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A Global Literature Meta-analysis of Hygrothermal Optimisation for Excavated Soil Reuse in Different Climate Buildings

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Abstract

This meta-analysis explores the hygrothermal optimization strategies employed in the reuse of excavated soil in construction across diverse climate zones. The study synthesizes findings from global literature, examining the effectiveness of various techniques in mitigating the impact of climate on buildings constructed using excavated soil. The analysis spans regions with distinct climatic conditions, providing insights into the adaptability and performance of hygrothermal optimization methods. The construction industry is increasingly focusing on sustainable practices and one avenue gaining attention is the reuse of excavated soil in building materials. This meta-analysis aims to provide a comprehensive overview of hygrothermal optimization strategies employed in constructions across different climate zones, emphasizing the role of excavated soil reuse.

Keywords: Hygrothermal optimization • Environment • Soil stabilization

Introduction

The study employs a systematic review approach, gathering data from a wide range of sources including peer-reviewed journals, conference proceedings, and technical reports. The inclusion criteria prioritize studies focusing on hygrothermal performance in buildings where excavated soil has been utilized. The selected studies span various climates, ensuring a global representation of hygrothermal optimization techniques. This section delineates the hygrothermal challenges associated with excavated soil reuse in construction. Factors such as moisture regulation, thermal conductivity, and insulation properties are explored in the context of different climate zones. Understanding these challenges sets the stage for evaluating the effectiveness of various optimization strategies [1,2].

Literature Review

Drawing upon studies from different regions, this section provides an in-depth analysis of hygrothermal optimization methods. It explores region-specific approaches, considering climatic variations and the adaptability of techniques employed. The analysis includes case studies showcasing successful implementations and lessons learned in different climate contexts. A comparative analysis is conducted to evaluate the performance of various hygrothermal optimization techniques. This section highlights the strengths and limitations of strategies such as soil stabilization, insulation incorporation and moisture management systems. The goal is to identify best practices that exhibit versatility across diverse climates.

The implications of hygrothermal optimization for excavated soil reuse extend beyond immediate construction concerns. Sustainable construction practices not only contribute to energy efficiency but also align with broader environmental goals. This section delves into the broader implications of adopting such strategies, considering their potential impact on reducing carbon footprints and fostering a more sustainable built environment. While hygrothermal optimization presents promising solutions, practical implementation may face challenges and barriers. This section examines potential obstacles, such as regulatory constraints, cost considerations and the need for specialized expertise. Understanding these challenges is crucial for developing strategies to overcome them and facilitating the widespread adoption of excavated soil reuse in diverse climates [3].

Discussion

This section presents detailed case studies from different regions, highlighting successful applications of hygrothermal optimization in excavated soil reuse. Examining the real-world experiences of various projects provides valuable insights into the factors contributing to success and lessons learned from any shortcomings. Case studies contribute practical knowledge that can inform future projects and guide decision-makers in adopting effective strategies. The adoption of hygrothermal optimization techniques in excavated soil reuse not only addresses environmental concerns but also carries social and economic implications. This section explores how such practices impact local communities, considering factors such as employment opportunities, community engagement and the overall economic feasibility of sustainable construction practices [4-6].

Conclusion

In summary, this meta-analysis underscores the global relevance of hygrothermal optimization in excavated soil reuse for sustainable construction. By examining diverse climates and regions, we have identified commonalities and disparities in approaches. The findings contribute to a holistic understanding of the challenges and opportunities associated with hygrothermal optimization, paving the way for more informed decision-making in future construction projects. This meta-analysis consolidates global literature to provide a comprehensive understanding of hygrothermal optimization for excavated soil reuse in construction. The findings underscore the importance of context-specific approaches, offering valuable insights for architects, engineers and policymakers seeking sustainable building solutions.

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Conflict of Interest

None.

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