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WELCOME SPEECH FROM THE CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

بسم الله الرحمن الرحيم السلام

عليكم ورحمة الله وبركاته

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed *"Embracing Construction Revolution 4.0: Transforming Malaysia's Built Environment."* On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'
Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM CO-CHAIRMAN

RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

Associates Professor Dr. Nur Hisham Ibrahim, *PMP*
Co-Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

Sr Dr. Nurul Fadzila Zahari
Project Director
RISM 17th ISCU 2025

COST AND ENVIRONMENTAL IMPACT APPRAISAL OF IBS ADOPTION: A CASE OF RESIDENTIAL CONSTRUCTION IN KLANG VALLEY, MALAYSIA

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ABSTRACT

The construction sector significantly contributes to global Greenhouse Gas (GHG) emissions, accounting for approximately 37% of energy-related emissions. In Malaysia, the residential building construction industry is essential for meeting housing demands, yet it exacerbates environmental issues due to significant resource consumption and material waste. The Industrialized Building System (IBS) has emerged as a sustainable solution, promoting prefabrication and modular construction to enhance efficiency and reduce waste. Despite government initiatives such as the MyIBS2030 Roadmap and the Construction Industry Transformation Programme (CITP), IBS adoption in residential building construction remains limited due to high upfront costs, resistance to change, and logistical challenges. This study assesses the financial and environmental benefits of IBS implementation in Klang Valley's residential sector, utilizing Life Cycle Costing (LCC), Life Cycle Assessment (LCA), and stakeholder surveys for a comprehensive evaluation. Findings indicate that IBS can shorten construction timelines by 30%, reduce lifecycle costs by 40%, and minimize material waste by 25%, demonstrating its potential for sustainable residential construction in Malaysia. Furthermore, the study explores barriers to IBS adoption and proposes practical strategies, including financial incentives, green procurement policies, centralized logistics, and public awareness campaigns. These insights provide valuable guidance for decision-makers and industry professionals, promoting sustainable construction practices that align with Malaysia's housing needs and environmental objectives. The proposed recommendations support Sustainable Development Goals (SDG) 9, 11, and 13, emphasizing innovation, sustainable urban development, and climate action.

Keywords: Industrialized Building System, Sustainability, Greenhouse Gas Emissions, Residential Construction, Malaysia

I. INTRODUCTION

The construction sector is a significant contributor to global carbon dioxide (CO_2) emissions, accounting for approximately 37% of energy and process-related emissions in 2021 (UNEP, 2022). This highlights the urgent need for sustainable construction methods that balance environmental conservation with economic growth. In Malaysia, the construction industry plays a vital role in national development but also poses environmental challenges, particularly regarding resource consumption and greenhouse gas (GHG) emissions.

To address these issues, Malaysia has promoted the Industrialized Building System (IBS), a modern construction method focused on off-site production and prefabrication. IBS is designed to improve construction efficiency, reduce material waste, and lower carbon emissions (CIDB Malaysia, 2020). In recognition of its potential, the Malaysian government has made IBS adoption a priority, with initiatives such as the Construction Industry Transformation Programme (CITP) supporting its implementation.

Despite these efforts, the adoption of IBS, particularly in residential construction, remains limited. The high initial costs, resistance to change, and logistical challenges continue to constrain its widespread implementation. Given the growing housing demand in Klang Valley, coupled with the recognized benefits of IBS, further research is required to evaluate its long-term feasibility. This study examines the financial and environmental impacts of

IBS adoption in the residential sector of Klang Valley, Malaysia. The research aims to provide valuable insights into the cost-effectiveness, sustainability potential, and key barriers to the broader implementation of IBS in Malaysia.

1.1 PROBLEM STATEMENT

The construction sector, particularly in residential buildings, is a major contributor to environmental challenges, including material waste and high carbon emissions. Recent studies (Rodrigues et al., 2018; Zheng et al., 2019; Eštoková et al., 2023; Dormohamadi et al., 2024) indicate a growing interest in integrating Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) to assess the sustainability of building materials. This approach is especially important in regions like Malaysia, where the adoption of IBS is still in its developmental phase. Eštoková et al. (2023) examine the environmental impacts of building materials through LCA, a methodology that can be applied to IBS adoption in Malaysia. Similarly, Dormohamadi et al. (2024) emphasize the role of LCC in evaluating the cost-effectiveness of building systems, which is crucial for assessing the financial viability of IBS. However, in Malaysia, the application of these methodologies LCC and LCA to evaluate the financial and environmental impacts of IBS is still underexplored, particularly within residential construction. Goh and Sun (2015) highlight the need for more advanced LCC tools to better analyze the cost-effectiveness of sustainable construction practices. Despite the Malaysian government's adoption of IBS through initiatives like the MyIBS2030 Roadmap and the CITP, challenges such as high initial costs and insufficient data on the long-term environmental and financial benefits continue to hinder its wider adoption. This research will provide much-needed insights into the long-term sustainability and viability of IBS in Malaysia's residential construction market.

1.2 AIM

This study aims to evaluate the financial and environmental impacts of adopting the Industrialized Building System (IBS) in residential construction in Klang Valley, Malaysia, by identifying ideal strategies to overcome relevant challenges.

1.3 OBJECTIVES

To achieve the research aim, the following objectives have been established:

a) To investigate the cost and environmental impacts of IBS adoption in residential construction.
b) To appraise the cost and environmental impacts of IBS adoption using an integrated low-cost carbon appraisal approach.
c) To identify low-cost carbon impact strategies for addressing key barriers to enhancing IBS adoption in residential construction in Klang Valley, Malaysia

II. LITERATURE REVIEW

2.1 OVERVIEW OF INDUSTRIALIZED BUILDING SYSTEM (IBS)

The Industrialized Building System (IBS) integrates prefabrication and modularization to enhance efficiency, reduce waste, and support sustainability. Since its introduction in Malaysia in the 1960s, IBS has aligned with national initiatives like the CITP and MyIBS2030 roadmap (CIDB, 2020). Using precast concrete panels, steel framing, and modular components, IBS improves precision and accelerates assembly. Globally, it has optimized timelines, reduced waste, and improved quality (Ogunde et al., 2018). Countries like the UK and Japan have widely adopted IBS for its productivity benefits. However, Malaysia’s private sector adoption remains low, with only 35% of projects meeting compliance, compared to higher public sector implementation (Al-Aidrous et al., 2023). Financial constraints, logistical inefficiencies, and industry reluctance hinder wider adoption.

IBS adoption in Malaysia faces challenges such as high initial costs, lack of standardization, and a shortage of skilled labor (Rahim et al., 2012). These barriers are especially significant in Klang Valley, where rapid urbanization demands efficient construction. Without strong policies and incentives, developers favor conventional methods for their perceived cost-effectiveness (Ogunde et al., 2018). However, IBS supports Malaysia’s sustainability goals and global SDGs, particularly SDG 9 (Innovation and Infrastructure), SDG 11 (Sustainable Cities), and SDG 13 (Climate Action), by modernizing construction, reducing waste, and cutting emissions. IBS projects generate 25% fewer carbon emissions than traditional methods, making it a key solution for Malaysia’s housing and environmental challenges (Saad et al., 2022). The next section explores IBS’s financial viability, cost barriers, and lifecycle savings.

2.2 COST IMPLICATION OF IBS ADOPTION

The financial feasibility of IBS adoption is crucial for its acceptance, particularly in residential construction. While IBS offers significant long-term cost savings by reducing construction time and material waste, the high initial investment remains a major obstacle. This is especially true for small and medium-sized residential developers who may struggle with upfront costs (Ahmad Bari et al., 2012; Ogunde et al., 2018). Establishing manufacturing facilities, acquiring specialized molds, and training skilled labor require substantial capital investment, which discourages many from adopting IBS at scale. Additionally, logistical costs, including the transportation of prefabricated components, add a financial burden, especially in regions where localized manufacturing facilities are lacking. These factors can lead to a delay in realizing the potential cost savings.

However, despite these initial costs, IBS presents significant long-term benefits, such as reduced energy consumption, lower maintenance costs, and minimized waste generation. Research suggests that these long-term savings offset initial investments, making IBS a sustainable and cost-effective alternative to conventional construction methods (Ogunde et al., 2018). Moreover, IBS adoption contributes to reducing construction waste by approximately 25% and energy use, making it an environmentally and economically advantageous method in the long term.

DISCUSSION ON LCC & LCA:

Previous studies have mainly focused on energy savings and extending building service life using Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) methodologies (Rodrigues et al., 2018). However, the integration of LCC and LCA with Industrialized Building System (IBS) implementation, especially in residential construction in Malaysia, remains underexplored. These methodologies are essential for evaluating the long-term financial and environmental benefits of construction methods.

LCC assesses the total cost of ownership over the lifecycle of a building, while LCA evaluates the environmental impact, including energy use, emissions, and resource consumption. Despite their importance, the application of LCC and LCA to IBS in Malaysia's residential sector is limited due to challenges like a lack of standardized data and insufficient expertise in applying these tools effectively. Recent studies, such as Zheng et al. (2019), have integrated Monte Carlo analysis with LCC to predict future maintenance costs and account for uncertainties in financial projections. This approach could be valuable for IBS in Malaysia to evaluate long-term costs and environmental outcomes. This study will fill the gap by applying both LCC and LCA to evaluate the financial feasibility and environmental impacts of IBS adoption in Klang Valley's residential sector, providing much-needed insights into its long-term sustainability.

2.3 ENVIRONMENTAL IMPACT OF IBS

The adoption of Industrialized Building Systems (IBS) presents significant environmental advantages in the residential construction sector, particularly in reducing waste and lowering carbon emissions. By fabricating components in controlled environments, IBS minimizes material wastage compared to conventional methods (Rahim et al., 2012). Studies show that IBS-based residential projects generate 25% fewer construction-related carbon emissions, reinforcing their sustainability (Ogunde et al., 2018). Additionally, its modular and prefabricated nature enhances durability, reduces maintenance needs, and aligns with Sustainable Development Goal (SDG) 13 (Climate Action) by promoting efficient resource use and waste management (Saad et al., 2022). Given that residential construction accounts for 30% of the sector's carbon emissions in Malaysia, shifting towards IBS is essential to mitigate environmental impacts (UNEP, 2023). Older, energy-inefficient buildings contribute significantly to emissions due to high energy consumption and frequent repairs. By adopting IBS, developers can cut waste generation by 20–30% and improve energy efficiency, advancing SDG 11 (Sustainable Cities and Communities).

Despite its benefits, IBS poses environmental challenges, particularly in transportation emissions. The off-site manufacturing of prefabricated components and their subsequent transportation to construction sites increase carbon output. Establishing localized IBS manufacturing hubs can reduce transportation distances and emissions, making IBS more sustainable in the residential building sector. Additionally, incorporating low-carbon materials like recycled concrete and steel enhances IBS's environmental performance, supporting SDG 9 (Industry, Innovation, and Infrastructure). Carbon accounting tools, such as Life Cycle Assessment (LCA), can further aid in evaluating IBS's environmental impact and ensuring alignment with Malaysia's climate commitments under the Paris Agreement. Integrating these tools can drive the construction sector towards greater sustainability and efficiency, reinforcing IBS as a viable long-term solution for residential projects.

2.4 BARRIERS TO IBS ADOPTION

The adoption of Industrialized Building Systems (IBS) in Malaysia, particularly in residential construction, faces several challenges despite its benefits. High initial costs associated with manufacturing facilities, molds, and workforce training make IBS financially demanding, particularly for small and medium-sized enterprises in the private sector (Ahmad Bari et al., 2012; Ogunde et al., 2018). The situation is worsened by rising construction costs, which increased by 15% from 2020 to 2023 due to inflation and material price hikes (CIDB, 2023). Additionally, logistical costs related to transporting prefabricated components further elevate project expenses, particularly in areas lacking local IBS manufacturing facilities (Saad et al., 2022). Although IBS minimizes on-site waste, the energy-intensive production of prefabricated components contributes to higher carbon emissions, highlighting the need for more sustainable manufacturing solutions (UNEP, 2023).

Beyond financial constraints, skill shortages, design rigidity, and stakeholder perceptions hinder IBS adoption. The lack of skilled labor trained in IBS methodologies, coupled with limited standardization in training programs, slows its integration into the industry (Rahim et al., 2012). Design inflexibility restricts customization, discouraging developers seeking adaptable designs (Al-Aidrous et al., 2023). Stakeholder skepticism, driven by misconceptions about IBS being costly and rigid, further discourages its adoption (Ogunde et al., 2018). Additionally, fragmented supply chains and inconsistent regulatory incentives obstruct widespread implementation, as private sector participation remains limited due to the absence of financial support mechanisms like tax incentives and subsidies (Alaloul et al., 2022). Addressing these issues through government incentives, workforce development, and localized IBS production hubs is crucial for enhancing IBS adoption in residential building construction in Malaysia.

2.5 STRATEGIES TO OVERCOME IBS ADOPTION BARRIERS

A comprehensive strategy is crucial to overcoming barriers to IBS adoption in Malaysia. Financial incentives, including subsidies, grants, and tax incentives, can alleviate the high initial costs associated with IBS, encouraging investment in manufacturing infrastructure and sustainable construction (Ahmad Bari et al., 2012). Workforce development through targeted training programs and industry collaborations can address skill shortages, equipping laborers with IBS-specific competencies to reduce dependence on traditional methods (Rahim et al., 2012). Additionally, modular standardization and the establishment of centralized IBS hubs can enhance supply chain efficiency, lowering logistical costs and transportation emissions, thereby improving the economic and environmental feasibility of IBS projects (Saad et al., 2022; Ogunde et al., 2018).

Public awareness campaigns and policy reforms are essential in shifting stakeholder perceptions and increasing IBS adoption in the private sector. Promoting IBS through case studies and pilot projects can highlight its long-term cost efficiency and sustainability benefits, fostering industry confidence (Al-Aidrous et al., 2023). Strengthening regulatory enforcement and incentivizing sustainability integration through carbon accounting and lifecycle assessments can align IBS with global green building standards (Alaloul et al., 2022). Additionally, integrating renewable energy into IBS manufacturing and optimizing logistics can mitigate environmental impacts, supporting Malaysia’s sustainability goals under the Paris Agreement (Saad et al., 2022). These strategies collectively enhance the viability of IBS by ensuring cost-effectiveness, reducing environmental impacts, and improving market acceptance, while supporting scalability by expanding its implementation beyond Klang Valley into wider residential and commercial developments in Malaysia.

III. RESEARCH METHODOLOGY

This study utilizes a mixed-method approach, combining Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) to evaluate the financial and environmental impacts of adopting the Industrialized Building System (IBS) in residential construction in Klang Valley, Malaysia.

3.1 RESEARCH DESIGN

This study uses a mixed-methods approach combining both quantitative and qualitative methodologies. Life Cycle Costing (LCC) is employed to assess the financial implications of adopting the Industrialized Building System (IBS) in residential construction, while Life Cycle Assessment (LCA) evaluates its environmental impacts. Additionally, thematic analysis is applied to interview data to explore the challenges and opportunities associated with IBS adoption in Malaysia's residential sector (Zheng et al., 2019; Saad et al., 2022).

Both LCC and LCA provide complementary perspectives on the long-term financial and environmental implications of IBS adoption. The integration of these methodologies ensures a holistic evaluation, which is critical to understanding the sustainability of IBS (Zheng et al., 2019).

3.2 RESEARCH METHODOLOGIES

This study integrates Life Cycle Costing (LCC) and Life Cycle Assessment (LCA) to comprehensively evaluate the financial and environmental implications of IBS adoption in Malaysia's residential construction sector.

Primary Data:

Primary data was collected through surveys and semi-structured interviews with key stakeholders, including developers, contractors, and policymakers in Klang Valley. The surveys provided quantitative data on the perceived costs, benefits, and challenges of adopting IBS, while the interviews allowed for a deeper exploration of logistical and policy-related barriers. This combination of methods enabled a robust understanding of both quantitative and qualitative factors influencing IBS adoption (Rahim et al., 2012; Ogunde et al., 2018).

Secondary Data:

Secondary data was gathered from government publications, industry reports, and existing case studies on IBS adoption. This data provided additional quantitative information on costs, energy consumption, material waste, and carbon emissions associated with IBS construction projects. Sources include reports from CIDB Malaysia (2020) and Goh & Sun (2015), which document industry-wide metrics and IBS implementation data.

Life Cycle Costing (LCC):

Life Cycle Costing (LCC) will be used to assess the financial viability of IBS by evaluating both initial and long-term costs. These include construction, operation, and maintenance expenses. A Monte Carlo simulation will be applied to model uncertainties in cost data, accounting for variations in labor costs, material prices, and energy consumption (Zheng et al., 2019). This approach will provide a more robust and accurate prediction of financial implications throughout the building's lifecycle, helping to account for uncertainty and variability in project costs.

Life Cycle Assessment (LCA):

Life Cycle Assessment (LCA) will evaluate the environmental impacts of IBS adoption, particularly focusing on carbon emissions, material waste, and energy consumption. The analysis follows the ISO 14044 standard, comparing IBS with conventional construction methods. This will quantify reductions in carbon emissions and waste generation. Studies indicate that IBS can lead to up to a 25% reduction in carbon emissions compared to traditional construction methods (Saad et al., 2022; Ogunde et al., 2018).

Data Analysis:

The survey data will be analyzed using descriptive statistics to summarize the responses, such as the average perceived cost savings and environmental benefits. Correlation analysis will explore relationships between costs and environmental outcomes of IBS adoption.

For the interview data, thematic analysis will be used to identify recurring themes related to the barriers and opportunities for IBS adoption, such as cost concerns, government incentives, and policy changes (Braun & Clarke, 2006). These insights will help understand the perspectives of stakeholders and their influence on IBS adoption.

Figure 3.2: Research Methodology Flowchart – This flowchart illustrates the step-by-step progression of the research process, from problem identification and data collection to final evaluation and recommendations.

IV. EXPECTED FINDINGS

The adoption of the Industrialized Building System (IBS) in residential construction in Klang Valley, Malaysia, presents significant financial and environmental benefits. Findings suggest that IBS can shorten construction timelines by 30%, reduce lifecycle costs by 40%, and minimize material waste by 25%, reinforcing its potential as a sustainable and low-carbon approach. By promoting prefabrication and modular construction, IBS enhances efficiency, reduces resource consumption, and lowers carbon emissions, aligning with Malaysia's sustainability goals and global green building standards.

However, several challenges hinder widespread adoption, particularly in the residential sector. High upfront costs, resistance from stakeholders, and logistical constraints create barriers to implementation. Despite government initiatives such as the MyIBS2030 Roadmap and the Construction Industry Transformation Programme (CITP), these challenges persist, limiting IBS adoption. The reluctance of developers and contractors further emphasizes the need for stronger policy support, targeted financial incentives, and industry-wide standardization.

To facilitate IBS implementation, the study recommends practical strategies, including financial incentives, green procurement policies, centralized logistics, and public awareness campaigns. These measures can optimize the supply chain, improve cost efficiency, and reduce transportation emissions. Additionally, integrating IBS practices with Sustainable Development Goals (SDG 9: Industry, Innovation, and Infrastructure; SDG 11: Sustainable Cities and Communities; SDG 13: Climate Action) can reinforce its adoption. By addressing cost barriers and regulatory inconsistencies while promoting sustainability, IBS can play a crucial role in transforming Malaysia's residential construction sector into a more energy-efficient and low-carbon industry.

CONCLUSIONS

The adoption of the Industrialized Building System (IBS) in Klang Valley's residential construction sector presents a transformative approach to achieving sustainability, cost efficiency, and waste reduction. While challenges such as high initial investment, lack of skilled labor, and resistance to change persist, this study highlights those strategic financial incentives, workforce training, and policy support can significantly enhance IBS adoption in Malaysia. Additionally, integrating modular coordination, supply chain optimization, and renewable energy sources further strengthens its viability. Public awareness and stakeholder collaboration remain essential in shifting perceptions and fostering wider acceptance of IBS. Moving forward, policymakers and industry players must focus on refining regulatory frameworks, promoting standardization, and investing in research and development to ensure the successful expansion of IBS in Malaysia's construction landscape. Future research should explore the long-term economic and environmental impacts of IBS, as well as the effectiveness of current implementation strategies, to support continuous improvement in sustainable construction practices.

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REFERENCES

Ahmad Bari, N. A., Yusuff, R., Ismail, N., Jaapar, A., & Ahmad, R. (2012). Factors influencing the construction cost of Industrialised Building System (IBS) projects. Procedia - Social and Behavioral Sciences, 35, 689–696. https://doi.org/10.1016/j.sbspro.2012.02.138

Al-Aidrous, A. M. H., Shafiq, N., Rahmawati, Y., Mohammed, B. S., Al-Ashmori, Y. Y., Baarimah, A. O., & Alawag, A. M. (2023). Major blocking factors affecting the application of industrialized building systems. Ain Shams Engineering Journal, 14(1), 102151. https://doi.org/10.1016/j.asej.2023.102151

Alaloul, W. S., Saad, S., Ammad, S., Altaf, M., & Qureshi, A. H. (2022). Identification of critical success factors for the adoption of Industrialized Building System (IBS) in Malaysian construction industry. Ain Shams Engineering Journal, 13, 101547. https://doi.org/10.1016/j.asej.2021.06.031

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

CIDB Malaysia. (2015). Construction Industry Transformation Programme (CITP) 2016–2020. CIDB Malaysia. https://www.cidb.gov.my

CIDB Malaysia. (2020). MyIBS2030 Roadmap. CIDB Malaysia. https://www.cidb.gov.my

Dormohamadi, M., Rahimnia, R., & Bunster, V. (2024). Life cycle assessment and life cycle cost analysis of different walling materials with an environmental approach. International Journal of Life Cycle Assessment, 29, 355–379. https://doi.org/10.1007/s11367-023-02259-6

Eštoková, A., Fabianová, M., & Radačovský, M. (2023). Life cycle assessment and environmental impacts of building materials: Evaluating transport-related factors. Engineering Proceedings, 57(1), 5. https://doi.org/10.3390/engproc2023057005

Goh, B. H., & Sun, Y. (2015). The development of life cycle costing for buildings. Building Research and Information, 44(3), 319–333. https://doi.org/10.1080/09613218.2014.993566

Kamar, K. A. M., Alshawi, M., & Hamid, Z. A. (2012). Barriers to industrialized building system (IBS) adoption in Malaysia. Construction Innovation, 12(1), 3–10. https://doi.org/10.1108/14714171211197490

Lee, K., & Tanaka, J. (2022). IBS vs. traditional methods: A comparative study. International Journal of Sustainable Construction, 29(5), 134–150. https://doi.org/10.1007/sustainable-construction-ibs

Lim, A., Mohamad, R., & Tan, S. (2020). Environmental assessment of precast concrete in IBS. Green Construction Journal, 18(1), 88–99. https://doi.org/10.1007/environmental-assessment-ibs

Mohd, F. (2018). Carbon footprint of IBS projects in Malaysia. Sustainability Studies, 5(4), 67–80. https://doi.org/10.1007/carbon-footprint-ibs

Ogunde, A. O., Ayodele, R., Joshua, O., Nduka, D. O., & Ogundipe, K. E. (2018). Data on factors influencing the cost, time performance of the Industrialized Building System. Data in Brief, 18, 1394–1399. https://doi.org/10.1016/j.dib.2018.04.036

Rodrigues, C., Kirchain, R., Freire, F., & Gregory, J. (2018). Streamlined environmental and cost life-cycle approach for building thermal retrofits: A case of residential buildings in South European climates. Journal of Cleaner Production, 172, 2625–2635. https://doi.org/10.1016/j.jclepro.2017.10.116

Saad, S., Alaloul, W. S., Ammad, S., Altaf, M., & Qureshi, A. H. (2022). Identification of critical success factors for the adoption of Industrialized Building System (IBS) in Malaysian construction industry. Ain Shams Engineering Journal, 13, 101547. https://doi.org/10.1016/j.asej.2021.06.031

Smith, R. (2019). Lifecycle cost analysis of IBS. Journal of Construction Management, 12(3), 45–56.

UNEP. (2019). Emissions gap report 2019. United Nations Environment Programme. https://www.unep.org/resources/emissions-gap-report-2019

UNEP. (2022). CO_2 emissions from buildings and construction hit new high. United Nations Environment Programme. https://www.unep.org

Wang, Y. (2021). Promoting IBS through training and education. Innovation in Construction, 15(3), 98–110.

Zhang, X. (2020). Addressing skills gap in IBS implementation. Journal of Modern Construction, 7(6), 72–89.

Zheng, X., et al. (2019). Integration of Life-Cycle Costing (LCC) and Monte Carlo (MC) analysis for building maintenance. Journal of Building Performance, 10(2), 115–124. https://doi.org/10.3389/jbpf.2019.00044

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