reflecting changes in the work environment (Niskanen, 1994; Kennedy & Kirwan, 1998; Mearns et al., 1998; Liu, 2009). Moreover, it can be assessed at

individual, group, project, and organizational levels (Neal et al., 2000; Zohar & Luria, 2005). Two particularly relevant dimensions are safety climate level, which represents the average safety perception within a group, and safety climate strength, which reflects the degree of consensus among its members (Bergman & Payne, 2018; Peretz et al., 2021). However, the multidimensional nature of the construct and the absence of complete consensus regarding its dimensions continue to pose theoretical and methodological challenges (Leitão & Greiner, 2016).

Research on safety climate in construction has consequently expanded across different theoretical and empirical perspectives. Existing studies can be broadly organized around four interconnected areas: the definition and conceptualization of safety climate, its measurement, its antecedents or determining factors, and its consequences for workers and organizational safety performance (Xia et al., 2023). Despite these advances, the literature remains fragmented across different journals, institutions, geographical contexts, methodological approaches, and research themes. Furthermore, although previous reviews have contributed to understanding specific dimensions of safety climate, comprehensive studies combining statistical bibliometric performance analysis with scientific network mapping remain limited in the specific context of the construction industry. This limitation makes it difficult to obtain an integrated understanding of how the field has evolved, which publications and actors have shaped its intellectual development, how research themes are interconnected, and which knowledge gaps remain open for future investigation.

To address this research gap, this study aims to conduct a bibliometric analysis of the scientific literature on safety climate in the construction industry from 1980 to 2024. Specifically, the study maps the historical evolution of scientific production, identifies the most influential publications, authors, journals, and institutions, examines the intellectual and thematic structure of the field through keyword and scientific network analyses, and explores patterns of international research collaboration. By integrating scientific performance analysis and bibliometric network mapping, this study provides a comprehensive overview of the development of safety climate research in construction over more than four decades. The findings are expected to contribute theoretically by consolidating the structure and evolution of this research field, methodologically by providing a systematic bibliometric mapping of its scientific production, and practically by identifying emerging themes, research gaps, and opportunities capable of supporting future studies, safety management practices, and evidence-based occupational safety policies in the construction industry.

2. Materials and Methods

2.1 Research design

This study adopted a descriptive and analytical bibliometric approach to systematically examine the scientific literature on safety climate in the construction industry (CS-C). Bibliometric, statistical, and science-mapping techniques were combined to characterize the evolution of scientific production and identify the main intellectual and thematic structures of this research field. The study was guided by three research questions: (RQ1) What are the historical and current publication trends in safety climate research within the construction industry? (RQ2) Which publications have exerted the greatest influence on the development of knowledge in this field? (RQ3) Which safety climate topics have attracted the greatest attention among researchers?

The eligibility criteria were established before the screening process. Studies were considered eligible when they consisted of journal articles indexed in the Scopus database, were published in English, Portuguese, or Spanish, and specifically addressed safety

climate within the construction industry. Studies were excluded when they were articles in press, conference papers, errata, editorial notes, unavailable in full text, unrelated to occupational or organizational safety, or did not specifically address the construction industry.

2.2 Data collection and study selection

The bibliographic search was conducted in the Elsevier Scopus database on October 10, 2025. The search strategy combined terms associated with safety climate, workplace, and the construction industry. The following search expressions were applied: *TITLE (safe AND climate)** and *TITLE-ABS-KEY ((workplace OR work) AND construction)***. The use of the wildcard operator (*) enabled the retrieval of variations of the corresponding search terms.

The initial search retrieved 169 records. Subsequently, titles and abstracts were manually screened by two researchers according to the predefined eligibility criteria. During this stage, 15 records were excluded because they did not specifically address the construction industry. After the screening and eligibility assessment, the final dataset comprised 154 articles, which constituted the bibliographic portfolio used in the subsequent analyses. This selection procedure was designed to ensure that the final sample remained consistent with the scope and research questions established for the study.

2.3 Bibliometric analysis and science mapping

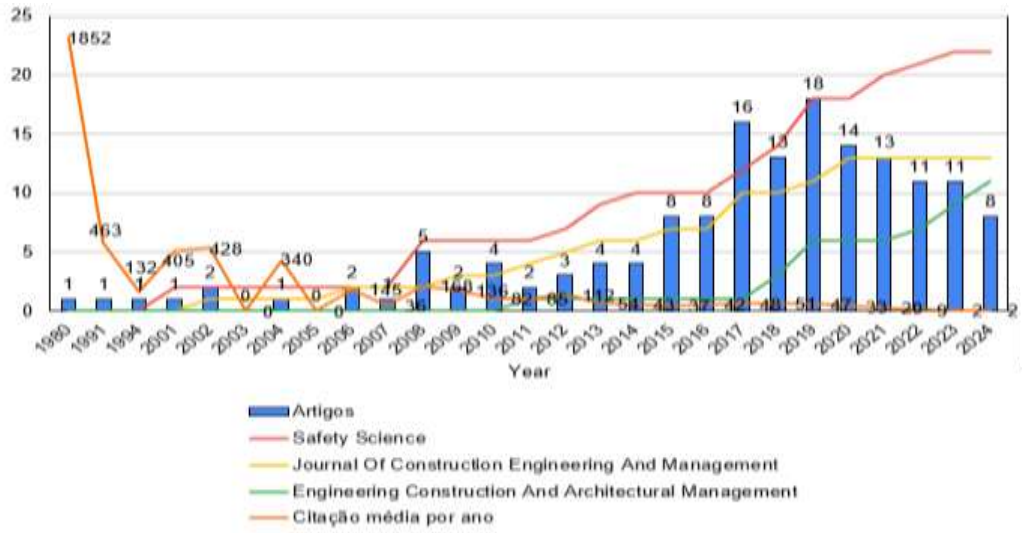
The bibliometric analysis was conducted in two complementary stages. The first consisted of a scientific performance analysis, aimed at characterizing the evolution and overall structure of the literature through indicators related to publication trends, citation patterns, leading authors and co-authors, relevant journals, and the institutions with the greatest scientific participation. The second stage involved science mapping, which examined the relationships and intellectual structure of the selected literature through keyword co-occurrence and scientific network analysis. This approach enabled the identification of thematic clusters, relationships among the main research topics, and international collaboration patterns, revealing the geographical distribution and connections among countries and regions contributing to CS-C research.

Data processing and bibliometric analyses were performed using R/RStudio and the Bibliometrix package through the Biblioshiny 4.1 interface (Aria & Cuccurullo, 2017), which supported bibliographic data processing and the generation of descriptive and performance indicators. VOSviewer version 1.6.19 was additionally employed to analyze and visualize scientific networks derived from the bibliographic data (Van Eck & Waltman, 2014). The combined use of these tools integrated quantitative performance indicators with network-based visualization, providing a comprehensive representation of the evolution, intellectual structure, collaboration patterns, and thematic organization of safety climate research in the construction industry.

3. Results

The bibliometric analysis covers 44 years of scientific development in research on safety climate in the construction industry (CS-C), comprising 154 articles published between 1980 and 2024 across 51 scientific journals. The dataset involved 376 authors, including nine single-authored publications, and contained 366 author keywords. Scientific production showed an annual growth rate of 4.8%, indicating a gradual expansion of interest in the field over the analyzed period. Regarding data completeness, approximately 9% of the articles did not provide author keywords, which represents a minor limitation for keyword-based analyses.

Figure 1 - Annual scientific production, average citations, and publication trends in the three leading journals on safety climate in the construction industry (1980–2024).



Source: Elaborated by the authors (2026).

Figure 1 presents the temporal evolution of scientific production on CS-C, combining the annual number of published articles, the average number of citations associated with publications from each year, and the cumulative contribution of the three journals with the highest number of articles on the topic. During the first two decades of the analyzed period, scientific production remained highly limited, with only three publications identified. Nevertheless, this initial stage produced studies that became fundamental references for the subsequent development of the field. The seminal study by Zohar (1980), Safety Climate in Industrial Organizations: Theoretical and Applied Implications, accumulated 1,852 citations by the date of data extraction and represents the conceptual foundation of safety climate research. Similarly, Dedobbeleer and Béland (1991) published A Safety Climate Measure for Construction Sites, which accumulated 463 citations and provided an important methodological basis for measuring safety climate specifically in construction environments.

Scientific production remained relatively modest during the following decade. Publication activity increased intermittently, reaching five articles in 2008 and four articles in 2010. Among the influential studies from this stage, Gillen et al. (2002) investigated the relationships among perceived safety climate, job demands, and coworker support among injured construction workers, thereby strengthening the integration of psychosocial variables into safety climate research. In the same year, Mohamed (2002) published Safety Climate in Construction Site Environments, which accumulated 428 citations according to the data represented in Figure 1. These publications contributed to expanding the field beyond its initial conceptual foundations toward the examination of organizational, behavioral, and psychosocial determinants of safety performance.

A substantial acceleration in publication activity can be observed from 2015 onward. The field reached eight publications in both 2015 and 2016, followed by a pronounced increase to 16 articles in 2017, 13 in 2018, and a historical peak of 18 publications in 2019. Scientific production remained comparatively high in subsequent years, with 14 articles in 2020, 13 in 2021, and 11 articles in both 2022 and 2023, before decreasing to eight publications in 2024. This trajectory demonstrates that safety climate became increasingly consolidated as a relevant topic within construction-related occupational safety research, particularly during the last decade of the analyzed period.

The evolution of the leading publication outlets also reflects the consolidation of CS-C as a specialized research field. The three journals with the greatest contribution were Safety Science, with 22 articles, followed by the Journal of Construction Engineering and Management, with 13 articles, and Engineering, Construction and Architectural Management, with 11 articles. Together, these journals accounted for 46 of the 154

publications analyzed, corresponding to approximately 29.9% of the total scientific production included in the bibliometric portfolio. Their increasing participation, particularly from the mid-2000s onward, indicates the emergence of specialized publication channels connecting occupational safety, construction management, human factors, and organizational safety research.

Table 1 presents the main bibliometric indicators related to the most productive authors, journals, and institutions in research on safety climate in the construction industry (CS-C). The results indicate a strong concentration of scientific production among researchers and institutions located primarily in Asia and Oceania, particularly Hong Kong, mainland China, and Australia. Contributions from researchers affiliated with institutions in Iraq and Pakistan were also identified.

Table 1 - Leading authors, journals, and institutions in safety climate research in the construction industry (1980–2024)

Category	Author / Journal / Institution	Country	Articles
Leading authors	Chan, Albert P. C. – The Hong Kong Polytechnic University	Hong Kong	9
	Lingard, H. – RMIT University	Australia	8
	Fang, D. – Tsinghua University	China	7
	Shen, Y. – Old Dominion University	—	7
	Hon, C. K. H. – School of Architecture and Built Environment	China	6
	Zhang, R. P.	China	6
	Al-Bayati, A. J. – Lawrence Technological University	Iraq	5
	Blismas, N. – RMIT University	Australia	5
	Cooke, T. – RMIT University	Australia	5
	Zahoor, H. – National University of Sciences and Technology	Pakistan	5
Leading journals	Safety Science	—	22
	Journal of Construction Engineering and Management	—	13
	Engineering, Construction and Architectural Management	—	11
	International Journal of Environmental Research and Public Health	—	11
	Journal of Safety Research	—	11
Leading institutions	The Hong Kong Polytechnic University	Hong Kong	22
	RMIT University	Australia	14
	Universitas Indonesia	Indonesia	10
	Kyung Hee University	South Korea	9
	Queensland University of Technology – School of Property	Australia	9
	City University of Hong Kong	Hong Kong	8
	Shanghai Normal University	China	8
	The University of Newcastle	Australia	8
	Tsinghua University	China	8

Source: Authors' elaboration (2026).

Regarding individual scientific productivity, Chan, Albert P. C., affiliated with The Hong Kong Polytechnic University, was the most productive author, with nine publications, followed by Lingard, H., from RMIT University, with eight. Fang, D. and Shen, Y. contributed seven publications each, while Hon, C. K. H. and Zhang, R. P. contributed six each. These results indicate that a relatively small group of researchers has maintained recurrent participation in the development of CS-C research, particularly through institutions located in Asian and Australian research environments.

A similar concentration was observed among publication outlets. Safety Science was the leading journal, with 22 articles, followed by the Journal of Construction Engineering and Management, with 13. Engineering, Construction and Architectural Management, the

International Journal of Environmental Research and Public Health, and the Journal of Safety Research each contributed 11 articles. These five journals therefore accounted for 68 of the 154 articles (44.2%) included in the bibliometric portfolio, demonstrating a considerable concentration of CS-C research within a limited number of specialized publication outlets.

At the institutional level, The Hong Kong Polytechnic University showed the highest scientific production, with 22 publications, followed by RMIT University, with 14, and Universitas Indonesia, with 10. Kyung Hee University and Queensland University of Technology contributed nine publications each, whereas City University of Hong Kong, Shanghai Normal University, The University of Newcastle, and Tsinghua University each accounted for eight publications. Overall, the institutional distribution confirms the prominent role of Asian and Oceanian universities in the development of safety climate research in construction, particularly institutions located in Hong Kong, mainland China, Australia, Indonesia, and South Korea.

Table 2 presents the ten most influential articles on safety climate in the construction industry (CS-C) according to the total number of citations recorded in the bibliometric dataset. The results reveal that the most highly cited publications are predominantly associated with the conceptual foundations of safety climate, the development and validation of measurement instruments, the relationship between safety climate and safety performance, and the investigation of psychological, social, and contextual factors affecting workers' safety behavior.

Table 2 - Most influential articles on safety climate in the construction industry (1980–2024)

Authors	Title	Total citations
Zohar (1980)	Safety climate in industrial organizations: Theoretical and applied implications	1,852
Mohamed (2002)	Safety Climate in Construction Site Environments	509
Dedobbeleer & Béland (1991)	A safety climate measure for construction sites	463
Glendon & Litherland (2001)	Safety climate factors, group differences and safety behaviour in road construction	405
Gillen et al. (2002)	Perceived safety climate, job demands, and coworker support among union and nonunion injured construction workers	347
Siu et al. (2004)	Safety climate and safety performance among construction workers in Hong Kong	340
Fang et al. (2006)	Safety Climate in Construction Industry: A Case Study in Hong Kong	283
Zhou et al. (2008)	A method to identify strategies for the improvement of human safety behavior by considering safety climate and personal experience	214
Choudhry et al. (2009)	Measuring Safety Climate of a Construction Company	205
Chen et al. (2017)	Impact of individual resilience and safety climate on safety performance and psychological stress of construction workers: A case study of the Ontario construction industry	198

Source: Authors' elaboration (2026).

The citation structure highlights the foundational role of theoretical and conceptual studies in the development of the field. Zohar (1980) stands out as the most influential publication, with 1,852 citations, considerably exceeding the citation counts of the other articles included in the ranking. The study established the conceptual basis for understanding safety climate as a relevant organizational construct and subsequently supported its application to different occupational contexts. Within the construction-specific literature, Mohamed (2002), with 509 citations, represents another major contribution by examining safety climate directly within construction site environments.

A second prominent research stream concerns the development and application of safety climate measurement instruments. Dedobbeleer and Béland (1991), whose study accumulated 463 citations, proposed a safety climate measure specifically designed for construction sites. Choudhry et al. (2009), with 205 citations, subsequently addressed the measurement of safety climate at the construction company level. The prominence of these publications demonstrates the importance assigned to the operationalization of safety climate and to the development of instruments capable of translating workers' perceptions into measurable organizational indicators.

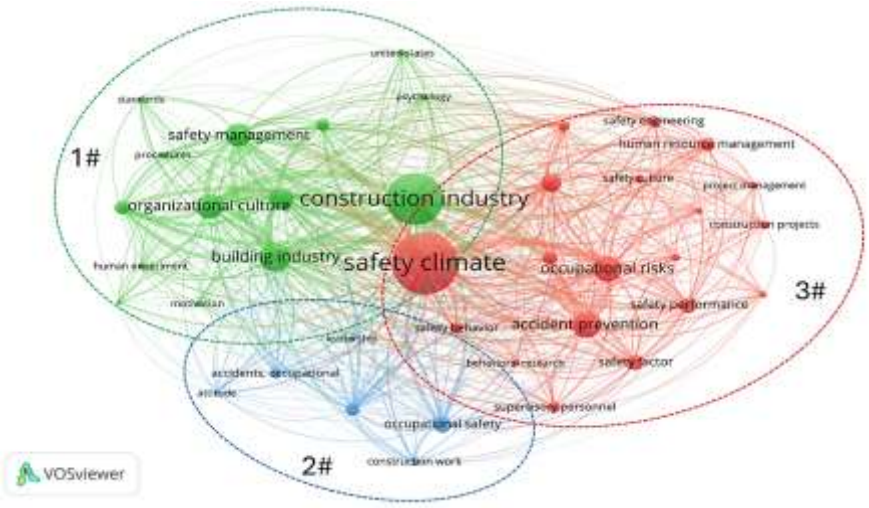
A third research stream encompasses the psychological, social, and behavioral determinants and consequences of safety climate. Glendon and Litherland (2001) examined safety climate factors, group differences, and safety behavior in road construction, whereas Gillen et al. (2002) investigated safety climate in conjunction with job demands and coworker support. More recently, Chen et al. (2017) incorporated individual resilience and psychological stress into the relationship between safety climate and safety performance. Together, these studies indicate a progressive expansion of the field from the measurement of organizational perceptions toward a broader understanding of the interactions among organizational conditions, psychosocial factors, worker characteristics, and safety outcomes.

The geographical context also emerges as an important characteristic of the most influential literature. Siu et al. (2004) and Fang et al. (2006), for example, examined safety climate among construction workers in Hong Kong, while Chen et al. (2017) investigated the Ontario construction industry. These studies illustrate the application of safety climate research across different geographical and organizational settings. In parallel, Zhou et al. (2008) extended the discussion toward strategies for improving human safety behavior, considering both safety climate and workers' personal experience.

Overall, the ten most cited publications suggest an intellectual evolution of CS-C research from conceptual foundations and measurement instruments toward behavioral, psychological, organizational, and contextual applications. The citation structure therefore indicates that the consolidation of the field has been supported by three interconnected pillars: (i) theoretical and conceptual development, (ii) safety climate measurement and assessment, and (iii) investigation of psychological, social, behavioral, and contextual factors associated with safety performance. These thematic foundations provide a basis for examining the broader intellectual structure of the field through the scientific network analyses presented in the following sections.

The co-occurrence analysis of the keywords used in the CS-C articles is presented in Figure 2. The network map reveals the formation of three interrelated thematic clusters, representing different perspectives within the scientific literature on the topic. Overall, Cluster 1 concentrates studies associated with the construction industry and organizational aspects of safety; Cluster 2 encompasses elements related to occupational safety and serves as a bridge between the other clusters; and Cluster 3 positions safety climate as the main structuring axis of the network.

Figure 2 – Keyword co-occurrence map of CS-C publications (1980–2024).



Source: Elaborated by the authors with the assistance of VOSviewer software (2026).

Cluster 1 (green) concentrates studies related to the construction industry, with strong associations with topics such as organizational culture, safety management, and managerial practices. The intensity of the connections and the size of the nodes indicate the relevance of these concepts within the thematic structure of the cluster. More peripheral positions include terms related to motivation, psychology, people, procedures, and regulatory standards. This configuration suggests that studies within this cluster address construction safety not only from a technical perspective but also by considering human, behavioral, and organizational factors. Accordingly, these studies contribute to understanding how organizational culture, institutional processes, and management practices can influence the implementation and effectiveness of safety strategies in the construction sector.

Cluster 2 (blue) contains fewer terms but plays an important role in connecting Cluster 1, which is associated with the construction industry, and Cluster 3, which is centered on safety climate. Prominent topics within this cluster include leadership, attitudes, occupational accidents, occupational safety, and construction work. The intermediate position of these terms within the network indicates that factors related to leadership, worker attitudes, and occupational safety constitute elements capable of connecting the organizational and sector-specific dimensions of construction with the behavioral and perceptual approaches associated with safety climate. Thus, although numerically smaller, Cluster 2 plays a relevant role in the conceptual integration of the network.

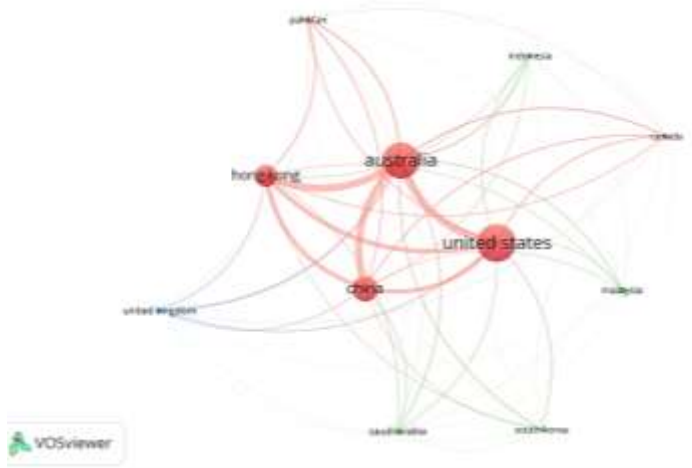
Cluster 3 (red) exhibits a greater concentration and development of themes related to safety climate, which emerges as one of the main structuring cores of the network. The size of the central node and the intensity of its connections demonstrate its relevance within the analyzed literature, particularly through its associations with accident prevention and occupational risks. The cluster also encompasses topics such as safe behavior, safety culture, project management, human resource management, and safety engineering, demonstrating the multidimensional nature of research conducted in this field. The proximity of these concepts to terms associated with the construction industry further reinforces the application of safety climate as a relevant approach for understanding and improving working conditions within this sector.

Taken together, the three clusters reveal that the literature on CS-C is structured around the integration of organizational, human, behavioral, and technical factors. While Cluster 1 emphasizes the organizational and managerial context of the construction industry, Cluster 2 establishes an interface primarily based on leadership, attitudes, and occupational safety, and Cluster 3 consolidates safety climate as the central theoretical axis. This articulation demonstrates that construction safety is addressed as a multidimensional phenomenon in which institutional, behavioral, and operational aspects are interdependent.

From an applied perspective, this integration can support the development of more effective safety policies, continuous improvement processes, and evidence-based interventions. Continuous improvement approaches and quality management tools can contribute to identifying operational inefficiencies, reducing rework, and systematically improving organizational processes (Lima et al., 2026). These approaches may complement safety management practices by supporting more structured and standardized organizational environments, while simultaneously considering organizational characteristics, worker attitudes and behaviors, and the risks inherent in construction activities. In this regard, the thematic structure identified in Figure 2 reinforces the importance of integrated approaches to strengthening safety climate and safety culture, thereby contributing to safer and more sustainable working environments in the construction industry (Garcia et al., 2026).

The international collaboration patterns among countries and regions contributing to CS-C research were also examined. Figure 3 presents the co-occurrence network of countries and regions identified in the publications between 1980 and 2024, highlighting the intensity of scientific cooperation and the formation of different collaboration clusters.

Figure 3 – Co-occurrence map of countries and regions in CS-C publications (1980–2024).



Source: Elaborated by the authors with the assistance of VOSviewer software (2026).

As shown in Figure 3, most of the countries and regions represented in the network are connected through collaborative scientific production, while the different colors indicate distinct cooperation clusters. At the center of the network, a particularly strong relationship can be observed between Australia and the United States, which emerge as major international collaboration hubs in CS-C research. These countries also maintain relevant connections with Hong Kong and China, reinforcing the prominent role of Asia and Oceania in the development of this research field.

Although with lower connection intensity than the central axis, the network also reveals collaborative relationships involving the United Kingdom, Saudi Arabia, South Korea, Malaysia, Pakistan, Indonesia, and Canada. These connections demonstrate that research on safety climate in the construction industry has progressively expanded across different geographical contexts, involving countries with distinct economic, organizational, and construction-sector characteristics.

At the same time, the network indicates a more limited participation of other European countries and an evident absence of South American countries among the main collaboration nodes. This geographical imbalance suggests that the international development of CS-C research remains concentrated in a relatively restricted number of countries and regions. Such concentration is consistent with the institutional results previously identified, in which universities from Asia and Oceania showed particularly strong scientific participation.

Overall, Figure 3 demonstrates that CS-C has developed as an increasingly international research field, although scientific collaboration remains unevenly distributed. Given the global relevance of occupational safety in construction, the results indicate considerable potential for expanding cooperation networks, particularly through greater participation of underrepresented regions such as South America and other parts of Europe. Future international partnerships may contribute to comparing safety climate across different regulatory, cultural, economic, and organizational environments, thereby broadening the empirical basis and external validity of knowledge produced in this field.

5. Conclusions

This study provided a 44-year overview of the scientific evolution of safety climate in the construction industry (CS-C) from 1980 to 2024, based on 154 articles analyzed through bibliometric performance analysis and science mapping. The results revealed substantial growth in scientific production, averaging approximately 12 articles per year over the last decade, although the relatively low citation impact of many recent studies suggests that the field still has potential for greater scientific consolidation. China emerged as the leading contributor, followed by Australia, while Safety Science and the Journal of Construction Engineering and Management were among the most relevant publication outlets, and The Hong Kong Polytechnic University stood out as the most productive institution.

The intellectual and thematic structure of CS-C research revealed three main streams: theoretical and conceptual foundations originating from Zohar (1980); development and validation of safety climate measurement instruments; and investigation of psychological, social, behavioral, organizational, and contextual factors. Keyword mapping further demonstrated the multidimensional nature of the field by integrating human, managerial, organizational, and technical aspects. International collaboration was concentrated mainly in Asia, Oceania, and North America, particularly among Australia, the United States, China, and Hong Kong, whereas South America showed limited participation. This geographical imbalance highlights an important research gap, especially for Brazil and other emerging economies, where local regulatory, cultural, organizational, and labor conditions may influence safety climate in the construction industry.

This study contributes by systematizing the intellectual, thematic, institutional, and geographical development of CS-C research and providing a structured knowledge base for advancing occupational safety research and practices. However, the exclusive use of Scopus and a search strategy specifically focused on CS-C may have excluded relevant studies indexed elsewhere or using different terminology. Future research should therefore incorporate other databases, such as Web of Science, expand cross-country comparisons, and strengthen investigations in Brazil and other underrepresented regions. Further studies should also develop and validate context-specific measurement instruments, investigate the antecedents of safety climate, and longitudinally assess its effects on safe behavior, accidents, injuries, and organizational performance.

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