

INSURANCE IN MANAGING RISKS OF THE CONSTRUCTION PROJECTS – LITERATURE REVIEW

DOI: 10.2478/czoto-2025-0017

Received: 28/10/2025

Accepted: 24/11/2025

Małgorzata Okręglicka¹ – orcid id: 0000-0002-5806-2322, e-mail: malgorzata.okreglicka@pcz.pl

Anna Lemańska-Majdzik¹ – orcid id: 0000-0003-3484-3498, e-mail: a.lemanska-majdzik@pcz.pl

¹Częstochowa University of Technology, Dąbrowskiego 69, 42-201 Częstochowa **Poland**

Abstract: This article addresses the role of insurance in risk management in construction projects, demonstrating its crucial role in ensuring project stability. Using bibliometric analysis based on data from the Scopus database, the authors examined how this area of research has evolved over the years. Visualizing keyword networks in VOSviewer allowed them to identify which topics are most closely related and how research emphases have shifted. The results demonstrate that insurance, the construction industry, and risk management form a common, strongly interconnected core of the scholarly discussion. Over time, research has shifted from theoretical considerations of the relationships between these concepts (around 2010–2014) to more practical issues, such as risk assessment, contractor liability, and occupational safety (around 2014–2016). The analysis identified four main thematic areas, confirming that insurance plays a key role in risk transfer and project stabilization. At the same time, limitations were revealed – gaps in contractor knowledge, difficulties with selecting appropriate insurance policies, and the fact that not every risk can be effectively insured. The review's conclusions point to the need for a more integrated approach to risk management and encourage empirical research that will provide a better understanding of how insurance actually impacts loss mitigation and the industry's adaptation to changing market realities.

Keywords: insurance, construction projects, risk management, project management

1. INTRODUCTION

Risk management in construction projects is not only a process of identifying and analysing threats, but above all, the ability to effectively respond to them. In an industry where projects are expensive, lengthy, and complex, with a large number of parties involved, effective risk management is becoming one of the most important factors determining the success of the entire project (Jibril and Shaban, 2021). Research shows that a well-organized risk management system is an essential element of project practice and can significantly impact the final project results.

Due to the high capital intensity of construction projects, the ability to predict and mitigate risk is crucial, as unexpected events have significant financial consequences. Research confirms that effective risk management promotes better resource utilization and reduced

losses – crucial in an industry where budgets are often limited and investor expectations are exceptionally high (Phoya and Eliufoo, 2016). For example, construction projects in Nigeria demonstrate that effective team communication proved to be a key factor in effective risk management. Similar conclusions are drawn from studies conducted in other countries (Jiang et al., 2013).

The long duration of construction projects creates additional challenges. During project implementation, legal regulations may change, new technologies may emerge, and market fluctuations may occur – all of which impact risk levels. Therefore, effective risk management cannot be a one-time activity; it must be continuous and involve constant monitoring, assessment, and adaptation to changing conditions (Abdul-Rahman et al., 2015). This approach makes it a dynamic process, encompassing all phases of the project lifecycle and providing the foundation for maintaining the schedule and quality of construction work.

In projects involving multiple stakeholders, understanding their roles, expectations, and relationships is crucial. Project stakeholders can have varying degrees of influence on decisions, often leading to tensions or conflicts (Ma et al., 2018). Effective risk management strategies should therefore not only analyse technical factors but also incorporate activities aimed at building understanding and cooperation among project participants (Alhammadi et al., 2021). In this context, analytical tools such as social network analysis are helpful, allowing for a better understanding of the influence of stakeholders on the project and identifying areas where risks resulting from their interactions may arise (Lin and Chen, 2021).

One of the key elements of risk management in construction is technological innovation. Implementing technologies such as Building Information Modeling (BIM) has the potential to significantly improve the effectiveness of risk management through improved visualization of the construction process and analysis of potential threats (Li et al., 2024). BIM application examples have demonstrated that these technologies can support decision-making and enable more effective information exchange among all project participants, which is crucial for risk identification and management.

Effective risk management in construction projects requires an integrated approach that considers both technical and soft aspects, such as communication and collaboration between stakeholders. Research shows that developing an organizational culture in which risk management is perceived as a shared responsibility is crucial (Patel et al., 2024). This is the only way to minimize the negative effects of unexpected events, which can significantly impact the course and final outcomes of construction projects. In the future, developing this culture and integrating advanced technological tools will provide the foundation for further improving the effectiveness and quality of risk management in the construction sector. In the context of risk management in construction projects, insurance plays a crucial role as a tool for risk transfer and stabilizing project implementation. While risk is inherent in every construction project, effective risk management, particularly the use of insurance mechanisms, has become crucial to ensuring project continuity and success. In the construction industry, where uncertainty regarding costs, deadlines, and safety is common, insurance offers fundamental support in managing such threats (Murtazova and Aliyev, 2022).

Insurance plays an important role in risk transfer. It allows potential losses related to unforeseen events to be transferred to insurance companies, reducing the financial burden on investors and contractors in the event of damage or delays (Ng'ombe et al.,

2023). As researchers note, in the context of green construction, the use of insurance systems is a key risk management method that helps protect against external and internal risk factors (Murtazova and Aliyev, 2022). In crises, such as natural disasters, insurance can also support the rapid reconstruction of infrastructure, which is crucial for the sustainability of construction projects (Ng'ombe et al., 2023).

Despite the numerous benefits of using insurance in construction projects, many companies face challenges in adopting it. Liu et al. point out that in China, many construction companies avoid purchasing insurance due to a lack of sufficient know-how and the ability to properly manage policies. This problem is also significant in other countries, where insufficient knowledge of available insurance products can limit the effectiveness of risk management in construction. Selecting appropriate policies to meet the specific needs of a given project can also be a challenge, requiring collaboration with insurance and legal advisors (Liu et al., 2018).

Insurance, as a tool for stabilizing construction projects, also enables companies to more effectively plan and manage their finances. It supports improved cash flow, enabling companies to cover costs related to delays or damages that could otherwise threaten financial liquidity (Landry and Turner, 2020). The design of insurance policies can be a key element of risk management, contributing to reduced uncertainty in project settlements. Practical examples show that projects that invest in appropriate insurance often experience better financial results and shorter completion times (Murtazova and Aliyev, 2022).

An important aspect to note is the role of insurance education among stakeholders. For construction companies to fully utilize the potential of insurance, it is crucial to understand how various forms of insurance can be applied in practice. The potential benefits of insurance in risk management stem not only from its use but also from knowledge of the possibilities and limitations it presents (Ng'ombe et al., 2023). Systematic training and information campaigns can significantly improve the perception of insurance as an effective tool for stabilizing the implementation of construction projects.

The prospects for the development of insurance as a risk management element in the construction industry seem promising. Technological advances and innovations in insurance systems can contribute to better adapting offers to market needs (Murtazova and Aliyev, 2022).

Despite the fact that insurance is widely used in construction as a risk transfer tool, its effectiveness in risk management is often underestimated or ambiguously assessed. Stakeholders in the construction industry believe that insurance automatically protects against all types of risks, leading to a simplistic perception of its role in the complex management process (Hatmoko et al., 2021).

One of the main challenges in assessing the effectiveness of insurance in construction is its limited ability to cover all types of risks. As indicated in research, at least some of the risks construction contractors face remain outside the scope of insurance or are not adequately defined in policies (Prajá, 2023). In particular, some risks, such as the risk of delays related to unforeseen circumstances (e.g., changes in legal regulations or crises), may not be covered, resulting in uncertainty as to the actual level of protection provided by policies (Liu et al., 2018).

Choosing the right insurance instruments is an important element of the risk management strategy in construction projects. Different types of insurance policies differ in scope and purpose of protection, but their common function is to mitigate the effects of the

materialization of risks that may threaten the success of the investment. Insurance serves as both financial security and a tool to stabilize the project implementation, which increases the credibility of the parties and facilitates obtaining financing (Negi, 2021). Research indicates that effective implementation of a risk management strategy allows organizations to avoid many potential problems (Akhtar et al., 2023). At the same time, the appropriate selection of Insurance policy management requires identifying and understanding the risks specific to a given project, as emphasized by Alhammadi et al. (2021). Proper and consistent insurance management can significantly impact the economic performance of a project, minimizing the risk of financial losses and ensuring its liquidity (Patel et al., 2024). The table below summarizes the basic types of insurance policies used in construction, along with their role in risk mitigation.

Table 1

Types of insurance in construction projects and their role in risk prevention

Type of Insurance	Risk Mitigation	Typical Limitations
Construction and Erection	Limiting losses resulting from damage to structures, materials, and works during construction; protection against random events.	No coverage for design errors, gross negligence, or normal wear and tear.
Third-Party Liability	Reducing the risk of third-party claims for personal injury and property damage caused by construction works.	Exclusions for own damages, intentional acts, and violations of law.
Machinery and Construction Equipment	Minimizing the risk of work interruptions due to equipment failure, damage, or loss.	No coverage for natural wear and tear, lack of maintenance, or manufacturing defects.
Employees	Reducing the financial impact of workplace accidents; protecting employment continuity and company reputation.	Exclusions in cases of gross violation of health and safety rules or intentional acts.
Delay	Limiting financial risk related to project completion delays (loss of revenue, contractual penalties).	No coverage for delays unrelated to an insured event (e.g., legal disputes, strikes).
Environmental	Reducing the risk of costs and liability for environmental damage, pollution, and remediation.	Exclusions for intentional acts or long-term emissions.
Transport	Reducing the risk of loss due to damage or loss of materials and equipment in transit to the construction site.	Carrier liability limitations, exclusions for improper packaging.
Financial (Insurance Guarantees)	Reducing the risk of a contractor's failure to fulfil contractual obligations (e.g., non-refund of advance payment, non-performance of works).	Insufficient guarantee limits, no coverage in case of contractor insolvency.

Source: own elaboration

Another aspect that influences the effectiveness of insurance is its availability and contractors' skills in selecting and managing it. Liu et al. indicate that in the context of the Chinese construction market, many companies avoid purchasing insurance due to a lack of adequate knowledge. The belief that insurance is of little importance or is complex leads to delays in making decisions regarding the purchase of appropriate policies (Liu et al.,

2018). Even when insurance is purchased, its understanding and effectiveness in risk management may be questionable if contractors are unable to take advantage of the full range of rights and benefits.

The complexity of accessing information about available insurance products can also contribute to underestimating their value. Research shows that many contractors still lack access to comprehensive data regarding effective insurance products, which leads to poor decisions at the purchasing stage (Liu et al., 2018). With the insurance market dominated by a few large insurance companies, smaller companies may feel lost and unable to negotiate favourable terms. In the construction industry, the issue of project risk diversity also arises, which can complicate the way insurers assess them. As the authors note, various policies can have quite restrictive terms that do not always align with the specifications of the construction project, which can lead to dissatisfaction when a loss occurs (Owusu-Manu et al., 2020). Therefore, the ambiguity surrounding the assessment of insurance's effectiveness as a risk management tool in construction projects also stems from the lack of adaptation of insurance systems to the specific needs of the industry.

2. METHODOLOGY OF THE RESEARCH

This article presents a literature review on the relationship between the construction industry and insurance, conducted using bibliometric analysis based on the Scopus database, selected for its broad scope of disciplines and the ability to export bibliographic data. The bibliometric analysis was conducted using VOSviewer software, which enabled a systematic understanding of the structure and dynamics of the researched area of knowledge. Visualization of the co-occurrence network allowed for the identification of key thematic clusters, the identification of research trends, and the assessment of the level of interest in individual topics over time.

The primary function of the VOSviewer software is to construct and visually present bibliometric and textual networks. The software helps examine how various elements are interconnected, such as co-authorship networks, citation/co-citation networks, and keyword co-occurrence networks. It utilizes proprietary mapping and clustering techniques (VOS mapping and VOS clustering) to create clear network layouts, grouping related elements together. This tool allows for the analysis and exploration of large scientific datasets such as Scopus and Web of Science, and the identification of emerging research topics and gaps in the literature. The authors selected this tool based on its familiarity and ease of use. Alternatives to VOSviewer software include Gephi, Pajek, and NetMiner.

The Scopus database was selected for analysis. A search was conducted on October 16, 2025, using the query: (insurance) AND ("construction projects" OR "construction industry"). The data was analysed using VOSviewer, which enabled the creation of bibliometric maps. Two main types of visualizations were developed as part of the research:

- Overlay visualization – a time map depicting the dynamics of the researched area by visualizing the average year of publication for each keyword. This method allowed us to identify topics and trends that have gained importance in recent years.
- Network visualization – a map of keyword co-occurrences, illustrating the thematic structure of the analysed area. Based on the network analysis, four thematic clusters were identified, indicating different approaches and research contexts regarding the

relationship between tacit knowledge and innovation, with the primary keywords identified for each cluster.

- Cluster 1: construction project, contractors, risk, risk assessment, construction insurance
- Cluster 2: construction industry, insurance, safety
- Cluster 3: construction management, construction projects, risk
- Cluster 4: construction, health, and safety

3. RESULTS

The map visualizes a network of keyword relationships, clearly identifying insurance, the construction industry, and risk management as the central and most frequently occurring concepts in the analysed dataset. Their large size and central position indicate that they constitute a core area of research or documentation interest. At the centre of this network lies the strongest relationship between insurance and the construction industry, suggesting that their interaction is a key topic. Risk management is directly and strongly linked to both concepts, positioning it as a mechanism connecting the industry with its financial and legal protection. Concepts such as construction management, contractors, health and safety, and risk assessment are important subtopics that branch off from the main nodes, confirming that risk and its mitigation are integral to every aspect of construction activity.

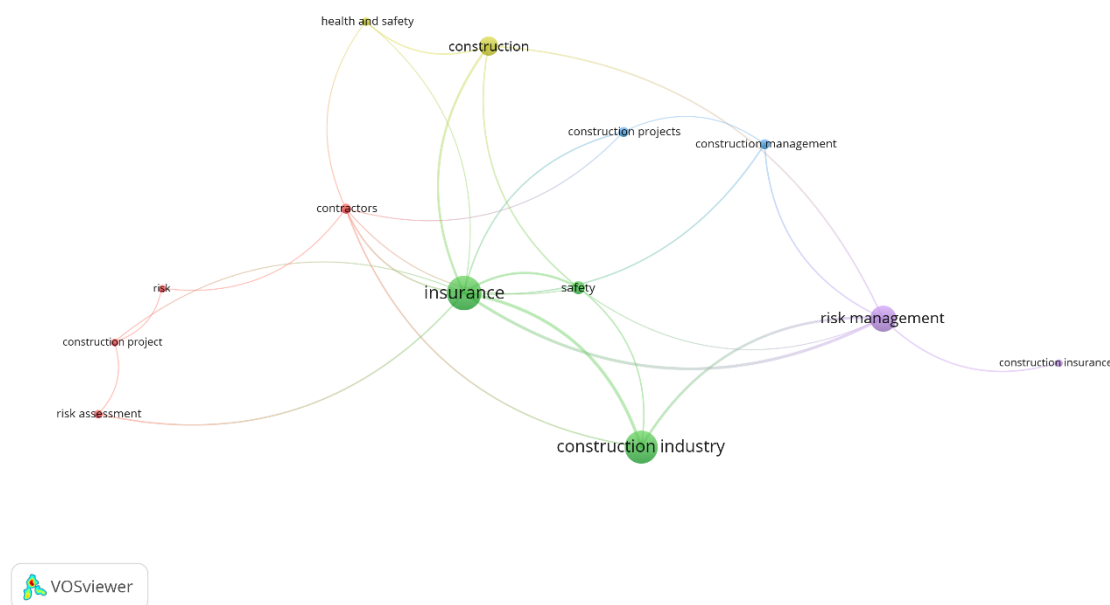


Fig. 1. Network visualization (VOSviewer software)

Source: own elaboration

The map visualizes the network of keyword connections, with a superimposed timeline spanning the period from the early years (around 2010-2011) to the late years (around 2015-2016) of the analysed scope.

The central and largest nodes, indicating the key importance in research, remain insurance, the construction industry, and risk management. These three concepts are most strongly interconnected, forming the foundation of the discourse, with the thickest edge connecting insurance and the construction industry.

The timeline analysis shows that the main topics – insurance, the construction industry, and risk management – were intensively researched or discussed in the early and middle years (around 2010–2014). This suggests that the relationship and methodology surrounding these fundamental issues were established during this time. In contrast, more detailed and practical aspects, such as risk assessment, the general concept of risk, contractors, and health and safety, have a clear tendency to appear in publications from the later period (around 2014–2016). This pattern indicates an evolving focus: after the foundations of risk management and insurance were established, the focus shifted in later years towards detailed implementation, assessment, and accountability in these areas.

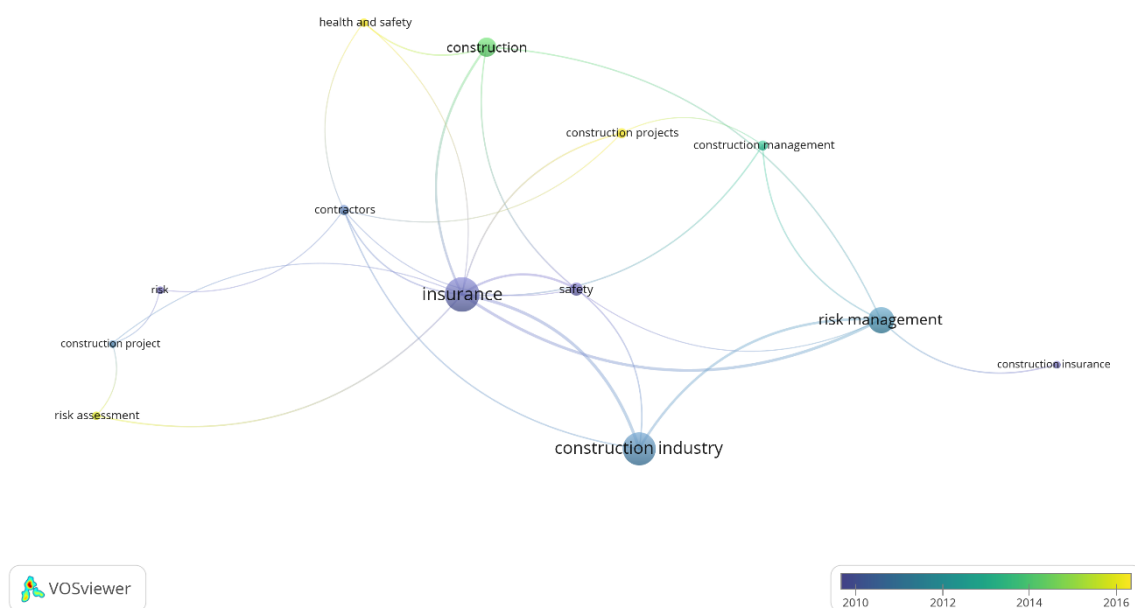


Fig. 2. Overlay visualization (VOSviewer software)

Source: own elaboration

In relation to cluster 1, the topic focuses on a systematic approach to the inherent risks associated with construction projects. The construction industry itself is inherently burdened with numerous risks resulting from its complexity and multi-stage nature, with contractors playing a key role in managing these issues. Various factors, such as budget constraints, technical challenges, design changes, and environmental issues, contribute to project implementation difficulties and potential financial losses (Obondi, 2022; Mahamid, 2013; Ugwu et al., 2019).

Therefore, risk management is a key function in construction management. Effective risk management practices aim to increase the likelihood of achieving positive project outcomes while mitigating negative impacts (Alhammadi et al., 2021; Nawaz et al., 2019). Furthermore, construction insurance plays a crucial role as a risk transfer mechanism, offering financial protection against potential liabilities and unforeseen events (Ugwu et al., 2019). Modern risk assessment tools, including those using Building Information Modeling (BIM), support contractors in identifying and quantifying risks, ensuring better decision-making and project success (Yu et al., 2017; Gavrysh & Melnykova, 2019). Therefore, a methodical approach to risk assessment and appropriate insurance strategies is essential for the successful management of construction projects.

Concerning cluster 2 - The construction industry is inherently exposed to a variety of risks, including financial, operational, and natural hazards, which necessitate the use of effective risk management strategies. One of the most crucial tools for mitigating these risks is insurance, which provides financial protection for construction sector entities against potential losses resulting from unforeseen events during project implementation (Owusu-Manu et al., 2020; Hatmoko et al., 2021). Insurance facilitates risk transfer, allowing construction companies to engage in diversified projects while minimizing the financial impact of adverse incidents (Liu et al., 2018). Research indicates gaps in knowledge and practices regarding the proper procurement of construction insurance within the industry, with companies often relying on brokers to navigate the complexities of available products (Liu et al., 2018). Despite its critical importance, the utilization of insurance varies across the construction sector, influenced by factors such as project complexity and risk perception (Gashahun, 2020; Owusu-Manu et al., 2020). Therefore, deepening the understanding of insurance mechanisms in the construction industry is essential to strengthening risk management practices, leading to better project outcomes and increased financial stability for the entire sector (Pukała et al., 2021).

Referring to cluster 3, construction as a sector is fundamentally risk-prone, which requires health and safety to be an integral and prioritized part of its management. The risk assessment process in the construction industry is crucial, influenced by the specific nature of construction projects and the experience of contractors. Contractors play an essential role in identifying, analysing, and mitigating construction-related risks, which significantly impact project outcomes. Research indicates that contractors' industry experience can improve risk management practices, enabling better decision-making and proactive health and safety strategies (Phan, 2020; Gashahun, 2020).

However, many contractors may not fully understand the actual risks associated with construction, often confusing subjectively perceived risks with objective assessments. Such misunderstandings lead to an underestimation of potential losses related to accidents and safety, which can impact their willingness to invest in effective risk management tools, including insurance (Liu et al., 2018; Taofeeq et al., 2020). Moreover, the dynamics of risk management in construction vary depending on project delivery methods, with contractors subject to varying levels of responsibility, particularly in the context of occupational health and safety (Shen et al., 2017). For project success and to minimize negative impacts, it is crucial for contractors to actively engage in assessing occupational health and safety risks at an early stage, adapting appropriate insurance strategies that facilitate the transfer of liability for potential losses (Owusu-Manu et al., 2020; Hatmoko et al., 2021). By recognizing the multifaceted nature of risk and adopting an informed approach to health and safety management, construction companies can increase their operational efficiency and contribute to the overall success of the construction industry.

Finally, cluster 4 is a smaller cluster that emphasizes the link between the general concept of construction and occupational health and safety (OHS) issues. Construction is inherently linked to health and safety issues due to its high-risk environment. This industry consistently experiences elevated accident rates, making effective OHS management absolutely imperative. The presence of heavy equipment and complex technological operations contributes to a wide range of potential hazards, requiring comprehensive safety programs to protect workers (Durdyev et al., 2017; Giri, 2020). Effective management systems that prioritize worker safety are fundamental to overall project

success, as poor OHS performance can lead to significant financial and reputational consequences (Yiu et al., 2019; Gambatese et al., 2005). Furthermore, management commitment to health and safety is crucial to building a strong safety culture in construction projects. Research has shown that organizational commitment enhances the effectiveness of occupational health and safety initiatives by influencing both employee safety behaviours and risk perceptions (Strickland et al., 2017; Wu et al., 2018). Establishing a positive safety climate is essential because it shapes construction personnel's attitudes and behaviours toward risk management. Therefore, contractors play a key role in promoting safety practices by integrating health considerations into daily operations and decision-making processes, ultimately leading to better outcomes for both employees and projects (Hassan, 2021).

4. DISCUSSION AND CONCLUSION

The bibliometric analysis confirmed the key role that insurance, the construction industry, and management play in the scientific discourse surrounding construction projects. Visualizations of keyword networks revealed that these three concepts constitute a fundamental core of research interests, with the strongest relationship between insurance and the construction industry, suggesting their mutual, critical importance. Risk management is positioned as a key mechanism connecting the industry with its financial and legal protection.

A temporal analysis provided insight into the research evolution. The main topics (insurance, construction industry, risk management) were intensively studied in the early and middle periods (around 2010–2014), allowing for the consolidation of methodological foundations and the relationships between these topics. In the later period (around 2014–2016), research attention shifted toward more specific, practical aspects, such as risk assessment, the role of contractors, and health and safety. This shift indicates the maturity of the field and a shift from broad concepts to detailed implementation and accountability in risk management. The four thematic clusters identified clarify the context of risk management. Clusters 1 and 3 emphasize the role of contractors in a systematic approach to project risks and the importance of risk assessment and modern tools, such as BIM, for project success. Clusters 2 and 4 emphasize that, despite the necessity of using insurance as a financial mechanism for risk transfer in risky sectors, knowledge gaps remain regarding the proper acquisition and effective use of insurance policies. Effective risk management, therefore, requires not only the strategic selection of insurance instruments but also the development of a safety culture and awareness among all project participants. A limitation of this study is its reliance on a single database (Scopus), which could potentially exclude important publications not indexed in this source. Furthermore, the specific nature of the query used could have limited the dataset obtained, thus impacting the comprehensiveness of the topic.

Therefore, future research should include in-depth empirical analyses focusing on the actual effectiveness of various types of insurance policies in minimizing financial losses in construction practice. Comparative studies are also recommended to assess the impact of regulatory and cultural differences on insurance strategies and risk management in construction in various regions of the world.

In summary, insurance is an indispensable tool for risk stabilization and transfer in construction, but its effectiveness depends on contractor awareness, the appropriateness of policies to the specific project, and an integrated approach to risk management. Future

research should focus on filling knowledge gaps and adapting insurance systems to the dynamically changing needs of the industry.

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