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THE GREAT TRANSITION:
RESHAPING THE BUILT ENVIRONMENT
FOR A CHANGING WORLD

SUB-THEMES

Sustainable and Regenerative Design
Smart and Resilient Cities
Decarbonization and Green Energy
Social Inclusivity and Well-Being
Project Management
Policy, Governance and Economic Transitions
Cultural Heritage and Identity
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Vegetation for Soundscape Quality Enhancement: A Systematic Literature Review

Muhammad Atiqi bin Mustapa[1]*, Lee Yoke Lai[2], Sapura binti Mohamad[3] and Nazli bin Che Din[4]

[1] Department of Landscape Architecture, Faculty of Built Environment & Surveying, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia; muhammadatiqi@graduate.utm.my

[2] Senior Lecturer, Department of Landscape Architecture, Faculty of Built Environment & Surveying, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia; lylai@utm.my

[3] Associate Professor, Department of Landscape Architecture, Faculty of Built Environment & Surveying, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia; b-sapura@utm.my

[4] Associate Professor, Department of Architecture, Faculty of Built Environment, University of Malaya, 50603 Kuala Lumpur, Malaysia; nazlichedin@um.edu.my

* Correspondence: muhammadatiqi@graduate.utm.my

Abstract: Soundscape studies have gained attention in urban development due to rising concerns about noise pollution. Limited research directly addressing vegetation in relation to soundscape outcomes for soundscape quality enhancement. Growing evidence suggests vegetation holds notable potential in reducing traffic noise and improving soundscape quality in urban environments. The aim of this paper is to conduct a systematic literature review to investigate research trends on vegetation in relation to perceived soundscape quality. The main objective is to identify the study trends, geographical locations, and publication years. Second, to analyse the characteristics of vegetation, greenery, or landscape in relation to soundscape. The review follows a quantitative systematic approach the investigate the research trends focusing on literature published from year 2010. A structured search was conducted using academic databases Scopus and Web of Science. The applying keywords related to vegetation, and soundscape. Studies were selected based on predefined inclusion and exclusion criteria. Data were extracted and analysed using with key findings, categorising vegetation characteristics in relation to soundscape outcomes. Recognising vegetation as a strategic component of soundscape quality enhancement is essential in urban planning and landscape design. This review highlights the need for future studies for other regions, contextual area, and standardised vegetation metrics that will provide more comprehensive insights and support the development of soundscape-informed urban planning and landscape design strategies for healthier and more liveable urban areas.

Keywords: vegetation; landscape; green; soundscape and soundscape quality

Exploring Sustainable Practices in Asset Management of Indonesia's Transportation Infrastructure: A Systematic Literature Review

Riza Susanti[1]**, Syahrul Nizam Bin Kamaruzzaman[2], Azlan Shah Bin Ali[3], Mochamad Agung Wibowo[4]

[1] Postgraduate student, Department of Building Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; 24059593@siswa.um.edu.my
[2] Professor, Department of Building Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; syahrulnizam@um.edu.my
[3] Professor, Department of Building Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; asafab@um.edu.my
[4] Professor, Department of Civil Engineering, Universitas Diponegoro, Semarang, Indonesia; agung.wibowo@ft.undip.ac.id
* Correspondence: 24059593@siswa.um.edu.my

Abstract: This review synthesizes research on sustainable practices in asset management of Indonesia's transportation infrastructure to address environmental, social, and economic challenges in energy efficiency, waste management, lifecycle assessment, and sustainability frameworks. This review aimed to identify current asset management practices in Indonesia through PRISMA as systematic literature review. Findings reveal that sustainable asset management in Indonesia's transportation already emphasize energy efficiency, waste reduction, lifecycle assessment and adaption of technologies such as recycled asphalt, IoT and BIM. However, the implementation faces barriers such as governance fragmentation, lack of regulation and policy enforcement, limited institutional coordination, high cost and limiting integration across the asset lifecycle. Public-private partnership (PPP) as solution for financial constraints by the government but remain challenged by risk management across long concession periods. Overall, Indonesia has initiated the implementation of sustainable asset management but persistent deficiencies in integration, regulation and execution remain. These findings underscore the need for holistic, context-specific frameworks and enhanced institutional collaboration to bridge gaps between theory and practice. The synthesis informs policy and operational improvements to advance sustainable, resilient transportation infrastructure in Indonesia and comparable developing contexts.

Keywords: sustainable asset management; transportation infrastructure; Indonesia

Aligning Green Building Rating Systems with the Triple Bottom Line: A Comparative Study for Malaysia

Shu Jou Teoh[1], Mahanim Hanid[2]* and Zafira Nadia Maaz[3]

[1] Postgraduate student, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; u2104630@siswa.um.edu.my
[2] Associate Professor, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; mahanim@um.edu.my
[3] Senior Lecturer, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; zafiranadia@um.edu.my
* Correspondence: mahanim@um.edu.my

Abstract: The construction sector faces intensifying pressure to reduce its environmental footprint. While Green Building Rating Systems (GBRSs) serve as important evaluation tools in this transition, their proliferation has led to fragmentation and inconsistent sustainability assessments. This fragmentation poses particular challenges in developing countries like Malaysia, where less than 5% of buildings achieve green certification and raise questions about the effectiveness of existing rating systems. A key concern is whether GBRSs adequately reflect the Triple Bottom Line (TBL) framework of sustainability to balance environmental, economic and social considerations. While comparative studies exist, the systematic evaluation of nationally developed GBRSs within Malaysia through TBL framework remains limited. This study addresses this gap by conducting a comparative analysis of Malaysia's GBRSs including GBI, GreenRE, and MyCREST, benchmarked against the international LEED system. Through quantitative analysis of technical manuals and normalized scoring of credit weightings, this study evaluates each GBRS's balance across TBL pillars. The findings reveal significant TBL imbalance across all examined GBRSs. Environmental criteria dominate with 61-85% of total weighting, social considerations receive secondary emphasis at 11-28% and economic dimensions are largely absent at 0-5%. The pronounced environmental bias indicates that Malaysian GBRSs mirror global trends in considering sustainability primarily with environmental performance, thereby creating a potential avenue for greenwashing. These findings provide insights for enhancing GBRS design to achieve more TBL-balanced sustainability assessments. By emphasizing the importance of social and economic criteria, this study supports development of TBL-balanced sustainability assessments that advance Malaysia's carbon neutrality goal and sustainable development.

Keywords: green building rating systems; triple bottom line; sustainable development; Malaysia; comparative analysis

Emotionally Responsive Colour Strategies for Enhancing Urban Vitality in Heritage Streets: Evidence from Melaka, Malaysia

Jijiang Zhang[1], Faziawati Abdul Aziz[2]* and Mohd Fabian Hasna[3]

[1] Postgraduate student, Department of Landscape Architecture, Faculty of Design & Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia; gs62052@student.upm.edu.my

[2] Senior Lecturer, Department of Landscape Architecture, Faculty of Design & Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia; faziawati@upm.edu.my

[3] Senior Lecturer, Department of Landscape Architecture, Faculty of Design & Architecture, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia; m_fabian@upm.edu.my

* Correspondence: faziawati@upm.edu.my

Abstract: Urban vitality in heritage environments is increasingly recognised as shaped not only by spatial and functional factors but also by sensory–affective dimensions. Among these, colour dynamics remain underexplored despite their potential to regulate perception, emotion, and behaviour. This study develops and empirically tests a heritage-sensitive framework linking colour perception, preference, and compositional schemes to urban vitality through emotion-mediated pathways. A three-phase mixed-method design was adopted: (i) GIS and POI-based spatial analysis to identify vitality hotspots, (ii) façade chromatic feature extraction via deep convolutional neural networks (DCNNs) applied to Street View Images, and (iii) survey-based perceptual modelling analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). Results demonstrate that heritage-aligned hues and balanced chromatic contrasts significantly enhance environmental, cultural, and social vitality ($R^2 \approx$ 0.59), with emotional responses—operationalised through the PAD model—acting as key mediators (indirect effect $\beta = 0.29$, $p < 0.01$; VAF = 62–74%). Critically, heritage cultural identity moderates the colour–emotion pathway, amplifying effects by approximately 50% among individuals with high cultural identification (interaction $\beta = 0.18$, $p < 0.05$). These findings advance environmental psychology by quantitatively evidencing the affective role of colour in heritage streetscapes and contribute to urban design theory by embedding cultural symbolism within the S–O–R–PAD–MHCII paradigm. Practically, the study offers planners and designers actionable strategies for balancing historical authenticity with contemporary vitality needs in living heritage districts.

Keywords: urban vitality; heritage streets; colour strategies; emotional responses; cultural identity

Building Flood-Resilient Cities in Malaysia: Multi-Stakeholder Perspectives

Sharika Tasnim[1]*, Nik Elyna Myeda Binti Nik Mat[2] and Mastura Binti Adam[3]

[1] Postgraduate student, Department of Architecture, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; s2124410@siswa.um.edu.my
[2] Senior Lecturer, Department of Building Surveying, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; elyna@um.edu.my
[3] Associate Professor, Department of Architecture, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; mastura@um.edu.my
* Correspondence: s2124410@siswa.um.edu.my

Abstract: Climate change exacerbates flooding through various interconnected mechanisms. Global warming increases evaporation, resulting in higher moisture content in the atmosphere. This leads to heavier rainfall and more intense storms. As a consequence, drainage systems become overwhelmed, triggering flash floods and increasing the frequency of river overflows. Additionally, sea level rise contributes to coastal flooding by pushing seawater further in low-lying urban areas. In this context, there is an urgent need to design flood-resilient cities that can minimize the impacts and damage caused by flooding. With the increasing severity and recurrence of flooding in Malaysia, proactive preparation is far better than reactive recovery. Thus, it is significant to integrate perspectives of various stakeholders to design flood resilient cities in Malaysia. To explore these perspectives, this study conducts semi-structured, in-depth interviews with twenty two informants across Kuala Lumpur, including experts from authoritative, professional, and academic backgrounds. The study's finding reveal a fragmented understanding and limited implementation of flood-resilient strategies, alongside insufficient awareness of emerging flood risks. Key issues identified include the absence of integrated governance frameworks, inadequate inter-agency coordination, and limited community engagement in resilience planning. The study contributes a holistic overview of Malaysia's current preparedness and supports the formulation of context-sensitive strategies for designing flood-resilient cities. Future research may benefit from incorporating longitudinal case studies to monitor the implementation and long-term effectiveness of flood-resilient strategies in Malaysian context.

Keywords: climate change; flood-resilient cities; urban flooding; stakeholder perspectives; Malaysian context

A Systematic Literature Review on Interrelation of Urban Development, Urban Sprawl, and Urban Resilience in Peri-Urban Context

Dian Indah Shofarini[1]*, Rosilawati Binti Zainol[2] and Peter Aning Anak Tedong[3]

[1] Postgraduate student, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; 24060875@siswa.um.edu.my

[2] Professor, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; rosilawatizai@um.edu.my

[3] Associate Professor, Faculty of Built Environment, Universiti Malaya,, Kuala Lumpur, Malaysia; peteraning@um.edu.my

* Correspondence: 24060875@siswa.um.edu.my

Abstract: Urban sprawl nowadays still reshape the form of peri-urban landscapes worldwide, posing significant environmental, social, and governance challenges. At the same time, resilience has emerged as a framework for addressing these pressures and fostering sustainable development. This paper applies a Systematic Literature Review (SLR) that explores the interrelations between urban sprawl, urban development, and resilience, with a particular focus on the peri-urban areas of Malang Raya, Indonesia. Using the PRISMA 2020 protocol, 76 peer-reviewed articles published between 2015 and 2025 were analysed. The result shows that sprawl ruin ecological systems, expands infrastructure stress, and exacerbates social inequality, yet resilience strategies—ecological restoration, participatory governance, and community capacity-building—offer pathways for adaptation. from the global perspectives, this study stresses how Malang's peri-urban districts can serve as testbeds for resilience-oriented planning in secondary cities. This study contributes a conceptual framework linking urban development, sprawl, and resilience, offering guidance for resilience-oriented planning in peri-urban Indonesia.

Keywords: urban development; urban sprawl; urban resilience; peri-urban; systematic literature review

Demographic Growth and Land Use, Landcover Change (LULC): A Nexus for Sustainable Urban Planning of Federal Capital City (FCC) Abuja, Nigeria

Aliyu Yaman Muhammad[1], Syafiqah Nazurah Mukhtar[2]*, Mahamud Baba[3] and Rosilawati Binti Zainol[4]

[1] Postgraduate student, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; and Department of Urban and Regional Planning, Federal University of Technology Minna, Nigeria; 22075104@siswa.um.edu.my
[2] Senior Lecturer, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; syafiqahnazurah@um.edu.my
[3] Postgraduate student, Department of civil Engineering, Universiti Sains Malaysia, Nibong Tebal, Penang, Malaysia; and Department of Surveying and Geoinformatics, Federal University of Technology Minna, Nigeria; baba@student.usm.my
[4] Professor, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; rosilawatizai@um.edu.my
* Correspondence: syafiqahnazurah@um.edu.my

Abstract: Rapid urbanization and industrialization in many developing countries often lead to considerable changes within urban areas, adversely affecting urban sustainability. Over the past forty years, the Federal Capital City (FCC), Abuja, and its surrounding towns have seen notable demographic growth due to heightened urbanization and industrialization.To propose sustainable urban planning, the impact of urbanization and demographic growth on green spaces must be assessed through change detection analysis. The change detection method used in this study is the 'Area Analysis method'. This involves the analysis which highlights the transition trend of vegetated area to built-up area and bare surface over the period under assessment. The processes involved the geo-processing, which was selected, and the earlier periods of the year, and the observed change of each period of the year, i.e., 1985 to 2025, geometry were calculated and intersected to estimate the change area. After the process was done, the output was inferred according to the change that occurred. After the change detection was identified and extracted using spatial query operation. Therefore, LULC change analysis and transition probabilities provide strong evidence of FCC Urbanization trajectory, rapid expansion, environmental degradation, planned greening efforts, and continued pressure from urban growth. These patterns emphasize the importance of sustainable planning to protect remaining green spaces while accommodating inevitable urban development.

Keywords: land use land cover change (LULC); built-up-areas; sustainable urban planning; urbanization and industrialization; and Federal Capital City (FCC)

A Business Intelligence-Enabled Governance Framework to Enhance Urban Resilience and Sustainable Development: A Case Study of Amman, Jordan

Ahmad AlArabiat[1]* and Umi Kalsum Zolkafli @ Zulkifly[2]

[1] Postgraduate student, Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia; s2167521@siswa.um.edu.my

[2] Senior Lecturer, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; umi@um.edu.my

* Correspondence: s2167521@siswa.um.edu.my

Abstract: This study examined how Business Intelligence (BI) tools could be integrated into urban governance frameworks to enhance resilience and promote sustainable development, using Amman, Jordan, as a case study. It adopted a qualitative-dominant mixed methods approach, centering on a semi-structured questionnaire administered to 42 participants, including urban planners, municipal officers, IT professionals, policymakers, and civil society representatives. The research explored stakeholder perceptions, institutional readiness, adoption barriers, and desired features of a BI-enabled governance system. Findings revealed widespread stakeholder optimism about the usefulness of BI tools, particularly for improving urban planning accuracy, forecasting risks, and supporting evidence-based decision-making. However, the study identified major institutional gaps, including limited technical capacity, fragmented data systems, and weak leadership structures. Barriers such as resistance to change and lack of training hindered BI adoption. Despite these challenges, respondents strongly agreed on key framework features like real-time dashboards, predictive models, participatory platforms, and mobile integration. The study contributed to the literature on smart urban governance by situating BI within the context of a middle-income, rapidly urbanizing city in the Global South. It emphasized the value of community-facing digital tools in promoting data-driven resilience. The research also highlighted the urgent need for capacity building, inter-institutional coordination, and inclusive design. Future studies should expand on these findings through comparative and longitudinal approaches. This research provided practical and theoretical insights into how cities like Amman can leverage BI for more responsive, inclusive, and sustainable governance.

Keywords: Urban resilience; Amman; business intelligence; governance innovation; sustainable cities; digital tools; municipal planning

Integration of 6G Networks with Artificial Intelligence and Large Language Models for Smart Cities: Applications, Technologies and Operational Mechanisms – A Review

Ali Afzal Awan[1], Nor Badrul Anuar[2]*, Kamarul Ariffin Noordin[3]* and Firdaus Sahran[4]

[1] Postgraduate student, Institute for Advanced Studies, Advanced Studies Complex, Universiti Malaya 50603, Kuala Lumpur, Malaysia; muhammad.afzal.awan@gmail.com
[2] Professor, Centre of Research for Cyber Security and Network (CSNET), Faculty of Computer Science and Information Technology, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; badrul@um.edu.my
[3] Professor, Advanced Communication Research and Innovation (ACRI), Department of Electrical Engineering, Faculty of Engineering, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; kamarul@um.edu.my
[4] Senior Lecturer, Centre of Research for Cyber Security and Network (CSNET), Faculty of Computer Science and Information Technology, Universiti Malaya, 50603, Kuala Lumpur, Malaysia;
firdaussahran@um.edu.my
* Correspondence: kamarul@um.edu.my , badrul@um.edu.my

Abstract: The rapid evolution of communication technologies from 1G (1st generation) to 6G (6th generation) and 6G integration with artificial intelligence (AI) is to reshape the concept of smart cities (SCs), where real-time data, automation and intelligent decision-making are essential components for cleaner, greener and smarter eco systems. The forthcoming 6G wireless networks are anticipated to provide ultra-low latency, extensive connection and unparalleled data transmission speeds, crucial for facilitating next-generation SC applications. This research critically examines the integration of 6G networks with AI especially focusing large language models (LLMs), highlighting their collaborative potential in facilitating intelligent urban infrastructure. Moreover, this review provides a holistic outlook of the applications of AI-LLM driven 6G networks in SCs including energy-efficient buildings, intelligent transportation system (ITS), autonomous vehicles (AVs), e-banking, enhanced cyber security and AI-IoT driven smart construction. Furthermore, this paper holistically reviews the adoption of LLM-6G-enabled technologies and operational mechanisms of advanced futuristic connectivity for intelligent decision making, energy efficiency and autonomous functioning of infrastructures & environment, banks, markets and vehicles. Overall, this paper provides a comprehensive analysis of the integration of 6G and AI (LLMs) highlighting their role in transforming and digitalizing urban spaces while paving the way for swift and green communication in SC.

Keywords: smart cities (SCs), artificial intelligence (AI), 6G network, large language models (LLMs), green communication

Flood Risk Management in Kelantan: Historical Review, Risk, Impact, and Recommendation

Wan Nur Zainina WH [1]*, Zahiruddin Fitri AH[2] and Syahrul Nizam K[3]

[1] Postgraduate student, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; wannur83@siswa.um.edu.my

[2] Senior Lecturer, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; zahiruddin@um.edu.my

[3] Associate Professor, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; syahrulnizam@um.edu.my

* Correspondence: wannur83@siswa.um.edu.my

Abstract: Flooding is one of the most frequent and devastating natural disasters in Malaysia, primarily caused by heavy monsoonal and convective rainfall, flat topography, and intensified by human-induced factors such as river siltation, deforestation, agricultural expansion, and rapid urbanization. Among the most flood-prone states is Kelantan, located on the east coast of Peninsular Malaysia, where annual flooding has led to severe socio-economic and environmental impacts. The state covers an area of 15,099 km² and comprises ten administrative districts—Kota Bharu, Tumpat, Pasir Mas, Machang, Pasir Puteh, Bachok, Tanah Merah, Jeli, Kuala Krai, and Gua Musang—of which several are traversed by the 248 km Kelantan River Basin and its major tributaries: Sungai Nenggiri, Sungai Galas, Sungai Lebir, and Sungai Pergau. This study synthesizes findings from 40 previous research works and reports to provide a comprehensive historical review and current assessment of flood occurrences and management practices in Kelantan. The objectives of the paper are to (i) examine the historical trends and causes of flooding in Kelantan, (ii) evaluate the effectiveness of existing flood risk management strategies, and (iii) propose recommendations to improve disaster preparedness, mitigation, and community resilience. The review highlights that while structural measures such as floodwalls and drainage systems have been implemented, non-structural approaches—such as community-based preparedness, land-use planning, and early warning systems—require further strengthening. The study concludes with strategic recommendations aimed at enhancing integrated flood management and promoting sustainable adaptation strategies for the Kelantan region.

Keywords: flood risk management; preparedness; Kelantan; impact; mitigation; recommendations

A Critical Review on the Role of AI-Enabled 6G Networks Integrated with Machine Learning and Large Language Models in Building Disaster-Resilient Cities

Aayzaz Ahmed[1], Manauwar Ehsan[2]*****, Mohd Talha Anees[3], Ali Afzal Awan[4] and Kamarul Ariffin Noordin[5]*****

[1] Postgraduate student, Department of Building Surveying, Faculty of Built Environment, Universiti Malaya 50603, Kuala Lumpur, Malaysia; 22079116@siswa-old.um.edu.my
[2] Postgraduate student, Department of Geology, Faculty of Science, Universiti Malaya 50603, Kuala Lumpur, Malaysia; manauwar@um.edu.my
[3] Senior Lecturer, Department of Geology, Faculty of Science, Universiti Malaya 50603, Kuala Lumpur, Malaysia; talhaanees@um.edu.my
[4] Postgraduate student, Institute for Advanced Studies, Advanced Studies Complex, Universiti Malaya 50603, Kuala Lumpur, Malaysia; muhammad.afzal.awan@gmail.com
[5] Professor, Advanced Communication Research and Innovation (ACRI), Department of Electrical Engineering, Faculty of Engineering, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; kamarul@um.edu.my
* Correspondence: manauwar@um.edu.my, kamarul@um.edu.my

Abstract: Excessive deforestation and industrialization are accelerating global warming and climate change, leading to extreme environmental consequences in the form of natural disasters, putting immense pressure on necessity of disaster-resilient cities. To address the gaps in existing studies which are only focusing on disaster prediction, this study aims to critically review the advanced technologies like sixth generation communication network adoption along with Artificial Intelligence (AI), Machine Learning (ML), and Large Language Models (LLMs) for enhanced disaster resilient cities. This study includes the articles taken from WoS database from 2020-2025, by using keywords query of "6G" AND "Disaster" AND "Resilience" AND "AI OR ML OR LLM". The findings of this study revealed that ML algorithms depict up to 80-94% accuracy for landslides, flood glacier melting and cloud bursts prediction while reducing the 90-95% computational duration. Moreover, Random Forest (RF) efficiently predicted ground motion and earthquake-induced damage, while ML based hybrid model named "STL-ARIMA-LSTM" precisely forecast the frequency and duration of heatwaves. Additionally, Gradient Boosting (XG-Boost) enhances the drought prediction accuracy. On the other hand, LLM frameworks using Retrieval-Augmented Generation (RAG) technology and ClimateChat are majorly utilized either during disaster or post-disaster to analyse the disaster images and social media data to formulate evacuation plans and post-disaster strategies. Furthermore, the study revealed that implication of advanced 6G networks can significantly enhance disaster preparedness, emergency response and post-disaster localization of impacted populations and assets. Overall, this study elucidates the role of AI-enabled 6G networks integrated with ML and LLMs in building disaster resilient cities.

Keywords: disaster resilient cities; artificial intelligence (AI); Sixth Generation (6G); machine learning (ML); large language models (LLMs); disaster preparedness

Building Smarter and Safer Cities: A Scientometric Analysis of Geospatial Early Warning Systems

Nurhaziyatul Adawiyah Yahya[1], Nurul Hidayah Yahya[2] and Norzailawati Mohd Noor[3]*

[1] Postgraduate student, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University of Malaysia, Kuala Lumpur, Malaysia; nadawiyah.yahya@live.iium.edu.my
[2] Postgraduate student, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University of Malaysia, Kuala Lumpur, Malaysia; hidayah.yahya@live.iium.edu.my
[3] Professor, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University of Malaysia, Kuala Lumpur, Malaysia; norzailawati@iium.edu.my
* Correspondence: norzailawati@iium.edu.my

Abstract: Rapid urbanisation coupled with intensifying climate change, has partly contributed to the increasing occurrences of natural disasters worldwide. Disasters such as floods, landslides and earthquakes are often detrimental to lives, properties, and infrastructure, resulting in immense financial losses. Since it is nearly impossible to prevent natural disasters from happening, various efforts have been made to reduce their impacts. Early warning systems (EWS) are among the initiatives designed as a preventive measure to address this issue, where the integration of geospatial techniques with EWS has proven successful in improving forecasting precision, supporting timely alerts, and strengthening decision-making. This study conducts a bibliometric analysis of geospatial early warning systems for urban resilience, examining 544 documents from Scopus (2015-2025) using Bibliometrix R and VOSViewer. The analysis reveals exponential research growth from 2022 onwards, with a significant geographical concentration, where China dominates with 40% of the total output, followed by the USA and Italy. Further analysis reveals that while three key themes (Risk-related research, Technology development, and Planning integration) show exponential growth, keyword co-occurrence analysis reveals a critical disconnect, where geospatial technologies remain inadequately integrated with urban planning processes despite successful EWS implementation. Keyword analysis reveals notable hazard bias, with flood-related studies comprising over half of all hazard-specific publications, creating gaps in understanding low-frequency but high-impact disasters such as earthquakes and tsunamis. Despite technological advances, the field requires a paradigm shift from technology-focused to integration-focused approaches, emphasising broader global participation, comprehensive hazard coverage, and stronger integration with urban planning to build truly resilient cities.

Keywords: bibliometric analysis; flood risk management; geospatial early warning systems; urban disaster resilience; urban planning integration

Analysing the Potential of SDGSAT-1 Night-time Light for Urban Development

Nurin Izzati Azmi[1] and Norzailawati Mohd Noor[2]*

[1] Postgraduate Student, Department of Urban and Regional Planning, Kulliyyah of Architecture and Built Environment, International Islamic University Malaysia, 53100 Kuala Lumpur, Malaysia; nurin.ia@live.iium.edu.my
[2] Professor, Department of Urban and Regional Planning, Kulliyyah of Architecture and Built Environment, International Islamic University Malaysia, 53100 Kuala Lumpur, Malaysia; norzailawati@iium.edu.my
* Correspondence: norzailawati@iium.edu.my

Abstract: Night-time light (NTL) data has become an effective instrument for tracking urban growth, providing vital information on the temporal and spatial development trends. Selangor has experienced increasing urbanisation, increasing urban poverty and unsustainable land use. Assessing the temporal dynamics of urbanisation is critical for Selangor's long-term growth. The Defence Meteorological Satellite Program (DMSP) and Visible Infrared Imaging Radiometer Suite (VIIRS) night-time light data, available at 30 arc-second or 15 arc-second (approximately 1km or 500m) spatial resolution, have been the primary source of satellite data used in previous urban development studies. However, the Chinese Academy of Sciences engineered a satellite in 2021 that offered higher 10-m spatial resolution night-time light data from the Sustainable Development Science Satellite-1 (SDGSAT-1), providing the opportunity for more in-depth analysis. With the latest and higher resolution night-time light imagery, this study aimed to analyse the capability of SDGSAT-1 glimmer imagery in detecting dynamic patterns of urban development in Selangor, especially in suburban areas. Built up areas were identified using threshold methods, and the development was monitored by years and its major direction based on the centre of the city. Selangor has been concentrating on expanding suburban districts to improve economic equality and move away from the city centre. The development results from policy-driven initiatives to reduce overcrowding in the urban centre, encourage balanced regional growth, and decentralise economic prospects.

Keywords: SDGSAT-1, night-time light data, remote sensing, urban development

Reimagining the ASEAN Power Grid: Trade Integration, Institutional Moderation, and Renewable Electricity Performance

Muhammad Afnan Arif Bin Mohd Amran[1]*

[1] Asia-Europe Institute, University of Malaya, 50603 Kuala Lumpur, Malaysia
* Correspondence: 22075853@siswa.um.edu.my

Abstract: The ASEAN Power Grid (APG) presents a strategic opportunity to advance regional cooperation in renewable electricity generation, yet the empirical linkages between trade integration and energy performance remain underexamined. This study investigates whether increases in intra-regional trade share (IRT) among seven ASEAN member states are associated with higher solar and hydropower electricity output, and whether institutional quality moderates this relationship. Using panel data from 2000 to 2022, the analysis applies fixed effects regression to estimate baseline effects and employs Fully Modified Ordinary Least Squares (FMOLS) to capture long-run dynamics. Results show that IRT has a positive influence on solar generation across models, while its effect on hydropower is more conditional and sensitive to the institutional context. Interaction terms reveal that dimensions such as voice and accountability enhance trade-energy linkages, whereas regulatory rigidity may constrain them. These findings suggest that trade integration alone is insufficient to drive renewable expansion without supportive institutional frameworks. By disaggregating renewable electricity by source and modeling both short-term and long-term effects, the study provides a granular understanding of how economic and institutional forces interact. It reimagines the APG not merely as a technical infrastructure project, but as a policy instrument whose success depends on the alignment of trade flows, institutional coherence, and regional energy governance. The study provides timely insights for policymakers seeking to harmonize trade, institutional reform, and clean energy strategies in pursuit of climate resilience and sustainable development.

Keywords: ASEAN power grid; renewable electric generation; intra-regional trade; governance; regional trade integration

Triboelectric Nanogenerators for Green Energy Harvesting and Self-Powered Skid Resistance Sensing: Fundamental Principles, Materials and Mechanisms

Aayzaz Ahmed[1]*, Mirza Aamish Hassan Khan[2], Mohd Ridha Bin Muhamad[3], Zahiruddin Fitri Bin Abu Hassan[4], Nurshafarina Jasme[5] and Ali Afzal Awan[6]

[1] Postgraduate student, Department of Building Surveying, Universiti Malaya 50603, Kuala Lumpur, Malaysia; aayzazahmad1550@gmail.com

[2] Postgraduate student, Center for Transportation Infrastructure Systems (CTIS), The University of Texas at El Paso, El Paso, TX79968, USA; mhkhan2@miners.utep.edu

[3] Associate Professor, Department of Mechanical Engineering, Universiti Malaya 50603, Kuala Lumpur, Malaysia; ridha@um.edu.my

[4] Senior Lecturer, Department of Building Surveying, Universiti Malaya 50603, Kuala Lumpur, Malaysia; zahiruddin@um.edu.my

[5] Senior Lecturer, Department of Building Surveying, Universiti Malaya 50603, Kuala Lumpur, Malaysia; shafarina@um.edu.my

[6] Postgraduate student, Institute for Advanced Studies, Advanced Studies Complex, Universiti Malaya 50603, Kuala Lumpur, Malaysia; muhammad.afzal.awan@gmail.com

* Correspondence: aayzazahmad1550@gmail.com

Abstract: Static energy demand due to continuous functioning of traffic lights, road illumination, and signaling equipment, leads to excessive CO_2 emissions from transportation sector. In this sector, another major concern is delipidated road conditions, especially wet or worn surfaces, increasing the risk of accidents due to reduced skid resistance. To address these challenges, there is a pressing need for decarbonization of transportation industry by utilizing renewable energy resources and self-sustaining, real-time skid resistance sensing technologies to enhance road safety and infrastructure resilience. Therefore, this study systematically reviews novel technology of triboelectric nanogenerators (TENGs) which can concurrently harvest the mechanical energy of vehicular motion into renewable electrical energy and perform the real-time skid resistance assessment through monitoring of these generated electrical signals. In this study, 20 peer reviewed journal articles of Web of Science database from 2015-2025 were chosen using keywords along with logical operators: "triboelectric nanogenerators (TENGs)" AND "green energy harvesting" AND "skid resistance". Furthermore, this study explores fundamental work principles of triboelectric nanogenerators, materials used for their fabrication and mechanisms for real-time skid resistance and energy harvesting. Key findings of this study revealed that utilization of carbon nanomaterials like graphene and MXene in form of composites depicted 80-95 mW/m², 270-280 mW/m² (power density), 270-275 V & 650-670 V (voltage) respectively. Overall, the findings highlight the potential of TENGs to enhance traffic safety through real-time skid resistance sensing powered by green energy harvesting, paving the way towards smart pavements, energy efficient built environments and intelligent transportation systems (ITS).

Keywords: Triboelectric Nanogenerators (TENGs); green energy harvesting; skid resistance; intelligent transportation system (ITS); self-sensing pavements

Evaluating the Energy and Sustainability Performance of AI-Enhanced Transparent Solar Panels in Saudi Smart Cities

Abdalrahman Alhndawi[1]* and Muhamad Ali bin Muhammad Yuzir[1]

[1] Faculty of Civil Engineering, Department of Environmental Engineering, Universiti Teknologi Malaysia (UTM), Malaysia; abadyhindawe@gmail.com
*Correspondence: abadyhindawe@gmail.com

Abstract: This study examined the performance of transparent photovoltaic (TPV) systems compared with conventional PVs in hot-arid climates, with a focus on Saudi Arabia's smart city projects such as NEOM and the Red Sea development. Using simulation models supported by synthetic datasets, the research evaluated energy yield, degradation, life cycle emissions, recyclability, and cost efficiency. Results showed that conventional PVs achieved higher energy output, shorter energy payback times, and better recyclability, confirming their current economic and environmental advantages. TPVs, however, offered unique architectural integration potential but faced challenges of lower efficiency and higher embodied emissions. Artificial intelligence (AI) optimization significantly improved TPV performance, increasing annual energy yield by around 15%, reducing emissions intensity, and enhancing stability under dust, temperature, and tilt variations. These findings suggest that while TPVs cannot yet replace conventional PVs, they can play a complementary role in sustainable urban development when supported by AI optimization, material innovations, and improved recycling systems.

Keywords: transparent photovoltaics; AI optimization; hot-arid climates; smart cities; life cycle assessment

Material Testing Transparency for Construction Decarbonization

Shiun Hoong Ho[1], Meldi Suhatril[2]*, Yap Hwa Jen[3] and Yap Suen Haur[4]

[1] Postgraduate student, Department of Civil Engineering, University of Malaya, Kuala Lumpur, Malaysia; 23119517@siswa.um.edu.my

[2] Associate Professor, Department of Civil Engineering, University of Malaya, Kuala Lumpur, Malaysia; meldi@um.edu.my

[3] Professor, Department of Mechanical Engineering, University of Malaya, Kuala Lumpur, Malaysia; hjyap737@um.edu.my

[4] Postgraduate student, Department of Civil Engineering, University of Malaya, Kuala Lumpur, Malaysia; 24055803@siswa.um.edu.my

* Correspondence: meldi@um.edu.my

Abstract: The built environment faces mounting pressure to meet ambitious decarbonization targets, but a critical oversight persists in construction material testing data integrity. Architects focus on energy efficiency and material choices while civil engineers optimize structural performance, yet both unknowingly rely on potentially compromised test data. Trust deficit in the construction process could lead to conservative design practices including material grades. With mixed-methods approach, this research examines evidence from ongoing forensic investigations of Malaysian development projects and quantitative modeling of a 248-unit double-story terrace house development. Preliminary forensic findings reveal potential systematic governance failures where CCC-certified projects failed core strength requirements while simultaneously showing overdesign patterns that waste materials and increase emissions. CIDB (2021) reports that upgrading concrete grade increases embodied emissions by about 36.4 kg CO_2e/m^3, with potential national impacts of 1.19 - 8.11 $MtCO_2e$ annually depending on hedging strategy adoption. However, data collection faced constraints due to the sensitive nature of construction documentation, making this pilot investigation preliminary evidence requiring larger validation studies. This study identifies four ways that testing transparency can deliver simultaneous benefits, including better regulatory compliance and quality assurance, lower CO_2 emissions through optimized concrete selection, reduced construction costs by eliminating over-specification, and production improvements. This connection between engineering confidence and environmental impact matters particularly for rapidly developing economies where construction quality governance affects both climate commitments and construction cost efficiency. The paper proposes a new lens for sustainable construction where testing transparency becomes foundational to both safe buildings and a low-carbon future.

Keywords: construction testing; embodied carbon; governance transparency; ESG; concrete strength

A Scientometric Review of Methods and Applications in BIM and Machine Learning Integration for Low-Carbon Building Renovation

Wang Yilin[1], Ziad Baydoun[2]* and Nazli Bin Che Din[3]*

[1] Postgraduate student, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; 24072115@siswa.um.edu.my
[2] Senior Lecturer, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; ziad@um.edu.my
[3] Associate Professor, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; nazlichedin@um.edu.my
* Correspondence: ziad@um.edu.my; nazlichedin@um.edu.my

Abstract: With the increasing complexity of the built environment within the context of today's global consensus on energy use reduction and emission curtailment, Building Information Modeling (BIM) technology has found great acceptance within the construction industry. At the same time, its integration with machine learning (ML) has created opportunities to develop new solutions for energy-efficient, sustainable building practices. However, the works have focused on energy optimization or carbon-reduction strategies for a single renovation stage of buildings, leaving the systemic integration value across the entire life-cycle renovation scenario for predictive algorithms largely uncharted. This study examined how BIM-ML integration has been utilized to achieve low-carbon outcomes, data-driven modeling, and multi-objective optimization in the renovation of existing buildings. This review applied scientometric analysis methods to a comprehensive survey of research on BIM-based smart retrofitting. The study covers many issues, including publication growth trajectories, keyword co-occurrence networks, trends in algorithmic use, the global distribution of research, and contributions from institutions. Although the research is in its early stages, the findings show that this area is rapidly expanding, from energy performance modeling to retrofit decision-support systems and carbon-emission control to multi-objective optimization. BIM and ML have coevolved across almost all climate types, building typologies, and life cycle stages, achieving seamless technological maturity. Intelligent retrofitting using BIM and ML has the potential to be transformational to attain a low-carbon built environment, as sustainable retrofitting gradually becomes one of the most pressing concerns for the construction industry.

Keywords: building information modeling (BIM); machine learning (ML); low-carbon retrofit; energy efficiency; sustainability

Urban Heat Island Effects on Campus Buildings: Energy Consumption and Mitigation Strategies

NurulAuni Zulkhairi[1], Mastura Adam[2]* and Norafida AbGhafar[3]

[1] Postgraduate student, Department of Architecture, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; 17012914@siswa.edu.my
[2] Associate Professor, Department of Architecture, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; mastura@um.edu.my
[3] Associate Professor, Department of Architecture, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; norafida@um.edu.my
* Correspondence: mastura@um.edu.my

Abstract: Urban Heat Island (UHI) is a prominent urban climate phenomenon that elevates ambient air temperatures in cities compared to adjacent rural areas. This effect has a major impact on building energy performance, particularly in tropical areas, where cooling energy demand dominates electricity consumption. University campuses, often located in dense urban contexts, are highly vulnerable to UHI impacts due to their compact morphology, high occupant density and aging building stock. Rising temperatures caused by UHI have demonstrated to increase cooling loads by 10% to 120%, reducing energy efficiency and increasing dependency on mechanical cooling systems. Despite increasing attention to green campus initiatives, limited empirical research quantify the relationship between UHI and energy consumption in Malaysian higher education institutions. Addressing this gap through performance evaluation and simulation modeling in localized research is critical for guiding retrofitting efforts and sustainability policies and frameworks. This review synthesizes global and regional literature on the relationship between UHI and building energy performance, with a focus on campus environments, particularly in urban settings. It discusses how UHI increases cooling energy demand, identifies the campus buildings vulnerabilities and emphasizes mitigating strategies such as green roofs, reflective surfaces, shading devices and campus-scale greening. Without effective mitigation strategies, UHI impacts in campus environments especially in urban settings, may lead to continuous increases in cooling energy consumption, reducing thermal comfort and diminished institutional capacity to contribute to broader sustainability and climate resilience goals.

Keywords: urban heat island (UHI); campus buildings; green campus; energy performance; mitigation strategies

Optimal Design Features for the Recovery Process of Depression among Young Adults at Home

Nur Amirah Abd Samad[1]*, Mimi Umayrah Mohd Tarmizi[2] and Asiah Abd Rahim[3]

[1] Senior Lecturer, Department of Architecture and Built Environment, Faculty of Engineering and Built Environment, UKM Bangi, Selangor, Malaysia; amirahsamad@ukm.edu.my

[2] Postgraduate student, Department of Architecture and Built Environment, Faculty of Engineering and Built Environment, UKM Bangi, Selangor, Malaysia; p150931@siswa.ukm.edu.my

[3] Professor, Department of Architecture, International Islamic University Malaysia, Gombak, Kuala Lumpur, Malaysia; arasiah@iium.edu.my

* Correspondence: amirahsamad@ukm.edu.my

Abstract: This study investigates the role of passive design strategies in residential environments as a complementary therapeutic medium for patients experiencing mood disorders in particular is depression. The primary issue is the lack of public and institutional awareness regarding the influence of built environments on mental well-being, especially during post COVID-19 pandemic, during which the time spent at home has increased significantly. The objective of this research is to identify and evaluate optimal passive design criteria that can enhance the quality of life (QoL) for depression patients through emotionally supportive spatial interventions. Employing a qualitative research methodology, the study incorporates content analysis of relevant literature, selected case studies, and in-depth interviews with psychiatrists, patients, and architects. The findings reveal a strong correlation between specific passive design elements such as natural lighting, cross ventilation, adaptive spatial layouts, neutral colour palettes, biophilic integration, and multisensory stimulation. Furthermore, this contributes to improvements in emotional stability, reduced depressive symptoms, and enhanced recovery experiences for depression. Thus, designs prioritising sensory comfort and spatial harmony, demonstrate substantial potential in facilitating holistic and sustainable indoor healing environments. The study contributes to the formulation of wellness-based residential design policies that are aligned with the Malaysian Ministry of Health's (KKM) agenda to address mental health challenges through spatial and environmental design strategies. In conclusion, passive design transcends its architectural function, emerging as an effective therapeutic instrument that reinforces psychological resilience and promotes long-term mental well-being.

Keywords: healing environment; passive design; mood disorder; depression; quality of life

Greening the Mind: The Role of Urban Green Spaces in Supporting Mental Wellbeing among Low-Income Populations

Syaidatul Azzreen Ishak[1]*, Hazreena Hussein[2] and Haslina Muhamad[3]

[1] Postgraduate student, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; azzreenishak@um.edu.my

[2] Associate Professor, Centre for Sustainable Urban Planning and Real Estate, Universiti Malaya, Kuala Lumpur, Malaysia; reenalambina@um.edu.my

[3] Associate Professor, Department of Anthropology and Sociology, Universiti Malaya, Kuala Lumpur, Malaysia; haslina_m@um.edu.my

* Correspondence: azzreenishak@um.edu.my

Abstract: Urban green spaces play a crucial role in enhancing the quality of life for city dwellers, particularly in densely populated and underserved communities. This study investigates the relationship between access to open green spaces and mental well-being among low-income populations living in urban environments. The aim is to explore how the presence and usage of green spaces influence psychological outcomes such as stress reduction, emotional resilience, and overall mental health. The objectives of this study are: (1) to assess the availability and accessibility of open green spaces in low-income neighbourhoods; (2) to examine the perceptions, usage patterns, and barriers experienced by residents regarding these spaces; and (3) to analyse the correlation between green space experience and mental well-being indicators. Using a survey questionnaire approach, this study provides a comprehensive understanding of how urban nature contributes to mental health equity. The findings aim to inform urban planning, public health strategies, and policy interventions that promote inclusive, health-supportive urban environments for vulnerable communities.

Keywords: open green space; mental well-being; low-income communities; environmental psychology

Exclusion by Design: A Critical Review of Public Space and Hostile Architecture for the Homeless in Kuala Lumpur

Nadiyah Noor Hisham[1]*, Mastura Adam[2] and Nurdiyana Zainal Abidin[3]

[1] Postgraduate student, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; 23052055@siswa.um.edu.my

[2] Associate Professor, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; mastura@um.edu.my

[3] Senior Lecturer, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; nurdiyana@um.edu.my

* Correspondence: 23052055@siswa.um.edu.my

Abstract: Exclusion in urban design is evident through design interventions that discourage the homeless from utilising the urban space. In Kuala Lumpur, as part of its effort to modernise, public spaces are being redesigned with strategic interventions, making the homeless invisible. The design interventions are used to eradicate, rather than to incorporate. Yet, many of the urban and underutilised spaces, such as sidewalks, beneath bridges and highways, and vacant areas, have the potential to serve as an inclusive environment for people experiencing homelessness. Despite growing awareness of homelessness in Kuala Lumpur, existing literature rarely addresses how urban design contributes to social marginalisation. This review fills the gap by examining the relationship between hostile architecture, urban design and spatial justice in Kuala Lumpur. A systematic literature review, conducted using the PRISMA methodology, examined global theories and local policies related to inclusive design and urban exclusion. The results demonstrate a justice gap: while universal design principles are applied to disabilities by inclusionary laws such as UBBL 1984 (34A), the Persons with Disabilities Act 2008, and the Kuala Lumpur Local Plan 2040, they do not apply to the homeless, who are excluded by exclusionary laws such as the Destitute Persons Act 1977 and local municipal bylaws. This paper proposes a framework for rethinking the urban spaces' inclusive infrastructure that promotes a sense of dignity, safety and belonging for all urban residents. The finding offers practical insights for government authorities, urban planners and architects in creating equitable urban design.

Keywords: homelessness; urban design; Kuala Lumpur; underutilised urban space; inclusive design

Independent yet Included: Enhancing Well-Being through Children's Independent Mobility

Nuraihan Mohd Ibrahim[1], Nur Aulia Rosni[2]* and Yong 'Adilah Shamsul Harumain[3]

[1] Postgraduate student, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; nuraihanibrahim@gmail.com
[2] Senior Lecturer, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; nurauliarosni@um.edu.my
[3] Senior Lecturer, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; adilah_shamsul@um.edu.my
* Correspondence: nurauliarosni@um.edu.my

Abstract: The ability of children to travel independently to and from school is a vital aspect of their social development, well-being, and inclusion within the urban environment. However, safety concerns, car-dependent planning, and parental anxiety have reduced children's independent mobility. This study examines the extent to which primary school children in Malaysia travel independently and how school planning and accessibility influence this ability. Questionnaire surveys were distributed to 50 schools under the Klang District Education Office (PPD Klang), yielding responses from 300 children aged 7 to 12 years. Findings show that only 12.3% of children were allowed to travel to school alone, while 55.3% were not allowed at all. Gender differences were evident, with boys being granted independence more frequently than girls, supported by a significant trend ($\chi^2 = 5.63$, p = .018). A strong relationship was found between parental permission and companionship ($\chi^2 = 158.43$, p < .001), indicating that autonomy is shaped within family contexts. Spearman's correlation revealed that willingness to walk decreased with distance ($\rho = -.408$, p < .001) and travel time ($\rho = -.180$, p = .002). Gender and age also influenced perceptions of safety and comfort, with significant differences across most indicators (p < .01). By addressing the social and environmental barriers limiting autonomy, the study highlights how car-oriented urban design, unsafe infrastructure, and overprotective parenting constrain children's mobility. The findings provide evidence for inclusive, child-friendly planning and policies that promote well-being, equality, and active participation in everyday urban life.

Keywords: children's independent mobility; social inclusivity; well-being; school planning; accessibility

The Implication of Social Sustainability on Real Estate Performance: A Systematic Review

Muhamad Saiful Alizan Nordin[1], Ainoriza Mohd Aini[2]* and Anthonia Oluwatosin Adediran[3]

[1] Postgraduate student, Department of Real Estate, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; 22094186@siswa.um.edu.my
[2] Senior Lecturer, Department of Real Estate, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; ainoriza@um.edu.my
[3] Senior Lecturer, Department of Real Estate, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; anthonia.a@um.edu.my
* Correspondence: ainoriza@um.edu.my

Abstract: This systematic review explores the impact of social sustainability on the financial performance of the real estate sector. As social factors within the environmental, social, and governance (ESG) framework gain importance in investment decision-making, understanding their implications on financial outcomes is crucial for the real estate industries. Using the PRISMA methodology, this study systematically reviews literature from Scopus, Web of Science, and Emerald Insight. Out of 71 full-text articles assessed for eligibility, 41 studies were included in this review. The findings are organized into four key themes (T1 to T4), identified across five (5) distinct asset classes clustered by the reviewers. These themes include: (T1) positive implications of social sustainability on real estate performance (n=20), (T2) negative implications (n=2), (T3) mixed or inconsistent impacts (n=17), and (T4) the inverse relationship between CSR and financial performance (n=2). T4 stands out by shifting the typical direction of analysis, examining the impact of performance on social sustainability rather than the reverse. Insights are further enriched by examining these themes across five (5) asset classes, namely (i) REITs, (ii) listed real estate, (iii) unlisted real estate, (iv) mixed sectors that includes real estate firms or REITs as well as (v) indirect real estate. This review contributes to the broader discourse on sustainable finance, emphasizing social sustainability's role in enhancing financial resilience and attractiveness in the real estate sector. It is among the first to examine its impact across diverse real estate asset classes, offering valuable insights for investors, developers, and policymakers.

Keywords: social sustainability; CSR; ESG; real estate; performance

Community's Willingness and Readiness to Participate in Community-Based Ecotourism as a Nature-Based Solution – Preliminary Findings

Ainul Salsabila binti Affandi[1]*, Goh Hong Ching[2], Yong 'Adilah binti Shamsul Harumain[3]

[1] Postgraduate student, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; 17202312@siswa.um.edu.my
[2] Professor, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; gohhc@um.edu.my
[3] Senior Lecturer, Department of Urban and Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; adilah_shamsul@um.edu.my
* Correspondence: 17202312@siswa.um.edu.my

Abstract: Community-based ecotourism (CBET) is increasingly recognized as a Nature-based Solution (NbS) that supports climate resilience, biodiversity conservation, and sustainable rural development. This study examines the factors influencing community participation in the CBET effort in Kampung Rosob, Sabah, using the Theory of Planned Behaviour (TPB) extended with elements of the Norm Activation Model (NAM). A mixed-methods explanatory design was employed, starting with a questionnaire survey, followed by semi-structured interviews for contextual insights. This paper presents the findings from the first phase of quantitative data. Structural model results reveal that attitudes, personal moral norms, and perceived behavioural control significantly drive willingness to participate, while social norms show no significant effect. Readiness factors, particularly structural and resource-related barriers, also influence willingness. The findings emphasize that while willingness exists, readiness constraints hinder meaningful participation. Strengthening local capacity, fostering transparent communication, and providing institutional support are critical to sustaining CBET efforts. Theoretically, this study advances understanding of community participation by extending the concepts of willingness and readiness through contextual integration of the TPB–NAM framework. It also offers practical recommendations for policymakers, NGOs, and tourism planners, and aligns with SDG 8 (Decent Work and Economic Growth), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land).

Keywords: community participation; community-based ecotourism; environmental-behaviour; nature-based solution; TPB-NAM

Conceptual Framework on Post-occupancy Evaluation of Older Adult Daycare Centers in China

Zeqin Wu[1], Raha Sulaiman[2]*, Nurshafarina Jasme[3]

[1] Postgraduate student, Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia; s2042831@siswa.um.edu.my
[2] Senior Lecturer, Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia; rahasulaiman@um.edu.my
[3] Senior Lecturer, Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia; shafarina@um.edu.my
* Correspondence: rahasulaiman@um.edu.my

Abstract: Background: Optimizing the built environment of older adult daycare centers in China is critical for enhancing user experience and operational efficiency amid rapid population aging. Although post-occupancy evaluation (POE) is widely used in building performance research, studies targeting daycare centers for older adults, especially in China, remain limited. Objective: This study develops a conceptual POE framework that integrates spatial quality stimuli, older adults' satisfaction perceptions, and spatial utilization behavior, offering a user-centered framework for understanding how spatial design influences behavioral outcomes. Methods: A quantitative systematic literature review (SLR) was conducted across Web of Science, Scopus, and ScienceDirect for publications from 1990 to 2024, search strings combined terms for daycare settings, older adults, and evaluation. Full-text eligibility focused on building-related evaluation of elderly daycare contexts, yielding 11 peer-reviewed studies. Results: Findings support a POE framework that explicitly connects technical, functional, behavioral, and maintenance dimensions to outcomes via satisfaction as a mediating mechanism, enabling diagnostic use (identifying spatial deficiencies) and strategic guidance (planning, design, and management) for age-friendly daycare centers in China.
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Keywords: older adult daycare centers; post-occupancy evaluation; spatial quality stimuli; satisfaction perceptions; spatial utilization behavior

Construction Site Welfare Facilities In Malaysian Construction Industry: Impacts Towards Working Performance

Mazianah Rahmat[1,2]*, Cheong Suet Xuan[2], Mohd Shahraiz Mohd Nor[3], Nurdiana Azmi[2] and Nurhayatul Khursniah Hasim[2]

[1] PhD Candidate, Department of Architecture and Built Environment, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, 43000 Kajang, Malaysia; p103026@ukm.siswa.edu.my
[2] Department of Surveying, Lee Kong Chian Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, 43000 Kajang, Malaysia
[3] MiTG Group Sdn Bhd, Seksyen 8, 40100 Shah Alam, Malaysia; raiz1085@gmail.com
* Correspondence: mazianah@utar.edu.my

Abstract: Welfare facilities are implemented to safeguard workers' well-being and working performance. Although Department of Occupational Safety and Health (DOSH) and Malaysian Standard have specified minimum welfare facilities to be implemented on construction sites, non-compliance is still common in Malaysian construction industry. Majority of previous research had focused on welfare facilities implementation on construction sites without further exploration on the impacts towards workers' working performance and similar studies are lacking in Malaysian construction industry. Therefore, this study aims to explore impacts of welfare facilities implementation on construction sites towards worker's working performance. Objective of this study are to examine impacts of welfare facilities implementation on construction sites towards worker's working performance. Seven impacts towards working performance were identified through literature review. Quantitative research method was adopted for this research. Out of 500 sets of questionnaires distributed, 111 sets of data were collected from respondents from G7 contractor firms within Klang valley, yielding a response rate of 22 %. Results revealed that personnel work mostly at office ranked "Fatigue" and "Physical ill-health" as the top two impacts towards working performance, where "Morale and motivation" and "Worker's output" were ranked top two by personnel work mostly on-site. Mann-Whitney U Test exhibited significant differences between personnel that work mostly at office and on-site on the impacts. The findings could be utilised by employers, various stakeholders and government agencies to enhance workers' living and working environments.

Keywords: welfare facilities; working performance; construction site; project management

Travel Time and Student Well-Being in an Emerging Transit-Oriented Development: The case of University Belt, Manila

Gene Lambert Giron[1]* and Nattapong Punnoi[2]

[1] Assistant Professorial Lecturer, College of Architecture, Design and Built Environment, Polytechnic University of the Philippines, Manila, Philippines; glrgiron@pup.edu.ph
[2] Assistant Professor, Center of Excellence in Social Design, Faculty of Architecture, Chulalongkorn University, Bangkok, Thailand; nattapaong.p@chula.ac.th
* Correspondence: glrgiron@pup.edu.ph

Abstract: Following the construction of the LRT-2 Legarda Station, Manila's University Belt has experienced rapid, unregulated growth, leading to high land and housing prices. These phenomena have forced low-income students to relocate outside the University Belt, where they must travel longer distances, which is detrimental to their physical and psychological well-being. Currently, scholarly papers and articles on travel experiences and well-being predominantly focus on workers or students in non-urban or single-institution settings, thereby creating a substantial research gap in highly urbanized areas. Hence, this research analyzed through a mixed-methods approach the impact of travel time on the psychophysical well-being of the 598 convenience-sampled university students and explored how unregulated urbanization and unaddressed success parameters of TODs contribute to inequalities in student well-being. Descriptive statistics, utilizing frequency distributions, examined socioeconomic and geographical patterns, whereas bivariate linear regression evaluated the correlation between travel time and indicators of well-being. The results show that most middle- to high-income students reside in the University Belt, while most low-income students live farther away due to their inability to afford housing. Even though some respondents live within the emerging TOD, many students still take Jeepneys, which shows that walking is not convenient, safe, or both. The linear regression, as validated by a Breusch-Pagan Test to be efficient and consistent, shows that travel time has a negative correlation with both physical ($\beta = -0.26$, $p < 0.001$) and psychological well-being ($\beta = -0.30$, $p < 0.001$). Although travel time has a significant impact on students' psychophysical well-being, it only reveals surface-level issues. The findings of this study highlighted broader problems that stem from the barriers to achieving the identified TOD success parameters, particularly in terms of walkability, safety, and affordable housing options, which can help reduce inequalities and transform the Legarda Station area from an emerging to a successful TOD that fosters good psychophysical well-being.

Keywords: well-being; travel time; transit-oriented development; university belt; Manila

Risk Related to Employers' and Consultants' Contractual Responsibilities Affecting Contractors' Work Progress: A PLS-SEM Approach

Siaw Chin Pan[1]*, Siaw Chuing Loo[2] and Umi Kalsum Zolkafli @ Zulkifly[3]

[1] Postgraduate student, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; 17048576@siswa.um.edu.my
[2] Senior Lecturer, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; umi@um.edu.my
[3] Associate Professor, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; siawchuing@um.edu.my
* Correspondence: 17048576@siswamail.um.edu.my

Abstract: Adherence to contractual responsibilities by the contracting parties is important for the success of construction projects. However, this fundamental aspect is often neglected by the parties, leading to disruptions to contractors' work progress. While there is extensive literature on construction delay risks, few studies have specifically examined risks arising from employers' and consultants' non-adherence to contractual responsibilities that affect contractors' ability to maintain smooth work progress, particularly in private sector projects. This paper aims to investigate the influence of these risks on contractors' work progress. The risks were identified and classified into five categories (employer-related contractual risk, employer-related financial risk, consultant-related technical risk, consultant-related contractual risk and consultant-related financial risk). A quantitative survey was designed, validated and distributed to G6 and G7 contractors registered with the CIDB. Data from 90 valid responses were analyzed using the Partial Least Squares Structural Equation Model (PLS-SEM). Findings revealed that only consultant-related technical risk, such as incomplete drawings and details, inaccurate designs and frequent design changes, significantly disrupt contractors' work progress. This indicates that risks arising from consultants contribute more directly to causing disruption, while employer-related risks, may have lesser effects or may be better managed and mitigated in practice. The findings highlight the importance of adhering to contractual responsibilities to promote fairer contract administration practices and support smoother work progress in the Malaysian construction industry.

Keywords: contractual responsibilities; employer-related risks; consultant-related risks; disruption; PLS-SEM

A Conceptual Framework for Enhancing Supply Chain Resilience of SME Contractors through Dynamic Capabilities with Moderating Effects of Government Support

Shariffah Zatil Hidayah Syed Jamaludin[1]*, Muzani Mustapa[2] and Zuhaili Mohamad Ramly[3]

[1] Postgraduate student, Department of Quantity Surveying, Faculty of Built Environment and Surveying, 81310 Johor Bharu, Johor, Malaysia; shariffah@graduate.utm.edu.my
[2] Department of Quantity Surveying, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310 Johor Bharu, Johor, Malaysia; muzani@utm.edu.my
[3] Department of Quantity Surveying, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310 Johor Bharu, Johor, Malaysia; zuhaili@uni.edu.my
* Correspondence: shariffah@graduate.utm.edu.my

Abstract: Bumiputera SME contractors in the Malaysian construction industry face the challenge of maintaining operational continuity as they are not sufficiently resilient in the face of volatile, uncertain, complex, and ambiguous (VUCA) disruptions. These contractors often struggle with limited financial, technological, and managerial capabilities, making them highly vulnerable to supply chain disruptions. Existing scholarly research investigates the association between dynamic capabilities (DCs) and organizational resilience; however, these studies predominantly focus on large organizations and rarely conceptualize how government support (GS) modulates these impacts. This paper develops an SLR-informed conceptual framework for supply chain resilience (SCRE) among Bumiputera SME contractors by integrating three dynamic capabilities—financial management, collaboration, and information technology capabilities—with government support as a moderating mechanism. The review included four processes: database searching, intellectual filtering, thematic refinement, and linguistic review. Furthermore, a conceptual framework that integrates these capabilities, moderated by government support, is proposed to improve supply chain resilience in the context of Bumiputera SME contractors. The study extends DC theory by incorporating public-sector enablers and offers a context-specific roadmap for strengthening resilience among Bumiputera SME contractors. It is expected that the framework can be used to guide policymakers in designing training programs, distributing financial support, and creating targeted policies to strengthen the capabilities of Bumiputera SME contractors. Ultimately, this study aims to promote sustainable growth and long-term competitiveness in the Malaysian construction sector by equipping vulnerable contractors with the necessary tools to adapt more effectively, withstand disruptions, and recover more quickly.

Keywords: dynamic capabilities; supply chain resilience; Bumiputera SME; contractors; government support

Production Barriers in Malaysia's Rent-to-Own Housing: Insights from Key Stakeholders

Dessy Shafiqa Azmi[1]*, Hasniyati Hamzah[2] and Zafirah Al Sadat Zyed[3]

[1] Postgraduate student, Department of Real Estate, Universiti Malaya, Kuala Lumpur, Malaysia; dessyshafiqa@um.edu.my
[2] Senior Lecturer, Department of Real Estate, Universiti Malaya, Kuala Lumpur, Malaysia; hasniyati@um.edu.my,
[3] Senior Lecturer, Department of Real Estate, Universiti Malaya, Kuala Lumpur, Malaysia; zafirahzyed@um.edu.my
*Correspondence: dessyshafiqa@um.edu.my

Abstract: The Rent-to-Own (RTO) housing scheme has emerged in Malaysia as an alternative pathway to homeownership for low- and middle-income households who are unable to secure conventional mortgage financing. Despite its policy relevance, the implementation of RTO initiatives remains constrained by barriers in the housing production system. This study investigates the institutional challenges faced by federal and state governments in the production of RTO housing, drawing on insights from stakeholders directly involved in programme implementation. Qualitative data were collected through semi-structured interviews with eight key stakeholders from federal and state housing agencies. Thematic analysis, guided by Ball's Structure of Provision framework, revealed three interrelated production barriers: (1) scarcity of suitable land and the rising cost of urban land, which limit the pipeline of RTO projects; (2) weak institutional coordination between federal and state governments and across state agencies, which delays project approvals and hinders knowledge-sharing; and (3) the absence of a standardized national framework, which has led each implementing agency to improvise its own RTO model, producing fragmented practices and uneven housing outcomes. These findings underscore the importance of addressing production-side bottlenecks as the foundation for effective RTO implementation. By situating RTO within an institutional lens, the study contributes to ongoing policy debates on affordable housing delivery in Malaysia and offers practical insights for enhancing land policies, intergovernmental coordination, and standardized implementation frameworks.

Keywords: rent-to-own (RTO); structure of provision (SOP); institutional challenges; affordable housing; stakeholders' perspectives

Policy and Institutional Frameworks for Resilient Housing: A Systematic Literature Review

Ali Ahmed Shah[1]*, Peter Aning Anak Tedong[2] and Suzaini Mohamed Zaid[3]

[1] Postgraduate student, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; aliahmdshah@yahoo.com

[2] Associate Professor, Department of Urban & Regional Planning, Universiti Malaya, Kuala Lumpur, Malaysia; peteraning@um.edu.my

[3] Associate Professor, Department of Building Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; suzaini_zaid@um.edu.my

* Correspondence: aliahmdshah@yahoo.com

Abstract: The intensity and frequency of climate-induced disasters have increased, exhibiting unprecedented and evolving patterns of destruction. Housing sector is increasingly susceptible to significant damage from these destructive forces, resulting in substantial human and capital costs. There is a lack of resilient housing policies aimed at addressing the heightened climate emergencies, especially in developing countries. Current state of knowledge and scientific research regarding established policies on resilient housing remains uncertain. Therefore, there is an urgency to examine the holistic system of resilient housing, emphasizing optimal policy implementations and institutional frameworks tailored to specific contexts in the Global South, including Pakistan. The study conducted a systematic literature review following PRISMA guidelines to achieve this objective. In analyzing resilient housing, we selected a total of forty-eight (48) papers from recent literature (2020-2025) across three reputable databases: Web of Science, Scopus, and ScienceDirect. Findings of the review emphasize the complex nature of resilient housing, influenced by structural, social, institutional, and policy factors. These factors, collectively shape the outcome of adaptation and recovery processes. Therefore, resilient housing requires an inclusive and integrated approaches that include social, technical, and institutional solutions for the development and implementation of policy frameworks.

Keywords: resilient housing; institutional frameworks; disaster risk reduction; climate adaptation strategies; systematic literature review

An Integrated Knowledge Management Framework for Managing Commercial Development Projects in Klang Valley

Yusuf Mohammed Abdullahi[1]*, Ainoriza Binti Mohd Aini[2] and Othman Bin Mohamed[3]

[1] Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia;
yusufma0734@yahoo.com, S2184211@siswa.um.edu.my
[2] Faculty of Built Environment, University of Malaya, Kuala Lumpur, Malaysia;
ainoriza@um.edu.my
[3] Associate Professor, Faculty of Built Environment, University of Malaya, Kuala Lumpur,
Malaysia; othmanmohamed@um.edu.my
* Correspondence: yusufma0734@yahoo.com

Abstract: Commercial development projects in Malaysia's Klang Valley face persistent challenges of fragmented knowledge sharing, weak digital integration, and limited organizational learning. This study aims to develop and validate an Integrated Knowledge Management (IKM) Framework tailored to this context. A mixed-methods design was applied: a survey of 120 industry professionals (developers, contractors, consultants) analyzed using SPSS, and 15 semi-structured interviews thematically coded in NVivo. Results identified four key barriers to effective KM implementation structural, technological, cultural, and process-related manifested through irregular knowledge-sharing cycles, underused mentoring systems, and low leadership commitment to KM. Based on these insights, the proposed IKM Framework integrates four interdependent dimensions: (1) Structural - establishment of a Knowledge Management Office (KMO) and performance-linked KM metrics; (2) Technological - unified platforms incorporating BIM and AI-based knowledge retrieval. (3) Cultural - leadership driven incentives and continuous learning; and (4) Process - standardized KM cycles across project stages. The framework enhances project efficiency, institutionalizes learning, and promotes collaboration across stakeholders. Theoretically, it contextualizes KM for Malaysia's commercial development sector; practically, it offers actionable guidelines for integrating KM into organizational policy and project workflows to support sustainable, knowledge-driven growth.

Keywords: knowledge management; project management; commercial development; Klang Valley; Malaysia

Guidelines for Implementing Solicited PPP Scheme Mechanism for Indonesia Infrastructure Development

Ali Sunandar[1], Saipol Bari Abd Karim[2]* and Umi Kalsum Zolkafli @ Zulkifly[3]

[1] Postgraduate student, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; 23083580@siswa.um.edu.my
[2] Associate Professor, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; saipolbari@um.edu.my
[3] Associate Professor, Department of Quantity Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; umi@um.edu.my
* Correspondence: saipolbari@um.edu.my

Abstract: There have been numerous studies worldwide on Public–Private Partnership (PPP) schemes; however, many remain limited in their discussion of the guidelines for solicited PPP infrastructure development, particularly in Indonesia. Indonesia still requires approximately USD 135 billion to achieve the National Medium-Term Development Plan (RPJMN) target of USD 190 billion through PPP schemes. Moreover, PPP regulations in Indonesia are fragmented across multiple ministries and agencies, resulting in weak understanding and confusion among private parties and investors. This study employs a regulatory document review combined with thematic analysis to synthesize and simplify the solicited PPP guidelines in Indonesia. The findings reveal that the mechanism for solicited PPP in Indonesia is structured into four stages: planning, preparation, transaction, and management, each comprising several activities. This structured framework is expected to enhance the understanding of infrastructure PPP stakeholders, particularly private parties and investors seeking to allocate capital in Indonesia, thereby fostering greater investment in the infrastructure sector and contributing to the achievement of national development plan targets.

Keywords: guidelines; Indonesia; infrastructure; PPP; public-private Partnership; solicited

Carbon Planning in the Construction Industry: Policy Gaps, Challenges, and Strategic Pathway toward Net-Zero

Norzarina Othman[1,2]*, Faizul Azli Mohd Rahim[1,2] and Nurshuhada Zainon[1,2]

[1] Centre for Building, Construction and Tropical Architecture (BuCTA),
Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur
[2] Department of Quantity Surveying, Faculty of Built Environment,
Universiti Malaya, 50603 Kuala Lumpur
*Correspondence: norzarinaothman@um.edu.my

Abstract: This paper critically examines carbon planning within Malaysia's construction industry, emphasizing the policy, institutional, and operational challenges that hinder progress toward national net-zero emission targets. Drawing on a review of key policy frameworks including the National Climate Change Policy 2.0 (NCCP 2.0), ISO 21930 environmental declarations, the National Construction Policy 2030 (NCP 2030), and the Twelfth Malaysia Plan (12MP), the study identifies fragmented regulatory structures, weak enforcement, and limited professional capacity as major impediments to effective carbon governance. Integrating the Domino Accident Theory, the research conceptualizes how policy deficiencies trigger cascading institutional and environmental consequences, producing a persistent policy–practice gap. To address these systemic barriers, the study proposes a Policy–Practice Gap Model for Carbon Planning that underscores the need for mandatory greenhouse gas (GHG) reporting, standardized life-cycle assessment (LCA), and carbon labeling within procurement. Findings indicate that while Malaysia has established high-level sustainability commitments, operational mechanisms remain underdeveloped. Strengthening enforcement, data infrastructure, and capacity building is essential for mainstreaming low-carbon practices in the construction sector. The proposed framework provides strategic insights for policymakers, regulators, and industry stakeholders seeking to align construction practices with Malaysia's 2050 net-zero ambition and global sustainability goals.

Keywords: Carbon planning; Sustainable construction; Climate change policy; Life-cycle assessment; Net-zero emissions

Investigating the Relationship Between Soundscape and Cultural Dynamics of Kuala Kangsar

Heba A M Shehab[1], Liyana Hasnan[2]*, Raha Sulaiman[3], Nurul Amira Abd Jalil[4], Nazli Che Din[5], and Jian Kang[6]

[1] Postgraduate student, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; 24200370@siswa.um.edu.my

[2] Senior Lecturer, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; liyana_h@um.edu.my

[3] Coordinator for Postgraduate Program, Department of Building Surveying, Universiti Malaya, Kuala Lumpur, Malaysia; rahasulaiman@um.edu.my

[4] Senior Lecturer, School of Architecture and Interior Architecture, Universiti Teknologi MARA, Shah Alam, Malaysia; amirajalil@uitm.edu.my

[5] Associate Professor, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; nazlichedin@um.edu.my

[6] Professor, Bartlett School Env, Energy & Resources, University College London, Central House, United Kingdom; j.kang@ucl.ac.uk

* Correspondence: liyana_h@um.edu.my

Abstract: Heritage sites are often assessed through architectural and physical features, whereas the acoustic dimension, essential to cultural identity and the lived experience of place, remains largely absent from such considerations. This research investigates the overlooked role of historical soundscapes in preserving the cultural identity of Malay Royal Towns, with a focus on Kuala Kangsar. Despite extensive efforts in safeguarding tangible heritage, intangible auditory elements such as royal court music, the call to prayer, ceremonial rhythms, and traditional market sounds remain underrepresented in preservation strategies. This study aims to document, analyse, and develop sustainable approaches for preserving these soundscapes, emphasizing their influence on spatial experience and community identity. In the first stage of our study, a systematic literature review approach was used to address critical gaps and related determining factors in cultural soundscape preservation through a community-centered approach that includes intangible heritage as a key component of identity formation and urban memory. The expected outcomes include the identification of determining factors that can help determine the unique auditory heritage of Kuala Kangsar from both potential tangible and intangible aspects for the next stage of the study. It helps with a richer understanding of the town's cultural dynamics, practical recommendations for integrating soundscapes into heritage practices, and enhanced awareness of auditory heritage among policymakers and local communities.

Keywords: soundscape; cultural heritage; Malay Royal Town; Intangible heritage; heritage preservation

Towards a Conceptual Framework for the Application of Place Theory in Architectural Heritage under Tourism Development

Hongwei Hui[1], Nurdiyana Binti Zainal Abidin[2]* and Wai Choong Wong[3]*

[1] Postgraduate student, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; 22082358@siswa.um.edu.my

[2] Senior Lecturer, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; nurdiyana@um.edu.my

[3] Associate Professor, Department of Architecture, Universiti Malaya, Kuala Lumpur, Malaysia; garywong@um.edu.my

* Correspondence: nurdiyana@um.edu.my; garywong@um.edu.my

Abstract: Under the background of tourism development, the quality of many architectural heritages gradually deteriorated. The historical atmosphere and traditional culture of original place are increasingly losting. It makes unique memory of residents disappear, and also makes the satisfaction of tourists decline. Finally, the tension between people and place is caused. To solve this problem, place theory on the relationship between people and place is constantly evolving, which can help people to establish and enhance sense of place. However, researches on sense of place are distinctive in different disciplines. Therefore, based on WOS and CNKI databases, this study reviews some key researches on sense of place by systematic literature review from concept discrimination, dimension division, generation process and influencing factors. And a theoretical framework is finally given to understand sense of place in the context of architectural heritage. The research significance is to guide to enhance sense of place in architectural heritage.

Keywords: heritage conservation; tourism development; place theory; relationship between people and place

Phenomenological Inquiry into Southern Chinese Floral Ornamentations' Cultural Meanings in Melaka's Late Straits-Eclectic Architecture

Abdul Hakim Zakaria[1] and Aida Kesuma Azmin[2]*

[1] Department of Architecture, Kulliyyah of Architecture and Environmental Design (KAED), International Islamic University Malaysia, Kuala Lumpur, Malaysia;
abdulhakimzakaria1236@gmail.com
[2] Department of Architecture, Kulliyyah of Architecture and Environmental Design (KAED), International Islamic University Malaysia, Kuala Lumpur, Malaysia;
aida_kesuma@iium.edu.my
* Correspondence: aida_kesuma@iium.edu.my

Abstract: Melaka, inscribed as a UNESCO World Heritage Site in 2008, stands as a living testament to its multicultural architectural heritage. Among its most remarkable expressions is the Southern Chinese Floral Ornamentation (SCFO), a distinctive decorative motif adorning the façades of Peranakan Chinese (Baba-Nyonya) shophouses in the Late Straits Eclectic architectural style (c.1910s–1940s). This erosion undermines both the architectural authenticity and cultural identity of the Peranakan community. This paper highlights the research gap leading to this the research inquiry which aims to explore the original cultural values and design philosophies embedded within SCFO, with the goal of highlighting its significance in fostering sustainable documentation and preservation of Peranakan Melaka community's Straits Chinese façade architecture and place identity. Three key research objectives are outlined: first to identify the inherent design philosophy and cultural symbolism of SCFO on Late Straits Eclectic shophouse façades; second to analyse the amalgamation of three distinctive cultural and ontological paradigms - Native Malays, Immigrant Chinese from Southern China, and Colonial architecture – that were adapted into shophouses' forms and embellishments; including third to develop a theoretical framework that highlights the Peranakan Melaka community's cultural intellectual property. This framework will guide construction industry stakeholders on the significance of cultural sustainability and place identity through the study of Southern Chinese floral ornamentations. It focuses on the qualitative phenomenological approach on literature reviews and comparative timelines analyses of three historically significant shophouses at Jalan Tun Tan Cheng Lock in the attempt to establish a conceptual framework for deeper research pursuits. Future recommendations include formulating material conservation guidelines, advancing digital heritage documentation, and promoting participatory community engagement to safeguard this vanishing heritage. Ultimately, this research advocates for the cultural sustainability of Melaka's Straits Eclectic architecture through the enduring preservation of its ornamental language.

Keywords: Southern Chinese floral ornamentations; late strait eclectic style; Melaka Peranakan shophouses; cultural sustainability

Metaphysical Approach in *'Alam Takambang Jadi Guru'* Vernacular Architecture Philosophy: An Integral Framework for Socio-ecological Sustainability

Nor Aniswati Awang Lah[1,3]* and Khairul Anwar Mohamed Khaidzir[2]

[1] Postgraduate Student, Department of Architecture, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia; noraniswati@graduate.utm.my

[2] Associate Professor, Department of Architecture, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia; b-anwar@utm.my

[3] Senior Lecturer, Department of Interior Design, Kolej Kemahiran Tinggi MARA Rembau, Institusi Pendidikan MARA (IPMA), 71400 Pedas, Negeri Sembilan, Malaysia; aniswati.lah@mara.gov.my

* Correspondence: noraniswati@graduate.utm.my

Abstract: This study examines the metaphysical aspects of the Minangkabau philosophy *Alam Takambang Jadi Guru* (ATJG) and its potential to promote socio-ecological sustainability in vernacular and traditional Nusantara architecture. Grounded in Malay-Islamic cosmology, ATJG positions nature as a spiritual and moral teacher, advocating harmony and balance. To bridge the gap between modern architectural practices and indigenous metaphysical wisdom, the research proposes a design framework that integrates spiritual, cultural, and ecological values. Employing a mixed-methods approach—phenomenology, ethnography, architectural hermeneutics, environmental-behavioural case study observation, and finally triangulation of data analysis—the study spans Minangkabau diaspora regions: Darek-Luhak Nan Tigo (origin), Kampar-Siak, Riau (intermediary), and Rembau, Negeri Sembilan (settlement). Preliminary findings from a decorative analysis of a 157-year-old Lanjong House and a pilot perception and observational study in Rembau reveal that while traditional values remain embedded in architectural forms, generational awareness is waning. Three hypotheses are supported: traditional meanings endure through evolving forms; community engagement with ATJG holds cultural significance; and metaphysical principles such as subtle energy and spatial planning enhance sustainable design. The resulting conceptual framework integrates four key elements—metaphysical philosophy, architectural typology, design system structure, and socio-ecological outcomes—offering a holistic, culturally grounded model for sustainable architecture. Ultimately, the study contributes to recontextualizing indigenous knowledge in contemporary design, emphasizing the role of metaphysical approaches in restoring the human-nature-spirit relationship and promoting architectural resilience through the wisdom of ATJG.

Keywords: *Alam Takambang Jadi Guru* (ATJG); metaphysical approach; vernacular architecture; socio-ecological sustainability; indigenous knowledge systems

Mapping Youth and Community-Driven Approaches in Cultural Heritage Preservation and Tourism: A Bibliometric Analysis

Noor Afiqah Mohd Nashar[1], Illyani Ibrahim[2]*, and Norzailawati Mohd Noor[3]

[1] Postgraduate student, Department of Urban and Regional Planning, International Islamic University Malaysia, Selangor, Malaysia; a.nashar@live.iium.edu.my
[2] Associate Professor, Department of Urban and Regional Planning, International Islamic University Malaysia, Selangor, Malaysia; illyani_i@iium.edu.my
[3] Professor, Department of Urban and Regional Planning, International Islamic University Malaysia, Selangor, Malaysia; norzailawati@iium.edu.my
* Correspondence: illyani_i@iium.edu.my

Abstract: This paper presents a detailed bibliometric analysis of 525 articles from the Scopus database to map research trends at the intersection of cultural heritage, youth participation, and sustainable tourism from 1982 to 2025. analyzed by RStudio and VOSviewer, which have analyzed the studies in terms of thematic clusters, citation patterns, and networks of co-occurrence of keywords. The development of the area is notable, and 361 publications (68.8%) were published within the past four years. Trends such as (1) Asian nations, notably China (126 affiliations) and Indonesia (84 affiliations) have become dominant producers; (2) sustainability related research took centre stage, with the journal, Sustainability (Switzerland), publishing 41 articles (7.8 %); (3) three main areas of research have arisen: sustainable tourism at heritage sites, participatory, community-based methods, and digital preservation technologies. The keyword analysis reveals that the predominant themes are cultural heritage (38%), place attachment (17%), and intangible cultural heritage (16%), with a slightly higher, albeit modest, presence of youth (7%) and participation (7%), indicating a direction for future growth. This research-based piece of advice is intended for researchers and practitioners who aim to establish community-designed heritage preservation processes through the design of pervasive tourism. The created bibliometric map provides clarity on the intellectual landscape of this rapidly expanding and interdisciplinary field, as well as the emerging trends within it.

Keywords: cultural heritage; sustainable tourism; community participation; youth engagement; bibliometric analysis

A Systematic Framework for Adaptive Reuse in Traditional Villages: A Three-Dimensional Heritage Revitalization Approach

Yang Yang[1], Hazwan Ariff Hakimi[2]* and Nur Farhana Azmi[3]

[1] Postgraduate student, Department of Architecture, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; s2152720@siswa.um.edu.my
[2] Senior Lecturer, Department of Architecture, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; hazwanariff@um.edu.my
[3] Senior Lecturer, Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; farhanazmi@um.edu.my
* Correspondence: hazwanariff@um.edu.my

Abstract: Adaptive reuse has emerged as a vital strategy for revitalizing traditional Chinese villages, which are increasingly threatened by rapid urbanization and population outflow. This study moves beyond the conventional emphasis on built heritage to propose a systematic, three-dimensional framework that encompasses the full spectrum of village heritage. The framework was developed through an extensive literature review and two focus group discussions. The proposed framework comprises three interrelated dimensions. First, Historic Building Reuse (HBR) emphasizes the repurposing of historic structures to generate economic opportunities while safeguarding their architectural integrity. Second, Public Space Reuse (PSR) focuses on revitalizing communal areas to strengthen social cohesion and reinforce community identity. Third, Intangible Cultural Heritage Reuse (ICHR) addresses the dynamic transmission and creative transformation of cultural practices, leveraging digital technologies to bridge intergenerational divides and create new forms of cultural value. By integrating both material and immaterial heritage assets, this framework provides a holistic diagnostic tool that highlights their synergistic potential. It offers policymakers and practitioners a basis for designing tailored, integrated strategies for the sustainable revitalization of traditional villages.

Keywords: adaptive reuse; historic building reuse; public space reuse; intangible cultural heritage reuse; Chinese traditional villages

The Digital Transformation Program for The Heritage Community to Ensure Future Rural Resilience: A Review

Muhammad Adib Akmal Azzihan[1]* and Norzailawati Mohd Noor[1]*

[1] Department of Urban and Regional Planning, Kulliyyah of Architecture and Built Environment, International Islamic University Malaysia, 53100 Kuala Lumpur, Malaysia
*Correspondence: norzailawati@iium.edu.my; adib2001@gmail.com

Abstract: Many rural communities face the challenge of their cultural heritage erosion. In the face of globalization and technological advances, this factor also weakens community identity. Despite growing scholarly interest in digital heritage, there is a critical gap in systematic reviews that integrate rural community resilience, digital transformation, and cultural heritage sustainability in diverse geographical contexts. This scoping study addresses this gap by mapping how digital transformation relates to rural heritage preservation and community resilience, using a framework introduced by Arksey & O'Malley (2005). Data were extracted from the Scopus database of publications from 2015 to 2025. A quantitative analysis reveals publication trends and geographical distribution, while a thematic analysis of 11 selected studies maps predominant themes. Of the 56 publications analyzed in the initial phase, research output increased significantly after 2018, with the highest contributions coming mainly from China (8 publications), Spain (7 publications), and the United Kingdom (7 publications). Three dominant themes were identified: (1) digitalization as a tool for heritage conservation, (2) changing socioeconomic participatory approaches, and (3) structural challenges influencing intercultural patterns. However, current research on the context of sustainability, rurality, digitalization, and societal resilience is still limited. Main barriers include the digital divide, inadequate infrastructure, and lack of digital literacy in rural communities. This review provides a systematic mapping of the field, identifies conceptual and geographical gaps, and makes policy recommendations to promote community-led, culturally sensitive, and sustainable digital heritage practices in rural areas.

Keywords: rural; digitalisation; heritage; community; and sustainability

Innovative Approaches to Mitigate Climate Impact in Built Environments: Laboratory Investigations of Salt Crystallisation in Culture and Heritage Conservation

Mohd Jaki Mamat[1], Siti Norbaya Mohd Konar[2]* and Shaari Mat Saod[3]

[1] Senior Lecturer, School of Housing, Building & Planning, Universiti Sains Malaysia, E49, 11800 Gelugor, Penang, Malaysia; mohdjaki@usm.my
[2] Postgraduate Student, Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; sitinorbayamohdkonar@gmail.com
[3] Registered Conservator Jabatan Warisan Negara, NTQT SDN BHD, NO21-1, Jalan KNMP 1, Kompleks Niaga Melaka Perdana, 75450 Bukit Katil, Melaka; Shaarintqt@gmail.com
*Correspondence: sitinorbayamohdkonar@gmail.com

Abstract: Salt crystallization poses a significant threat to the structural integrity and aesthetic value of heritage buildings. This study focuses on the laboratory investigations of salt crystallization in King Edward VII (1) School, a heritage building located in Taiping, Perak also known as "Bandar Hujan". The research aims to identify the types and sources of salts present in the building materials, assess the extent of salt-induced damage, and evaluate the effectiveness of various conservation treatments. Samples were collected from different parts of the building and subjected to laboratory analysis using ion chromatography to determine salt concentrations. The results revealed the presence of chloride and sulphate salts, which contribute to efflorescence, spalling, and cracking of the building materials. Additionally, high moisture content was found to exacerbate the salt crystallization process, leading to increased deterioration. The study discusses the implications of these findings for heritage conservation and proposes practical mitigation measures, such as desalination treatments, improved drainage systems, moisture control strategies, and protective coatings. By implementing effective treatment for salt crystallization can significantly reduce restoration frequency, prolong the lifespan of the heritage buildings, and minimize environmental impact. This research contributes to the broader understanding of salt crystallization in heritage buildings and offers valuable insights for the preservation of similar structures.

Keywords: innovative approaches; climate impact; built environments; culture and heritage conservation

Machine Learning in Information and Communication Technology (ICT) Project Planning: A Systematic Literature Review

Patrick Pragasam Kulandaisamy[1], Zulkiflee Abdul-Samad[2]* and Hafez Salleh[3]

[1] Postgraduate student, Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; patrick.pragasam@gmail.com
[2] Associate Professor, Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; zulkiflee1969@um.edu.my
[3] Professor, Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; hafez.saleh@um.edu.my
* Correspondence: zulkiflee1969@um.edu.my

Abstract: The increasing complexity of Information and Communication Technology (ICT) projects necessitates more advanced and data-driven project planning methods. Traditional approaches often fall short in addressing the dynamic requirements and vast data volumes associated with modern ICT initiatives. Machine learning (ML), a subset of artificial intelligence, offers significant potential to enhance project planning through predictive analytics, pattern recognition, and decision automation. This paper presents the systematic literature review (SLR) investigating adaptation of ML in ICT project planning specifically mapping them to project management knowledge areas defined in the Project Management Body of Knowledge (PMBOK). The study aims to investigate and provide insights on the adaptation of ML technology in ICT project planning in various project management knowledge area. The PRISMA methodology was applied and a total of 33 scientific articles were analyzed from SCOPUS and WOS databases. The results reveal the application of ML in ICT project planning, synthesizing key trends, benefits, challenges, and best practices. There are limited studies to summarize the published literature, these findings will ultimately deepen the understanding of the dynamics and progress of machine learning within the field of project management especially in the project planning area, while also proposing future directions and identifying critical areas for its application in the project.

Keywords: machine learning; artificial intelligence; ict project planning

Quantity Surveyors' Perspective on Blockchain Integration in Contract Management: A Preliminary Study in Malaysia

Nur Nadia Mazlan[1]*, Muhammad Hadi Mustafa[2] and Mohd Suhaimi Mohd Danuri[3]

[1] Postgraduate student, Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; 24202013@siswa-old.um.edu.my
[2] Senior Lecturer, Centre for Building, Construction & Tropical Architecture (BuCTA), Universiti Malaya, Kuala Lumpur, Malaysia; hadimustafa@um.edu.my
[3] Associate Professor, Centre for Building, Construction & Tropical Architecture (BuCTA), Universiti Malaya, Kuala Lumpur, Malaysia; msuhaimi@um.edu.my
* Correspondence: 24202013@siswa-old.um.edu.my

Abstract: The integration of blockchain technology into construction industry has been widely discussed as a potential solution to persistent challenges in contract management. However, adoption in Malaysia remains limited, with little empirical evidence addressing the professional perspectives of quantity surveyors. This study aims to provide preliminary insights into the awareness enablers, and challenges of blockchain integration into construction contract management, emphasizing the role of quantity surveyor across consultancy, contracting, client organization, and government bodies. A qualitative exploratory research design was adopted, using semi-structured interviews to capture professional opinions and experiences. Participants were purposively selected for their senior-level expertise in contract management and their prior engagement with digital tools, notably Building Information modelling (BIM) and blockchain applications. This criterion ensured that respondents possessed both the professional experience and the technological awareness necessary to provide informed perspective on the integration of blockchain into contract management practices. The data were analysed using thematic analysis following Braun and Clarke's six phase framework, enabling the identification of recurring pattern and themes. The finding reveals that awareness of blockchain among quantity surveyors is still at an early stage, with many practitioners demonstrating limited understanding of its application in construction field. Conversely, challenges include technical, legal, organizational, and cultural obstacles. This study contributes to literature by situating blockchain adoption within Malaysian construction context, highlighting both opportunities and barriers, as a preliminary study, the results offer a foundation for larger scale research and provide practical insights for industry leader, and professional bodies seeking to promote blockchain adoption in contract management.

Keywords: integration, blockchain technology; contract management; quantity surveyor; Malaysian construction industry

A Data-Driven Approach to Managerial Decision-Making in Construction Project Management: The Role of Machine Learning

Nurhayatul Khursniah Hasim[1], Hafez Salleh[1]* and Nurshuhada Zainon[1]

[1] Faculty of Built Environment, University of Malaya, Centre for Building, Construction, and Tropical Architecture (BuCTA), 50603 Kuala Lumpur, Malaysia
* Correspondence: hafez@um.edu.my

Abstract: The Malaysian construction industry continues to face persistent inefficiencies such as cost overruns, project delays, and weak risk control, many of which stem from fragmented managerial decision-making. As digital transformation accelerates, there is an urgent need to develop data-driven managerial competencies. This study assesses current managerial practices and examines how machine learning (ML) enhances decision-making effectiveness through strengthened managerial competencies. To achieve this, three objectives were formulated to assess current managerial and technological practices, to examine relationships among managerial competencies, ML adoption, and decision-making using Partial Least Squares-Structural Equation Modelling (PLS-SEM), and to evaluate the predictive accuracy of ML models in supporting managerial decisions. A quantitative, descriptive, and exploratory design was applied using survey data from 55 construction project managers. PLS-SEM tested theoretical relationships, while ML predictive modelling evaluated practical decision support accuracy. Preliminary results (dummy data) reveal that managerial competencies and decision-making are strong, yet ML literacy and adoption remain limited due to financial and technical constraints. The study establishes a strategic foundation bridging managerial competency theory with intelligent digital tools, emphasizing upskilling and cost-effective ML integration to improve decision quality and project efficiency in Malaysia's construction sector.

Keywords: managerial decision-making; machine learning; construction project management; managerial competency; digital transformation

Mapping the Future: A Scientometric Review of Geospatial AI Applications in Land Use Classification

Nurul Hidayah Yahya[1], Nurhaziyatul Adawiyah Yahya[2] and Norzailawati Mohd Noor[3]*

[1] Postgraduate student, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University of Malaysia, Kuala Lumpur, Malaysia; hidayah.yahya@live.iium.edu.my

[2] Postgraduate student, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University of Malaysia, Kuala Lumpur, Malaysia; nadawiyah.yahya@live.iium.edu.my

[3] Professor, Department of Urban and Regional Planning, Kulliyyah of Architecture and Environmental Design, International Islamic University of Malaysia, Kuala Lumpur, Malaysia; norzailawati@iium.edu.my

* Correspondence: norzailawati@iium.edu.my

Abstract: Land use and land cover (LULC) classification play a vital role in planning development. It assists the planners to understand the existing conditions and functions of the land, thus guiding future development. In recent years, Artificial Intelligence (AI) techniques have been widely integrated in the process of LULC classification and have shown great potential in automating the process of mapping LULC. The aim of this study is to identify and examine the extent of research regarding the integration of AI in LULC classification by studying the journals and papers that focus on the AI models and methods used in LULC classification which range from Machine Learning (ML) to Deep Learning (DL) techniques. For this bibliometric study, a total of 397 documents published between 2015 and 2025, were extracted from the Scopus database and analysed using Bibliometrix and VOSViewer. Our findings show that the top three countries that are leading in the studies of this field are China, India and United States of America, where most of these studies focus on remote sensing and ML techniques. The study in this field has steadily gained popularity in the recent years with the peak of the research being in 2024. We believe that the trend will continue going upwards for the coming years. The outcome of this study will not only provide insights to the current research patterns and extent, but also future research direction and needs, as well as identification of current research limitations and gaps in the study of this field.

Keywords: bibliometric analysis; LULC classification; machine learning; deep learning; remote sensing

Integrating Blockchain and Building Information Modeling (BIM) in Heritage Conservation Projects: A Systematic Literature Review

Choy Poh Keong[1]*, Muhammad Hadi Mustafa[1] and Zulkiflee Abdul-Samad[1]

[1] Centre for Building, Construction & Tropical Architecture (BuCTA),
Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
* Correspondence: cpk02230518@gmail.com

Abstract: The preservation of heritage buildings increasingly relies on accurate digital documentation and transparent data management systems. Integrating Blockchain Technology with Building Information Modeling (BIM), particularly Historic Building Information Modeling (HBIM), offers a novel solution by enhancing data integrity, traceability and stakeholder collaboration throughout the conservation lifecycle. However, existing literature also reveals significant limitations, including high implementation complexity, interoperability challenges and the absence of standardised integration frameworks. Furthermore, limited case studies and practical implementations reveal a need for further empirical research. This study systematically reviews the current literature on the integration of Blockchain and BIM technologies in the context of heritage conservation, aiming to identify technological advantages, existing challenges and research gaps. A comprehensive search was conducted across databases including Scopus, Web of Science and ScienceDirect, focusing on peer-reviewed articles published between 2015 and 2024. Keywords such as "Blockchain," "BIM," "HBIM," and "heritage conservation" were used to retrieve relevant studies. Following screening and selection, a total of 17 eligible studies were included and subjected to thematic analysis to extract key insights and emerging trends. The findings indicate that Blockchain can significantly improve the reliability and security of heritage data managed through BIM platforms, enabling better documentation, audit trails and data sharing across stakeholders. The study concludes that Blockchain–HBIM integration holds substantial potential for transforming heritage management and recommends that future research focus on framework development, cross-disciplinary collaboration and pilot testing in real-world conservation projects.

Keywords: blockchain technology; building information modeling (BIM); historic building information modeling (HBIM); heritage conservation; systematic review

Modernizing Eco-Friendly Construction Methods in Unstable States: The Case of Yemen

Abdulhadi Saeed Al-Zawari[1]*, Fadhilah Bt Mat Yamin[2] and Noorani binti Ismail[3]

[1] Postgraduate student of Technology, Operations & Logistics Management, College of Business, Universiti Utara Malaysia, Kedah, Malaysia, abdulhadi_saeed_h@cob.uum.edu.my

[2] Associate Professor of Technology, Operations & Logistics Management, College of Business, Universiti Utara Malaysia, Kedah, Malaysia, fmy@uum.edu.my

[3] Doctor of Technology, Operations & Logistics Management, College of Business, Universiti Utara Malaysia, Kedah, Malaysia, nooraini.ismail@staf.uum.edu.my

* Correspondence: abdulhadi_saeed_h@cob.uum.edu.my

Abstract: This study is an determines the complex opportunities and challenges within the modernizing eco-friendly construction, with Yemen being a special case study. Fragile states, like Yemen, are prone to government collapse, crumbling infrastructure, and long-term energy shortages, in the form of prolonged power disruption and absence of basic urban services over time. All these issues are further compounded by adverse environmental conditions in the form of high temperatures and humidity across many parts of Yemen, especially the extensive regions categorized as extremely hot. These climatic stresses accelerate the degradation of materials, exacerbate the fragility of infrastructure, and exacerbate the social hardship of populations living in weathered housing. Communities in many other countries, such as Yemen, are experiencing these combined conditions, and their severity is increasing with global climate change. The research calls for a radical shift towards climate-resilient and resource-efficient building models aligned with material innovation, the circular economy, and the use of environmental and sustainability technologies. Moreover, to reconsider the excessive use of traditional concrete blocks that do not comply with engineering standards and do not have a documented reference to building codes or regulations. This includes the adoption of thermally insulated pozzolan blocks, aerated concrete (AAC), and other low-carbon materials that respond to local climate stresses while reducing energy demand. The study also focuses on developing enforceable regulatory frameworks, cultivating a skilled local workforce, and preserving Yemeni architectural identity through sustainable design principles. However, the study promotes the application of inclusive, economically sustainable, and scalable construction practices in low-income rural and urban settlements, aiming to reduce spatial and socioeconomic disparities while enhancing structural resilience and environmental sustainability at the same time.

Keywords: unstable states; concrete block; sustainable construction; Yemen; eco-friendly building; Yemen architecture style
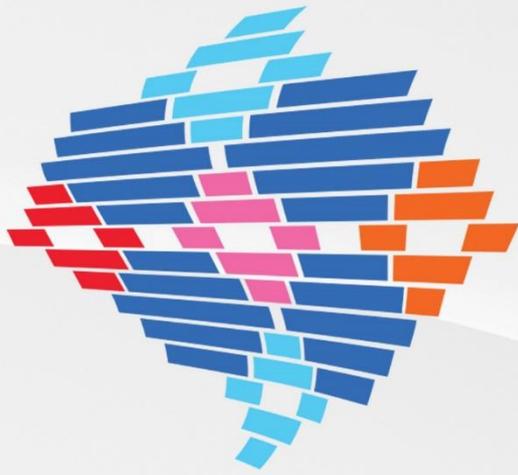
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To Propose Building Maintenance Information System Using 4D BIM Technology for Campus Facilities at Uniciti Alam, University Malaysia Perlis

Zul-Atfi Bin Ismail[1]* and Muhammad Haziq Harun[1]

[1] Faculty of Civil Engineering & Technology, Universiti Malaysia Perlis, zul-atfi@unimap.edu.my
* Correspondence: zul-atfi@unimap.edu.my

Abstract: Building maintenance encompasses the activities aimed at preserving and restoring a building's and facility's functionality, representing a globally demanding process. Effective maintenance management is crucial for the prolonged use of buildings, ensuring their preservation and promoting health and safety. Traditionally, the paper-based method of managing maintenance, which assigns priorities to each defect, including building amenities, has been associated with various issues such as inadequate maintenance, limited funding, poor services and maintenance backlogs. This study focuses on Block A3 of the Uniciti Alam Campus, University Malaysia Perlis, as a case study to explore best practices in maintenance management. The goal is to propose a new building maintenance information system utilizing Revit and Navisworks Manage software, aiming to enhance the existing maintenance management system. The study also aims to identify and compare issues related to maintenance management between the traditional paper-based method and Building Information Modelling (BIM). The proposed system improvement is intended for implementation in UniMAP's maintenance management system. Research methods employed include literature review and semi-structure interviews to gather relevant data, while Revit and Navisworks Manage software are utilized for research purposes. The anticipated outcome of this research is the improved efficiency of the maintenance management system through the implementation of the BIM method. It is expected to be a beneficial technology aiding staff and owners in addressing maintenance issues, particularly at the Uniciti Alam campus of UniMAP.

Keywords: building information modelling, building maintenance, facility maintenance, 4D BIM technology

Unveiling Maintenance Challenges in Government-Sponsored Residential Areas: A Conceptual Exploration of Common Issues and Strategic Solutions

Nurul Aisha Mohd Rozolan[1]* and Mohd Zailan Sulieman[1]

[1] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Pulau Pinang, aisharozolan8@gmail.com
* Correspondence: aisharozolan8@gmail.com

Abstract: Government-sponsored housing programs play a vital role in providing affordable and sustainable living solutions, particularly in urban areas. However, these residential developments often encounter persistent maintenance challenges that negatively impact residents' quality of life and the long-term performance of the built environment. Common issues include plumbing failures, structural deterioration, electrical malfunctions, pest infestations, and inefficient waste management systems. These problems stem from various factors, such as constrained budgets, poor construction practices, and fragmented maintenance management. Addressing these challenges is essential to ensure the sustainability and functionality of such housing initiatives. The primary objective of this research is to investigate the root causes of these recurring maintenance issues and propose effective strategies for their mitigation. This conceptual study adopts a qualitative research approach by synthesizing findings from existing literature, policy documents, and case studies related to residential building maintenance in government-sponsored housing. The analysis focuses on identifying systemic weaknesses and exploring potential solutions through the lens of building maintenance and asset management theories. The findings reveal that inadequate planning, insufficient resource allocation, and limited technological integration are significant contributors to these maintenance challenges. To address these issues, the study introduces a proactive maintenance framework emphasizing regular inspections, predictive maintenance techniques, and collaborative engagement with stakeholders. The proposed framework also highlights the potential of modern technologies, such as Internet of Things (IoT)-based monitoring systems, to improve maintenance efficiency and resource optimization. In conclusion, this paper provides practical insights for policymakers, housing authorities, and maintenance practitioners to enhance the resilience and sustainability of government-sponsored residential developments. The implementation of a structured, data-driven maintenance approach can significantly improve housing quality, operational efficiency, and resident satisfaction.

Keywords: government-sponsored housing, residential maintenance challenges, building performance management, sustainable urban housing, maintenance strategies

Occupant Satisfaction as a Measure of Maintenance Management Performance in Government Quarters: A Post-Occupancy Evaluation (POE) Approach

Noorsyarini Rosaria Noordin[1] and Nik Elyna Myeda[1,2]*

[1] Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia.
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia, elyna@um.edu.my
* Correspondence: elyna@um.edu.my

Abstract: This research aims to evaluate the effectiveness of maintenance management in high-rise government quarters through the application of Post-Occupancy Evaluation (POE). Despite ongoing efforts to improve service delivery in public residential facilities, issues such as recurring maintenance problems, poor service response and limited user engagement still persist. The study specifically investigates how three key POE parameters such as technical and functional performance, behavioural performance, and building facilities and services performance, affect the overall occupant satisfaction. A quantitative research design was employed, using a structured POE questionnaire survey distributed to residents of selected high-rise government quarters in Kuala Lumpur. Data collected were analysed quantitatively to assess satisfaction levels, rank each parameter performance and explore correlations between POE parameters and user satisfaction. The findings revealed that Behavioural Performance parameter scored highest in occupant satisfaction, followed by Building Facilities and Services Performance parameter, while Technical and Functional Performance parameter scored the lowest. Interestingly, all three POE parameters demonstrated statistically significant positive correlations ($p < 0.001$) with occupant satisfaction, empirically support the conceptual assumption that improvements in POE parameters lead to enhanced satisfaction. This paper contributes original insights by contextualising POE within the underexplored area of government residentials and offers empirical justification for embedding POE into performance-based maintenance management frameworks. The study supports a shift towards user-informed and data-driven strategies in public sector facilities and maintenance management.

Keywords: post-occupancy evaluation, facilities management, government quarters, maintenance performance, occupant satisfaction

Towards Net-Zero-Energy Building by Optimizing Solar-Integrated High-Rise Residential in Densely Populated Cities in Bangladesh

Tasnin Sultana Kadir[1] and Suzaini Mohamed Zaid[1]*

[1] Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia,
suzaini_zaid@um.edu.my
* Correspondence: suzaini_zaid@um.edu.my

Abstract: Bangladesh is growing rapidly in Dhaka, Rajshahi, and Chittagong. Electricity consumption rises every day as more people live in high-rise apartments. Climate change and pollution are significant environmental issues in Bangladesh. This study investigates whether high-rise building rooftops can accommodate solar panels to supply energy demands cleanly and responsibly. These buildings should become net-zero energy, generating as much solar power as needed. The study analysed the most recent literature and interviewed experts to investigate this notion, discovering many major obstacles. First, not all structures can sustain solar panels or get adequate sunshine. Second, installation of solar systems is costly, making it impossible for many individuals and developers. Third, government policies and support structures do not promote citywide solar energy adoption. Despite these challenges, the study examined sunshine availability, building strength, system design, and optimal rooftop area use to adopt rooftop solar. Urban roofs are often tiny or crowded; planning is crucial to optimise space. The study created a step-by-step strategy for building construction. Buildings can support solar panels, which can be tilted to catch more sunlight, and systems can be adequately maintained. Hence, architectural, engineering, city planning, and government authorities must collaborate to incorporate solar energy into cities. The study concludes that cities in Bangladesh may become energy independent, decrease pollution, and minimise electricity bills. This study's technique may aid other emerging nations with space and energy shortages. With appropriate planning and assistance, solar energy can help develop green cities.

Keywords: net-zero energy building (NZEB), solar photovoltaic (PV), renewable energy integration, building integrated photovoltaics (BIPV), energy optimization checklist.

Factors Underlying Non-Compliance with Building Control Requirements in House Renovations: A Malaysian Urban Perspective

Putri Nabila Kamarulzaman[1], Nur Farhana Azmi[2]* and Raha Sulaiman[2]

[1] Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
[2] Centre for Building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia,
farhanazmi@um.edu.my
* Correspondence: farhanazmi@um.edu.my

Abstract: The study investigates the factors underlying non-compliance with building control requirements in house renovations within Malaysia's urban context, addressing a gap in understanding why unauthorized renovation practices persist despite established regulatory frameworks. Through systematic literature review and semi-structured interviews with stakeholders across federal, state and local government agencies, as well as architects and contractors, the research identifies and validates multifaceted barriers to compliance. Six-phase thematic analysis using NVivo software revealed six major themes: issues in governance and institutional efficiencies, complexity of existing legislations and guidelines, financial and economic barriers, social and cultural influences, professional conduct and ethical issues, and technological limitations. The study validated nineteen literature-derived constructs while identifying eight emergent constructs including corruption, revenue-centric decision making, inter-agency coordination gaps, and restricted access to gated communities. Findings demonstrate that non-compliance emerges not from individual conduct but through systemic interactions among institutional weaknesses, underfunding, fragmented regulatory frameworks, social normalization of violations, professional accountability failures, and inadequate technological infrastructure. The research makes contributions by providing empirical validation within the Malaysian context, revealing previously underreported barriers from international literature, demonstrating how structural conditions create environments where non-compliance becomes normalized. These insights challenge simplistic regulatory assumptions and establish foundations for evidence-based policy improvements addressing systemic enablers rather than punitive enforcement approaches.

Keywords: building control, illegal house renovations, enforcement barriers, compliance factors

A Framework for the Analysis of Dwelling Overcrowding in Malaysia's People's Housing Programme (PPR): Literature Review Findings

Syu Yit Wong[1], Nur Farhana Azmi[2]*, Shirley Jin Lin Chua[2], Azlan Shah Ali[2] and Chee Keong Khoo[5]

[1] Faculty of Built Environment, Universiti Malaya 50603 Kuala Lumpur, Malaysia
[2] Centre for Building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
[3] School of Management, Guangdong Ocean University, Zhanjiang 524088, China,
farhanazmi@um.edu.my
* Correspondence: farhanazmi@um.edu.my

Abstract: In Malaysia's People's Housing Programme (PPR), dwelling overcrowding is still a serious and enduring problem that has an impact on the living conditions and general well-being of PPR households. Dwelling overcrowding has not been adequately addressed in spite of numerous housing policies and regulations. The primary obstacle is the constraints of the existing governance structure and how it is being implemented, such as the National Housing Policy (2018–2025), the Local Government Act 1976, the Street, Drainage and Building Act 1974, the Uniform Building (Amendment) By-Laws 2021, and the Construction Industry Standard (CIS) (26) 2019. These frameworks disregard occupancy-based measures that more accurately reflect household needs in favour of statutory compliance with minimum space standards. In order to analyse international standards and guidelines in addition to Malaysia's current framework and practice for defining overcrowding for PPR housing units, this paper uses scoping literature as its study methodology. The findings point out the discrepancies between local and international standards, point out "illogical" results in Malaysia's current practices, and suggest a framework that combines occupancy-based measurements with the country's current regulations regarding living space. Such a framework would immediately address the issue of dwelling overcrowding, improve the sufficiency and equity of Malaysia's People's Housing Programme (PPR) provision, and give policymakers objective metrics for monitoring, allocating, and planning.

Keywords: crowding measures, dwelling, international crowding standard, overcrowding framework, people's housing programme (PPR)

A Conceptual Assessment of Issues and Preventive Maintenance Strategy for University Public Toilet

Aminur Ruslan Mohd Zaini[1], Mohd Zailan Sulieman[1] and Naziah Muhamad Salleh[1]*

[1] Department of Building Surveying, Scholl of Housing Building and Planning, Universiti Sains Malaysia, 11800, Penang, Malaysia, naziahmsalleh@usm.my
* Correspondence: naziahmsalleh@usm.my

Abstract: This study assess the issues and evaluates the impact of implementing a preventive maintenance strategy on reducing maintenance costs and improving the quality of public toilets at public universities in Malaysia. The current reactive maintenance approach at universities leads to higher costs, frequent breakdowns, and reduced hygiene and user satisfaction. Through a case study approach, this research collects quantitative data on maintenance costs, conducts user satisfaction surveys, and analyzes maintenance records over the past three years. Findings demonstrate how a proactive approach can lower maintenance costs, reduce repair frequency, and improve user satisfaction, providing a sustainable maintenance model for other institutions.

Keywords: preventive maintenance, public toilets, facility management, cost reduction, user satisfaction

A Model for Building Information Modeling (BIM) Adoption in the Project Life Cycle of the Sarawak Construction Industry

Chin Lin Wei[1] and Afzan Ahmad Zaini[1]*

[1] Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia, azafzan@unimas.my
* Correspondence: azafzan@unimas.my

Abstract: Building Information Modelling (BIM) is a transformative technology that integrates digital tools throughout the entire project lifecycle, offering significant benefits in collaboration, resource optimization, and sustainability. While BIM has gained widespread adoption globally, the Sarawak construction industry faces challenges related to awareness, readiness, and strategic alignment with modern construction practices. This paper addresses these challenges by developing a model for BIM adoption in Sarawak's construction industry. A comprehensive methodology was employed, utilizing a questionnaire survey of 365 construction professionals. The data were analyzed using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and Structural Equation Modelling (SEM) via IBM SPSS Amos. The findings highlight three key current practices of BIM in Sarawak and identify four critical success factors essential for its successful adoption. The proposed model aligns these critical success factors with project lifecycle phases, serving as a strategic roadmap for policymakers, industry stakeholders, and practitioners. It outlines actionable steps to promote BIM adoption and integrate Sarawak's construction practices with digital transformation initiatives. By bridging the gap between current practices and future needs, this study contributes to the body of knowledge on digital innovation in construction and supports Sarawak's evolution into a technology-driven state.

Keywords: building information modelling, BIM, current practices, critical success factors, Sarawak

Understanding the Triple Helix Approach Through Network Governance Theory in Maintenance Practices for Asset Management by Local Authorities in Malaysia

Sylvia Gala Mong[1]*, Nor Rima Muhamad Ariff[2], Sarajul Fikri Mohamed[3], Mohd Saidin Misnan[4] and Rashidul Islam[5]

[1] Department of Quantity Surveying, College of Built Environment, Universiti Teknologi MARA Cawangan Sarawak, Malaysia
[2] School of Real Estate and Building Surveying, College of Built Environment, Universiti Teknologi MARA, Malaysia
[3] Malaysia-Japan International Institute of Technology, University Teknologi Malaysia, Malaysia
[4] Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, Malaysia
[5] Rangs Properties Limited, Rangs Babylonia, Bir Uttam Mir Shawkat Road, Tejgaon I/A, Dhaka-1208, Bangladesh, sylviagala@uitm.edu.my
* Correspondence: sylviagala@uitm.edu.my

Abstract: Asset management and maintenance are integral components of organizational success, efficiency, and sustainability. Effective asset management ensures that organizations derive maximum value from their physical assets throughout their lifecycle by implementing strategies for proper maintenance and upkeep. This leads to improved asset performance, operational efficiency, and cost reduction. Maintenance management plays a crucial role in minimizing unexpected breakdowns, repairs, and downtime, thereby reducing operational costs and increasing asset longevity. By implementing proactive maintenance practices such as preventive and predictive maintenance, organizations can identify and address issues before they escalate, mitigating risks associated with asset failure, safety hazards, and compliance issues. Well-maintained assets enable organizations to deliver goods and services efficiently and consistently, enhancing productivity, competitiveness, and customer satisfaction levels. Integrating the concepts of asset management and maintenance within the Triple Helix model offers a holistic approach to fostering innovation and sustainable development, particularly within local authorities in Malaysia. By aligning academic, industrial, and governmental efforts, organizations can optimize asset performance, minimize risks, and enhance efficiency. Collaboration among these sectors facilitates knowledge exchange, technology transfer, and joint innovation initiatives, driving economic growth and societal benefits. This integrated approach not only improves service delivery and infrastructure resilience but also promotes inclusive growth and environmental sustainability. By leveraging the synergies between asset management, maintenance practices, and the Triple Helix framework, local authorities in Malaysia can advance towards a more sustainable and prosperous future. Furthermore, effective asset management and maintenance contribute to the long-term sustainability of organizations and communities by extending asset lifespan, reducing resource consumption, and minimizing environmental impact.

Keywords: network governance theory, triple helix, maintenance practices, asset management

The User Satisfaction Level on the Maintenance Management Practices: A Case Study of Stadium Negeri Sarawak

Awang Ihsan bin Awang Yunus[1,2]*, Mohd Saidin bin Misnan[2], Sylvia Gala Mong[1] and Mohammad Nabil Fikri bin Saaid[1]

[1] Department of Quantity Surveying, Faculty of Built Environment, Universiti Teknologi Mara Cawangan Sarawak, Jalan Meranek, 94300, Kota Samarahan, Sarawak,
[2] Department of Quantity Surveying, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310, Johor Bahru, Johor Darul Takzim, awangihsan@uitm.edu.my
* Correspondence: awangihsan@uitm.edu.my

Abstract: User satisfaction serves as a critical indicator for evaluating the effectiveness of maintenance management in sport facilities, particularly in sustaining safety, functionality, and long-term usability. In Malaysia, sports facilities such as stadium face significance challenges related to user satisfaction in maintenance management This study aims to determine the level of satisfaction of users toward current maintenance practices in sport facilities especially stadium in Sarawak. A quantitative research design was employed, where 384 users were surveyed through structured questionnaires covering cleanliness, safety, equipment functionality, responsiveness, and overall facility conditions. Descriptive statistics and reliability tests were applied to analyse the responses. The findings reveal that while users generally expressed moderate satisfaction, specific issues emerged, particularly in cleanliness of high-use areas, response time to maintenance requests, and the quality of sporting equipment. Safety measures and staff responsiveness were also highlighted as key determinants of satisfaction. These results underscore the continued reliance on reactive maintenance practices, which limit user confidence and long-term facility sustainability. The study concludes that adopting proactive and preventive maintenance approaches, supported by skilled personnel, sufficient resources, and periodic user feedback mechanisms, is essential to enhance satisfaction and optimise facility performance. The findings provide practical insights for facility managers and policymakers in designing user-centred maintenance strategies that ensure sports facilities remain safe, functional, and attractive to the public.

Keywords: maintenance management, user satisfaction, sports facilities

Transforming Rural Accessibility: Socio-Economic Impacts of the Sibu-Kapit Link Road Within the Pan Borneo Highway Project

Evie Sendi Ibil[1]*, Sylvester Selan Balan[1], Sylvia Gala Mong[1] and Roseline Ikau[1]

[1] College of Built Environment, Universiti Teknologi MARA Cawangan Sarawak Kampus Samarahan, Jalan Meranek, 94300 Kota Samarahan, Sarawak, evie4076@uitm.edu.my
* Correspondence: evie4076@uitm.edu.my

Abstract: This research explores the socio-economic impacts of the newly constructed Sibu-Kapit Link Road, part of the Pan Borneo Highway project, which has transformed Kapit's accessibility, previously limited to ferry and logging routes. The roadway is poised to significantly influence Kapit's socio-economic landscape by improving transportation networks. However, comprehensive research on its implications remains limited, complicating efforts by policymakers and community leaders to make evidence-based decisions. The research identifies the social effects on local communities, evaluates the economic benefits for regional development, and proposes strategies to maximise Kapit's socio-economic growth. Utilising a quantitative approach, data was gathered through questionnaire survey of 141 Kapit residents, capturing their respective on the road's social and economic implications and recommended strategies for sustainable development. Key findings highlight the potential for job creation and tourism growth, emphasizing the need for collaborative efforts between federal and state authorities to ensure effective socio-economic advancement. This research underscores the transformative potential of infrastructure projects like the Sibu-Kapit Link Road with the Pan Borneo Highway project in driving rural development, offering actionable insights to optimize benefits and mitigate challenges.

Keywords: infrastructure project, Pan Borneo highway, rural development, Sibu-Kapit link road, socio-economic impact

Assessing Current Practices and Critical Success Factors Influencing BIM Adoption in Sarawak's Construction Industry

Chin Lin Wei[1,2] and Afzan Ahmad Zaini[1*]

[1] Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia
[2] Unit BIM, Cawangan Projek Khas, Jabatan Kerja Raya Sarawak (JKR), 93000 Kuching, Sarawak, Malaysia, azafzan@unimas.my
* Correspondence: azafzan@unimas.my

Abstract: Building Information Modelling (BIM) has been widely recognised as a transformative digital process in the construction industry, enhancing coordination, productivity, and cost efficiency. While strong government mandates and industry readiness support adoption in developed nations, BIM uptake in Sarawak remains at an early stage, with only 14% of organisations reporting project experience. This study investigates the current practices and critical success factors influencing BIM adoption in Sarawak's construction sector. A questionnaire survey was distributed to industry stakeholders, yielding 295 valid responses. Findings indicate that BIM's current practices are predominantly used for visualisation, collaboration, and clash detection. However, more advanced applications such as 4D or 5D BIM, facility management integration, and sustainability analysis remain limited. Key success factors include access to high-performance hardware, government financial support, skilled personnel, advanced training, and stable digital infrastructure. The results highlight the necessity for targeted policies, localised standards, and government-led initiatives to accelerate BIM adoption and maturity in Sarawak for future development.

Relative Risk Analysis of Residential Fire Casualties and Fatalities in Selangor, Malaysia

Farid Wajdi Akashah[1,2]*, Yi Rong Tan[1], Norhayati Mahyuddin[1,2] and Ahmad Faiz Tharima[3]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya 50603 Kuala Lumpur, Malaysia
[2] Centre for Building, Construction & Tropical Architecture (BuCTA), Faculty of Built Environment, Universiti Malaya 50603 Kuala Lumpur, Malaysia
[3] Malaysian Fire and Rescue Academy (Eastern Region), Fire and Rescue Department of Malaysia, Jalan Kuala Berang 21040 Marang, Terengganu, Malaysia,
faridakashah@um.edu.my
* Correspondence: faridakashah@um.edu.my

Abstract: Residential fires account for the highest fire-related casualties globally, including in Malaysia. This study investigates the factors influencing residential fire casualties to inform risk reduction strategies. Using data from fire investigation reports in Selangor between 2012 and 2014; the study addresses the limited scope of existing research on fire trends and risk characteristics in Malaysia. Vulnerable groups were identified based on demographic variables such as gender, ethnicity, and age, with casualty rates adjusted per 1,000,000 population for comparability. Time factors influencing casualties were assessed through distribution trends, while fire characteristics such as Room of Fire Origin (RFO), Source of Ignition (SOI), and Item First Ignited (IFI) were analysed using relative risk (RR) and Pearson's correlation. Key findings highlight males, children, and the elderly as the most vulnerable groups, with higher mortality rates linked to age-related factors and physical barriers like window and door grills in Chinese households. Night-time incidents posed more significant risks, emphasising the need for early warning systems. Fire characteristics revealed the kitchen and living room as high-risk areas, with living rooms exhibiting the highest RR due to electrical faults and flammable furniture. Soft goods, such as textiles and mattresses, contributed significantly to fatalities, while electrical and gas appliances were prominent ignition sources. This study contributes to fire risk theory and practical safety measures, offering insights for targeted interventions, improved building regulations, and fire prevention campaigns. It underscores the importance of adapting fire safety strategies to local conditions and addressing the specific needs of high-risk populations.

Keywords: fire safety, fire risk assessment, residential fire casualties, fire characteristics, vulnerable populations

A User-Centric Performance Evaluation Framework for Assessing Campus Facilities

Huiying (Cynthia) Hou[1]*

[1] Department of Building Environment and Energy Engineering, The Hong Kong Polytechnic University, cynthia.hou@polyu.edu.hk
* Correspondence: cynthia.hou@polyu.edu.hk

Abstract: This study develops a user-centered evaluation framework for assessing campus facilities management (FM) performance in universities. Recognizing the complexity of campus infrastructure and diverse user needs, the research integrates a systematic literature review, focus group discussions, and an Analytic Hierarchy Process (AHP)-based approach. The framework was validated through a structured questionnaire survey conducted at a Hong Kong university, yielding 226 valid responses. Results confirmed the framework's robustness and identified "indoor environmental quality," "space utilization," and "aesthetics and design" as the most critical performance indicators from a user perspective. By combining qualitative and quantitative methods, this study offers a comprehensive, empirically validated FM evaluation model that aligns facility performance with stakeholder expectations and institutional goals in higher education.

Knowledge Management Framework for Private Finance Initiative Projects at Pre-Contract Stage

Kumalasari Kipli[1]* and Fara Diva Mustapa[2]

1 KAB,UiTM Samarahan, Sarawak, Malaysia, kumalasari@uitm.edu.my
[1, 2] FABU,UTM, Johor Bahru, Malaysia.
* Correspondence: kumalasari@uitm.edu.my

Abstract: One of the procurement strategies used extensively in the international construction market, including Malaysia, is the Private Finance Initiative (PFI). In order to produce value for money (VFM) projects, such as Malaysian public infrastructure, PFI is an alternative procurement method. However, similar to other procurement types, PFI also has its drawbacks normally stemmed from information breakdown derived from its long contract durations. This certainly requires adjustments to improve project delivery. Consequently, this paper aimed to use knowledge management (KM) theory as the theory addresses one of the major problems in PFI contracts as systematic management of organisational knowledge, which entails the process of creating, gathering, organising, storing, diffusing, using, and exploiting knowledge for creating business value and gathering competitive advantage. The study carried out that KM needs to be enhanced during the pre-contract process because the elements have a continuous effect on the post-contract process and usage process after stage 5 of the RIBA plan. The objective of this paper is to investigate the implementation of various PFI KM models for construction across the globe to discover how the various models can be adopted within the PFI in Malaysians. The methodology use in this research is to use analysis of literature as the key to find the relevant item for conceptual framework. The study managed to point out that KM needs to be enhanced during the pre-contract process because the elements have a continuous effect on the post-contract process and usage process after stage 5 of the RIBA plan. The findings will assist in developing a conceptual framework to enhance PFI implementation in Malaysia especially at the pre-contract process in Malaysia by highlighting the salient KM tools at those stages. The outcomes of this paper can serve as a theoretical base for the development of an effective KM implementation model during the pre-contract process.

Exploring the Potential of Machine Learning Algorithms to Improve Project Management Practices

Nurhayatul Khursniah Hasim[1], Hafez Salleh[1]* and Nurshuhada Zainon[1]

[1] Faculty of Built Environment, Universiti Malaya, Centre for Building, Construction, and Tropical Architecture (BuCTA), 50603 Kuala Lumpur, Malaysia, hafez@um.edu.my
* Correspondence: hafez@um.edu.my

Abstract: Effective decision-making is essential to overcoming inefficiencies project output in the Malaysian construction industry, which faces persistent challenges in achieving optimal project outcomes. This study explores the transformative potential of machine learning (ML) algorithms to optimize decision-making in construction project management practice. A descriptive preliminary study with 262 construction project management professionals and practitioners as respondents across Malaysia was conducted using a structured questionnaire to assess current practices, identify inefficiencies, and optimize decision making with ML algorithm's applicability within the local construction context. The findings revealed that the current practice can address critical inefficiencies in decision-making, such as inaccurate scheduling, cost overruns, and ineffective risk mitigation strategies. By using predictive analytics and in data-driven decision-making, the right ML algorithm facilitates more precise in planning, accurate cost estimation, and proactive risk management towards project outcomes. However, two major barriers hinder ML adoption: a lack of technical expertise among project managers and the high costs associated with software acquisition, infrastructure development, and training. This study faced data sampling limitations and further research should expand to include insights from all levels of construction practitioners, beyond project managers, to incorporate top management practices. The findings found the need for targeted upskilling initiatives and cost-effective strategies to overcome barriers to ML adoption. Academically, this study advances the roadmap of knowledge in future research on ML algorithm applications in construction project management by providing a comprehensive understanding of its impact within the Malaysian context. Practically, by adopting ML-driven innovation, construction practitioners can enhance efficiency, improve competitiveness towards project outcomes

Keywords: machine learning algorithms, project management, decision-making, construction industry

Operation and Maintenance Strategies for Effective Energy Efficiency Interventions in Klang Valley Office Buildings

Mohd Hadri Aswad Salim[1] and Cheong Peng Au-Yong[1]*

[1] Centre for Building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia, auyongcp@um.edu.my
* Correspondence: auyongcp@um.edu.my

Abstract: This paper examines the role of Operation and Maintenance (O&M) strategies in enhancing the effectiveness of Energy Efficiency (EE) interventions in commercial office buildings within Malaysia's Klang Valley. Despite the enactment of policies such as the Energy Efficiency and Conservation Act (EECA) 2024 and the National Energy Efficiency Action Plan (NEEAP), post-implementation performance of EE initiatives often falls short due to inadequate O&M practices. Thus, this study aims to promote the most significant O&M strategies that support long-term energy performance by: (1) identifying current O&M strategies in practice, (2) evaluating their impact on EE effectiveness, and (3) recommending actionable improvements. Using a qualitative approach, data were collected through semi-structured interviews with Facilities Management (FM) professionals who manage office buildings in the Klang Valley. Thematic analysis revealed that while traditional strategies such as inspection-based and time-based maintenance being the dominant practices, the adoption of predictive and condition-based approaches remains limited due to financial and technical constraints. Notably, buildings with structured O&M plans, integrated digital monitoring systems like Building Energy Management System (BEMS), and supportive organisational cultures achieved significant reductions in energy consumption and Building Energy Intensity (BEI). The study's originality lies in its focus on the operational phase of EE implementation, an area often overlooked in Malaysian research, and its synthesis of practical insights with policy frameworks. It offers evidence-based recommendations that underscore the importance of aligning technical, organisational, and human resource elements to strengthen Malaysia's path toward high-performance, low-carbon commercial buildings.

Keywords: energy efficiency, energy performance, facilities management, office buildings, operation and maintenance

Data-Driven Modeling of Cultural Representation in Chinese Wuxia Animation Characters: A Machine Learning Approach to Formation Mechanisms and Educational Pathways

Xuejia Zhu[1] and Suebsiri Saelee[2]*

[1] Faculty of Fine-Applied Arts and Cultural Science, Mahasarakham University, Maha Sarakham 44150, Thailand.
[2] Faculty of Informatics, Mahasarakham University, Maha Sarakham 44150, Thailand, S0648792945@gmail.com
* Correspondence: S0648792945@gmail.com

Abstract: Wuxia animation serves as a digital medium for transmitting traditional Chinese cultural values, yet systematic computational models explaining how character design encodes cultural meanings remain underdeveloped. This study presents a data-driven machine learning approach to model the formation mechanisms of cultural representation in Wuxia animation characters and their educational pathways. We employ big data analytics and artificial intelligence techniques to process 800 online comments collected via Python web crawling and five semi-structured interviews. Using NVivo 12.0 for qualitative data mining and grounded theory methodology, we apply open coding, axial coding, and selective coding with constant comparison algorithms to identify patterns. Our computational model reveals three core mechanisms—cultural kernel, symbolic translation, and audience feedback—enhanced by market regulation and technical support systems. The data mining results demonstrate significant correlations between character design elements and audience cultural perception (Kappa > 0.5). This research contributes to computer science applications in cultural studies, providing algorithmic frameworks for animation creation, digital heritage preservation, and AI-assisted cultural education systems. The findings offer practical guidance for developing intelligent cultural transmission platforms and cross-cultural communication technologies.

Keywords: Wuxia animation, cultural representation, grounded theory, data mining, education, cross-cultural communication.

Enhancing BIMFM Integration In O&M Stage of Public Commercial Buildings: Insights from Sichuan, China

Shirley Jin Lin Chua[1,2]*, Azlan Shah Ali [1,2], XinYue Chen [1] and Cheong Peng Au-Yong[1,2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia.
[2] Center for Building, Construction and Tropical Architecture (BuCTA), Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia, shirleychua88@um.edu.my
* Correspondence: shirleychua88@um.edu.my

Abstract: This study seeks to enhance the implementation of Building Information Modeling for Facility Management (BIMFM) in public commercial buildings within Sichuan Province, China, focusing on the Operation and Maintenance (O&M) stage. Despite BIM's proven benefits in lifecycle data management, predictive maintenance, and energy efficiency, its adoption during O&M remains limited. The research investigates the key requirements, prevailing challenges, and strategic strategies for effective BIMFM integration. A qualitative research design was employed, utilizing semi-structured interviews with facility managers and technicians involved in the IFS and SKP projects in Sichuan Province, China. The collected data were thematically coded using NVivo software, followed by cross-case analysis to identify key requirements, challenges and develop practical optimization strategies for BIMFM integration. The findings reveal that Sichuan Province encounters several critical challenges in implementing BIMFM, including inadequate technical infrastructure, inconsistent data standards, and insufficient professional expertise. Notably, ineffective data handover between the design and operation-maintenance phases often results in BIM models losing their practical value during the O&M stage. Furthermore, cultural and organizational barriers, coupled with the persistence of traditional management practices, contribute to managerial skepticism regarding the benefits of BIM adoption. Through in-depth case analyses, the study proposes targeted solutions and policy recommendations to advance BIM adoption in comparable regions. Practical guidance is also provided for facility managers on optimizing BIMFM implementation, particularly during the operation and maintenance (O&M) phase.

Keywords: BIMFM integration, facility management, commercial buildings, public buildings, maintenance and operation

Modelling the Assessment of Temporary Relief Centre (TRC) During Disaster: Evidence from Case Study in Malaysia

Nik Elyna Myeda[1][2][3]*, Yong Adilah Shamsul Harumain[2] and Lim Jing Ying[3]

[1] Centre for Building, Construction & Tropical Architecture, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia, elyna@um.edu.my
[2] Center for Research in Industry 4.0, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
[3] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
* Correspondence: elyna@um.edu.my

Abstract: This study evaluates the facilities and services provided at Temporary Relief Centres (TRCs) in Malaysia to enhance the safety, comfort, and well-being of disaster victims. Using a mixed-method approach, the study integrates qualitative interviews with agencies managing TRCs and individuals affected by disasters, together with a nationwide quantitative survey involving 390 respondents who had stayed in TRCs. Findings indicate that while essential utilities such as water and electricity were satisfactory, significant gaps persist in accessibility for persons with disabilities, sanitation, waste management, and breastfeeding facilities. Overcrowding, limited space, and weak coordination of aid distribution further reduced evacuees' satisfaction and comfort levels. The study's novelty lies in integrating facilities management principles with user-experience evaluation to identify core attributes that influence evacuees' perceptions of TRC adequacy. These attributes covering accessibility, hygiene, comfort, inclusivity, spatial sufficiency, and management responsiveness form a basis for assessing the performance of TRCs beyond infrastructure provision. This holistic approach connects the functional quality of facilities with human experience, offering deeper insights into how the built environment affects well-being during displacement. The findings underscore the importance of inclusive, user-centred design and responsive management in shaping positive TRC experiences. The study contributes to establishing key attributes for measuring user satisfaction and experience in disaster shelters, strengthening Malaysia's efforts toward resilient and humane disaster response.

Keywords: temporary relief centre, facilities management, flood, disaster response, Malaysia

Screening Criteria for Private Partners: Toward A Sharia PPP Framework for Infrastructure Development in Indonesia

Ali Sunandar[1][2], Saipol Bari Abd Karim[2]*, Umi Kalsum Zolkafli @ Zulkifly[2] and Raha Sulaiman[3]

[1] Department of Civil Engineering, Faculty of Engineering, Universitas Mercu Buana, Indonesia,
[2] Department of Quantity Surveying, Faculty of Built Environment, Universiti Malaya, Malaysia, saipolbari@um.edu.my
[3] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, Malaysia,
* Correspondence: saipolbari@um.edu.my

Abstract: Indonesia has increasingly adopted Public-Private Partnership (PPP) schemes to accelerate infrastructure development, accompanied by a growing demand for stronger alignment with Sharia compliance. However, the existing PPP framework does not yet include mechanisms to ensure Sharia compliance, particularly in the selection of private partners whose business activities and financial practices may contravene Sharia law. This study aims to develop Sharia-based screening criteria for private partners as a foundation for establishing a Sharia-compliant PPP model in Indonesia. Employing a qualitative research design, the study draws on semi-structured interviews with policymakers, academics, representatives of professional associations and multilateral agencies, Sharia scholars, and private sector participants. The findings indicate that Sharia screening should encompass two principal dimensions: business activity and financial assessment. Business activity screening ensures ethical legitimacy by excluding firms operating in sectors prohibited under Sharia, such as conventional financial services, alcohol, gambling, pork-related products, tobacco, armaments, pornography, speculative trading in gold and silver, and non-compliant hospitality operations. Financial screening promotes fiscal prudence through the application of Sharia-based financial indicators, including the cash ratio, liquidity ratio, and leverage ratio, to evaluate the financial soundness and ethical integrity of potential partners. The study's novelty lies in integrating Sharia-compliant partner selection within the PPP regulatory and institutional framework, a dimension not yet formally addressed in Indonesia's policy or academic literature. The proposed framework contributes to the development of a transparent, socially responsible, and value-driven PPP model. Future studies are encouraged to empirically validate its applicability through pilot Sharia PPP initiatives.

Keywords: infrastructure, procurement, public-private partnership, screening criteria, Sharia compliance

High-Rise Housing Overhang in Sarawak: A Preliminary Review of Housing Policy from a Development Costs Perspective

Christabelle Jemin James[1]*, Fara Diva binti Mustapa[1] and Muzani bin Mustapa[1]

[1] Department of Quantity Surveying, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310, Skudai, Johor, Malaysia, jemin2001@graduate.utm.my
* Correspondence: jemin2001@graduate.utm.my

Abstract: Urban-rural migration requires developers to meet the housing supply and demand. However, the mismatch between house prices and income levels prevents homeownership, leading to persistent overhang problems in the country, including Sarawak. To unfold the root causes of the overhang housing issue in Sarawak, it is critical to address the influences and effects of the development costs towards the housing prices, especially from the housing policy perspective and the incurred development cost implications. Hence, this research aims to review the aforementioned through these research objectives by firstly determining the underlying factors contributing to the overhang housing issue from the housing policy perspective and subsequently investigating the incurred development cost implications contributing to the mismatch between housing prices and affordability. The study employs the PSALSAR Framework to conduct a preliminary review for these objectives, expecting the review to validate the potential in determining the key factors from the perspective of the housing policies and the incurred development cost implications that lead to overhang in high-rise housing, as well as to relate the developer's behaviour towards housing price and regulatory compliance. The literature findings will be validated and used as the content to set forth the semi-structured interviews with Sarawak housing developers and local authorities. This research is essential to assist policymakers and developers in strategic planning and decision-making, such as improving the current cost plan and control, as well as housing policies to curb overhang issues in high-rise housing.

Keywords: high-rise housing, housing development costs, housing policies, housing overhang, Sarawak

The Role of Sensitivity Analysis in Energy and Thermal Comfort Optimization for Hot-Humid School Design

Tian Xia[1], Azlan Shah Ali[2]* and Norhayati Mahyuddin[2]

[1] Department of Architecture, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur 50603, Malaysia
[2] Centre for Building, Construction & Tropical Architecture, Faculty of Built Environment, Universiti Malaya, Kuala Lumpur 50603, Malaysia, asafab@um.edu.my .
* Correspondence: asafab@um.edu.my

Abstract: School buildings in hot-humid climates struggle to balance energy efficiency and thermal comfort due to high temperatures, humidity and solar radiation that increases cooling loads and decreases natural ventilation. Existing design standards lack parameter priority guidance and thus are trial-and-error. We combine global sensitivity and multi-objective optimization to identify design parameters that influence the energy use intensity (EUI) and thermal comfort time ratio (TCTR) of Guangzhou educational facilities. We decompose Sobol variance of 1000 Latin Hypercube Sampling scenarios and quantify parameter sensitivities and interactions by building performance simulations. Results reveal Room Depth exhibits highest influence ($S_1 = 0.251$–0.266, $ST = 0.320$), followed by Standard Floor Height ($S_1 = 0.142$–0.154), Window-to-Wall Ratio ($S_1 = 0.129$–0.138), and Solar Heat Gain Coefficient ($S_1 = 0.118$–0.189). Significant Room Depth × WWR interactions (6.9% of EUI variance) demonstrate tropical design trade-off complexity. Low-sensitivity parameters like shading geometry ($S_1 < 0.014$) can be standardized without performance compromise. Validation against Pareto-optimal solutions shows consistent sensitivity rankings and optimization results.

Keywords: building design optimization, hot-humid climate, multi-objective optimization, school buildings, sensitivity analysis

Development of Spatial Planning Framework for Enhancing Healthy Indoor Air Quality in Adaptive Reused Kindergarten

Intan Bayani Zakaria[1,3], Norhayati Mahyuddin[1,2]* and Mohd Firrdhaus Mohd-Sahabuddin[4]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
[2] Centre for Building, Construction and Tropical Architecture (BuCTA), Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia, hayati@um.edu.my
[3] Programme of Building Surveying, Department of Built Environment Studies & Technology, Faculty of Built Environment, Universiti Teknologi MARA, Perak Branch, Seri Iskandar Campus, 32610 Seri Iskandar, Perak, Malaysia
[4] Department of Architecture, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
* Correspondence: hayati@um.edu.my

Abstract: Kindergartens as small-scale early education institutions are increasingly being established within refurbished commercial buildings due to limited availability of purpose-built facilities. However, the adaptive reuse of such spaces often leads to compromised indoor air quality (IAQ) arising from increased building airtightness and inadequate ventilation. This study aims to develop a framework to enhance healthy IAQ in adaptively reused kindergarten buildings, focusing on shop office typologies commonly found in Malaysia. The research integrates three key phases: (1) consolidation of existing design and regulatory guidelines related to IAQ and space planning, (2) field investigation of classrooms, common areas, and kitchens to identify IAQ performance issues, and (3) expert evaluation to validate the relevance and applicability of the proposed framework. Findings reveal that spatial and IAQ-related parameters such as orientation, floor area, window, ventilation strategies, location and compartmentation play a critical role in influencing air quality performance. Expert reviews recorded mean scores between 3.00 and 3.85, indicating strong agreement on the practicality and relevance of the proposed recommendations, with minor adjustments suggested for orientation and occupancy flexibility. The resulting framework provides an evidence-based reference for improving the environmental performance of refurbished educational spaces and supports the early decision-making of kindergarten operators in planning healthy and well-ventilated spatial layouts. The study contributes to the field of building adaptation and environmental performance by extending the understanding of IAQ issues in small-scale educational retrofits and providing a practical guidance tool to reduce exposure risks among children in refurbished learning environments.

Keywords: adaptive reused, framework development, indoor air quality, physical setting, refurbished kindergarten

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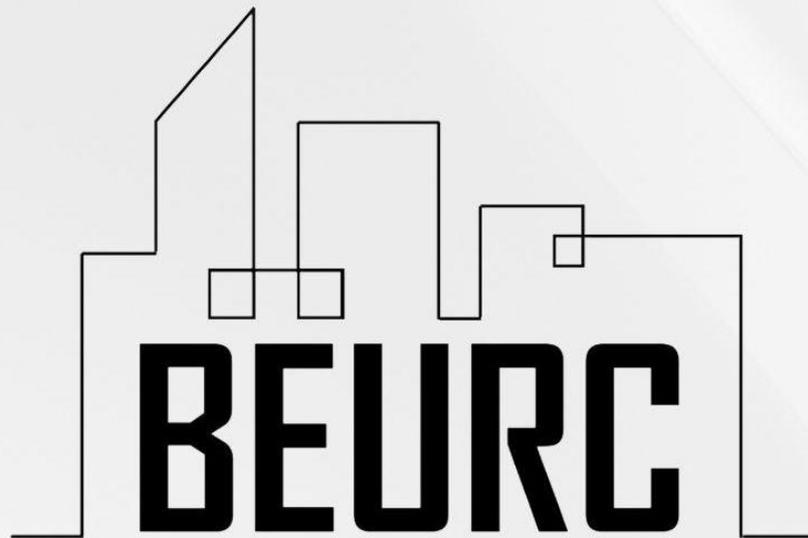
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Fire Safety Compliance in Historic Building

Amir Danial Ariffin bin Azhar[1] and Nur Farhana binti Azmi[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; amirdanialariffin56@gmail.com

[2] Centre for Building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; farhanazmi@um.edu.my

Abstract: Historic structures are priceless cultural treasures that represent identity, history, and architecture. However, because of things like material flammability, structural weaknesses, and a lack of specialised safety measures, they are becoming more and more susceptible to fire threats. As seen by fire accidents that have resulted in irreversible losses, Malaysia, which is home to many historic sites, confronts enormous issues in protecting its heritage structures. Ensuring adherence to safety and preservation rules is made more difficult by the lack of a standardised framework for fire safety audits. By addressing three goals identifying essential fire safety requirements for heritage buildings, evaluating the sufficiency of present rules, and suggesting essential components for an extensive fire safety audit checklist this study seeks to close the gaps in the literature. Document analysis, interviews with auditors, architects, and conservationists, as well as comparison with international standards, are all part of the qualitative method used. Case studies, like the Sultan Abdul Samad Building, shed light on the legal loopholes and real-world difficulties in managing fire safety for historic buildings. A comprehensive, implementable fire safety checklist that incorporates both legal compliance and the particular preservation requirements of historic structures is the study's expected output. In order to reduce the risk of fire and guarantee that these priceless buildings are maintained for upcoming generations, this checklist will provide helpful suggestions. The results are intended to establish a standard for the protection of heritage buildings worldwide and to improve Malaysia's fire safety management procedures.

Keywords: fire safety, heritage buildings, audit, preservation, Malaysia

Accessibility In University Buildings, Study of PWD Facilities

Muhammad Danish Syakir bin Ilias[1] and Syahamaruzzaman[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
22005036@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
syahrulnizam@um.edu.my

Abstract: Accessibility in university buildings is essential to fostering inclusive education and ensuring equal opportunities for persons with disabilities (PWDs). Despite advancements in accessibility standards, many universities face significant challenges in creating environments that fully accommodate diverse needs. Common barriers, such as poor spatial design and inadequate signage, hinder mobility and usability for individuals with physical and sensory disabilities (Machado & Oliveira, 2021). Technological innovations, like IoT-based wayfinding systems, have shown promise in improving navigation, particularly for visually impaired users (Prandi et al., 2021). Moreover, addressing environmental factors, such as excessive noise and crowded spaces, can significantly enhance engagement for autism students, (O'Connor et al., 2022). However, tools like Building Information Modelling (BIM) and post-occupancy evaluations reveal that most institutions still fail to meet comprehensive accessibility standards, with only 6% of top universities excelling in disability inclusion (Newton et al., 2023; Campanile et al., 2022).

Keywords: accessibility, university buildings, persons with disabilities (PWDs), technological innovations, disability inclusions

Battery Fires and Explosion of Micro Mobility Devices: Awareness and Best Practices for Battery Safety

Nur Adriana Batrisyia Binti Rozamah[1] and Farid Wajdi Akashah[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; 22005007@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; faridakashah@um.edu.my

Abstract: Increased usages of micro-mobility devices such as e-scooters and e-bikes have raised new challenges toward safety within buildings, especially in relation to possible fires or explosions resulting from batteries. While these provide convenience and ecological benefits, they pose extreme fire risks due to the volatile nature of lithium-ion batteries. The purpose of this research is to determine and hopefully mitigate that risk through the focus on battery fire prevention, general safety, and building safety protocols. The primary goals of this research are to identify key causes and associated risk factors of battery fires, assess the state of awareness among occupants and building management, and develop best management practices for the storage and charging of micro-mobility devices in buildings. The adopted mixed-method research design integrates case studies of battery-related fire incidents, questionnaires from building occupants and users of micro-mobility devices, and expert interviews with fire safety professionals and building managers. The quantitative data analyzed identifies the prevalence of these incidents and measures the level of safety awareness, while the qualitative insights offer deeper understanding of the challenges faced by both users and building management. The research also covers the effectiveness of the current fire protection systems and possible ways of improvements that could be pursued for building design and emergency response plans. The expected outcome will outline the significant shortcomings in current practice in respect of inadequacies relating to building design and fire management. On the basis of such findings, strategies will be developed for enhancing fire safety infrastructure, introducing better charging and storage solutions, and developing improved occupant awareness and management of buildings. The ultimate goal is to contribute to the safer integration of micro-mobility devices into urban buildings, helping to protect lives, property, and building infrastructure in support of increasing device adoption.

Keywords: battery safety, building fire risk, fire protection system, micro-mobility devices

Appraisal of Green Design Directives for High-Rise Buildings in Hot and Humid Weather

Lee Kang Jing[1] and Md Azree Othuman Mydin[2]

[1] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; kangjinglee@student.usm.my

[2] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; azree@usm.my

Abstract: Green design is the process of designing and a development approach that focuses on human health and a way that minimizes environmental impacts. In line with the rapid development growth of the construction industry in Malaysia, green building design has become familiar especially in high-rise buildings in city areas that have many citizens. However, the hot and humid weather is a limitation of green designs for high-rise buildings due to the tropical location of Malaysia. Green design remains in the early phase of the science and approach underlying the green building concepts. Numerous concerns persist and obstacles must be addressed before the industry can achieve substantial advancement in the implementation of efficient green design programs. Malaysia faces several issues concerning the environmental and economic performance of green buildings. A considerable volume of critiques regarding the actual environmental performance of buildings that have received green building certifications for new construction. The implementation is scarce due to insufficient knowledge among stakeholders' consultants and contractors. The goal of this study is to determine the performance and efficiency of the green designs for high-rise buildings in hot and humid weather. A quantitative data collection method was used, which was a questionnaire survey with 41 professionals from the Malaysia construction industry. A one-to-five linear scale was utilized on the questionnaire form in terms of various green design directive aspects. The findings suggest that green design strategies are generally effective and well-received in high-rise buildings in hot and humid environments. Unlike many studies that address green building strategies in general. This research specifically investigates the effectiveness of green design in hot and humid climates. By identifying green design performance in hot and humid climates, this study can contribute to better-performing and more liveable buildings.

Keywords: green design, high-rise building, hot and humid weather, criteria, alternatives

Identification of Priority Criteria for the Advancement of Green Buildings for Commercial Buildings

Liew Mei Xian[1] and Md Azree Othuman Mydin[2]

1 School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; meixian2928@student.usm.my

2 School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; azree@usm.my

Abstract: Green commercial buildings are environmentally responsible and resource-efficient structures. Green building is the fundamental element of sustainable development as it defines style of buildings designed and constructed in accordance with environmentally friendly principles. In this regard, this study draws attention to evaluating and addressing the most important topics: the priority criteria for the advancement of green buildings for commercial buildings. Therefore, to enhance and promote the development of green buildings, it is crucial to comprehend the factors that determine the successful application of green features to ensure that the obstacles during the construction process have been overcome. Through comprehensive literature reviews, surveys, and case studies, the research identifies key criteria such as energy efficiency, material selection, water conservation, and indoor environmental quality. By analyzing stakeholder perspectives, including architects, builders, and tenants, this research highlights the most impact criteria for promoting green building initiatives. The findings reveal that several key criteria significantly influence the adoption green building practices. Renewable energy usage emerged as the highest-ranking criterion, followed by indoor environmental quality, energy efficiency, effective waste management, and other relevant sustainability factors. This data offers valuable insights for policymakers, developers, and industry professionals, ultimately contributing to a more sustainable built environment. The study also identifies notable barriers that hinder the smooth implementation of green building practices such as financial barriers and stakeholders' awareness. Overall, this research underscores the driving forces that encourage the acceptance of green buildings while also shedding light on the obstacles that must be addressed to ensure successful implementation. Consequently, interested parties will gain better understanding of the factors affecting the priority criteria for the progression of green buildings in the commercial buildings, particularly within the commercial building sector, paving the way for more sustainable urban development.

Keywords: sustainable buildings (SB), advancement, green buildings (GB), construction, priority criteria, environmentally friendly

Impacts Of Malaysia's Climate on External Wall Material Deterioration in Residential Housing: A Comparative Study of Construction Eras in Pre-War (1900-1940), Post War (1980-1990) and Modern (Early 2000s) in External Wall Material Defect

Sofea Najwa Mahamad Pakrol Razi[1] and Zahiruddin Fitri Abu Hassan[2]

[1] Building Surveying, Faculty of Built Environment, University Malaya, Malaysia; 22004937@siswa.um.edu.my

[2] Building Surveying, Faculty of Built Environment, University Malaya, Malaysia; zahiruddin@um.edu.my

Abstract: Malaysia's tropical climate marked by high humidity, heavy rainfall and temperature fluctuations poses serious challenges to the durability of external wall materials in residential buildings. This study examines the impact of climate on wall deterioration in three building periods: Pre-War (1900–1940), Post-War (1980–1990) and Modern (early 2000s). Using a mixed method approach visual inspections and interviews with surveyors, homeowners, and conservation experts. Also to identifies key external wall defects which is cracking, moisture penetration, biological growth and surface erosion. The findings highlight the strengths and weaknesses of materials across different periods, emphasizing the need for climate-resilient construction and better maintenance. This research offers useful guidance for surveyors, conservationists and policymakers focused on sustainable housing and heritage preservation.

Keywords: wall material deterioration, climate impact, construction eras, residential housing, building defects

Evaluating Authenticity Factors in Conserving of Modern Heritage Buildings: A Case Study of Universiti Malaya Student Residential Colleges

Ashikin Mohd Azlan[1] and Zuraini Md Ali[2]

[1] Department of Building Surveying Faculty of Built Environment University Malaya;
ashikinazlan19@gmail.com
[2] Department of Building Surveying Faculty of Built Environment University Malaya;
zuraini_mdali@um.edu.my

Abstract: Evaluating Authenticity Factors in Conserving A Modern Heritage Buildings: A Case Study of Universiti Malaya Student Residential College is a research thesis that align and aim to record and identify the significance of heritage value in modern buildings in Universiti Malaya (UM) and provide or recommending an appropriate conservation strategies that balance heritage preservation and authenticity in the student residential college while aligning with UM masterplan's development goals. The rapid growth of the modernization of university of Malaya often presents major challenges to the preservation of heritage buildings. According to Universiti Malaya's master plan, the idea of demolishing residential college buildings raises worries about the possible loss of the architectural heritage. This study aims to identify the authenticity factors and significant heritage value of the students residential college buildings, assess their heritage value and propose appropriate conservation strategies that balance modernization with historical preservation in order to protect the architectural and cultural integrity of the 20th - century heritage buildings of university of Malaya specifically the first residential college (KK1), second residential college (KK2) and third residential college buildings (KK3). According to the National Heritage Act 2005 (Act 645), there is no limit age for any building to be nominated and gazetted under National Heritage. The research employs on site surveys, heritage assessment criteria and perception studies to determine which elements that can give contribution to the historical and cultural identity of the residential college buildings. The study uses to evaluate the aspects such as architectural uniqueness, historical importance and cultural significance. Based on the analysis, this study suggests a selective conservation approach where the architecturally significant structures are preserved and adaptively reused. The suggested approach include a minimal intervention for well-preserved structure, adaptive reused for functional enhancement and upgrading the comfort facilities of the building. This research contributes to the importance of heritage conservation in academic institutions by providing a framework for evaluating and managing heritage buildings within the growth of urban environments.

Keywords: heritage conservation, conservation approach, architectural significance, university masterplan, residential college buildings, Universiti Malaya

Challenges in Developing a Heritage Edu-Tour Walk for Students at University Campus

Muhamad Aizuddin Bin Mohd Sabri[1] and Zuraini Binti Md Ali[2]

[1] Universiti Malaya, Fakulti Alam Bina, 50603 Kuala Lumpur, Federal Territory of Kuala Lumpur; mohdaizuddinm@gmail.com

[2] Universiti Malaya, Fakulti Alam Bina, 50603 Kuala Lumpur, Federal Territory of Kuala Lumpur; zuraini_mdali@um.edu.my

Abstract: This study explores the challenges and strategies in developing a heritage educational walking tour (edu-tour walk) for students at Universiti Malaya, with the aim of preserving cultural heritage while enhancing awareness and appreciation among the campus community. The research objectives are to identify building factors to be considered in planning, examine challenges hindering the development of a heritage edu-tour walk, and propose strategies to address these challenges. A mixed-methods approach was employed, combining qualitative data from interviews with heritage experts and stakeholders, and quantitative data from questionnaires distributed to students and participants in a pilot edu-tour. Findings reveal that Universiti Malaya possesses significant heritage assets that can be leveraged for educational tourism, yet multiple challenges such as insufficient public awareness, funding limitations, infrastructural issues, and concerns regarding campus accessibility and academic disruption must be addressed. The study demonstrates that strategies including stakeholder collaboration, adaptive reuse of buildings, improved signage and infrastructure, and integration of sustainability principles can effectively mitigate these challenges. Anticipated results indicate that the establishment of a heritage edu-tour walk will strengthen heritage conservation, promote socio-cultural engagement, and support Universiti Malaya's sustainability goals, particularly its aspiration to become a net-zero carbon campus. Ultimately, this research highlights the intersection of education, conservation, and tourism, offering a framework for higher education institutions to adopt sustainable heritage edu-tourism initiatives that safeguard historical legacy while enriching student learning experiences.

Keywords: cultural heritage building, edu-tourism, heritage conservation, Universiti Malaya, walking tour

Issues and Challenges in Conserving 20th Century Modern Heritage Buildings: Old Staff Residence of Universiti Malaya

Nur Aini Soffiyah Binti Yusri[1] and Assoc. Prof. Sr. Dr. Zuraini Md Ali[2]

[1] Department of Building Surveying Faculty of Built Environment University Malaya;
22004936@siswa.um.edu.my
[2] Department of Building Surveying Faculty of Built Environment University Malaya;
zuraini_mdali@um.edu.my

Abstract: This research explores the issues and challenges in conserving 20th century modern heritage buildings, focusing on Old Staff Residence of Universiti Malaya. Despite their historical and social significance, many of these buildings face neglect due to a lack of public awareness, ambiguous heritage value, and growing development pressure. This poses a critical risk to preserving modern architectural heritage in Malaysia. The selected case study, Section 16 Staff Quarters/Housing, consists of 52-unit two-story bungalows and 8 blocks of four-story apartments that once served as essential housing for university staff. The objectives of this research are to identify the significance of the site, investigate current conservation challenges, and propose suitable approaches that align with preservation principles and modern-day needs. A qualitative research approach is adopted, including literature review, site observation, and interviews with stakeholders managing the quarters. Early findings reveal concerns such as insufficient maintenance, patent defects, and lack of conservation planning. The research proposes adaptive reuse as a practical and sustainable conservation strategy. This approach allows the building to retain its heritage character while serving new, relevant functions. Ultimately, the research aims to inform better conservation practices and policies for safeguarding modern heritage assets in Malaysia.

Keywords: adaptive reuse, conservation challenges, modern heritage, staff quarters, Universiti Malaya

Enhancing Safety and Comfort for Users in Lecture Halls of Potential Heritage Buildings: A Study on Health & Safety, Comfort, and Facilities

Puteri Shena Ellysha Rosman Md Jashim[1] and Zuraini Md Ali[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; 22005063@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; zuraini_mdali@um.edu.my

Abstract: Managing physical conditions, guaranteeing psychological safety, and creating an environment that promotes active learning are all part of creating a safe and comfortable lecture hall atmosphere. To assess and enhance the safety and comfort of students in lecture halls constructed in University Malaya's historic buildings from the 20th century, particularly in the faculties of Economics & Administration, and Education. This study focuses on three main areas: facilities, comfort, and health and safety. This modern building was constructed soon after independence (the early creation of Malaya). A comprehensive analysis of the literature, a case study example in detail, and direct observation also interviews with the students, lecturers, and facility managers are used to identify and assess the health and safety risks in lecture halls as well as the impact that comfort levels have on students' educational experiences there and to gain firsthand knowledge of the difficulties and potential solutions for facility upgrades while preserving the historic significance of the structures. Although the facilities at both faculties are considerably better, they still need to be improved in terms of seating ergonomics and fire safety compliance. Regulatory non-compliance, student difficulties, and suggestions for enhancing comfort, fire safety, and facilities while maintaining historical significance will all be highlighted in the findings. This guarantees that the lecture halls continue to serve as educational spaces while retaining their historical relevance, providing students a comfortable and safe environment.

Keywords: heritage, lecture halls, health & safety, comfort, facilities

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Sustaining a Transit Network Along the Blue Heritage

Jan Laren B. Bagonoc[1]

[1] Mapua University, 658 Muralla St, Intramuros, Manila, 1002 Metro Manila, Philippines; jlbbagonoc@mymail.mapua.edu.ph

Abstract: The paper revolves around an integrated waterway transit system in Metro Manila linking the cities of PaMaNa (Pasay, Malabon, Manila, and Navotas). In pursuit of honoring the vibrant waters of the urban sphere, the study regards them as the "Blue Heritage" that has pivotally rendered resources across different lines of generations. Rooted in the significance of sustaining a transit network, it encompasses the humane language of visions, design strategies, and innovations through the following aspects: SDG 6—Clean Water and Sanitation, SDG 9—Industry, Innovation, and Infrastructure, SDG 11—Sustainable Cities and Communities, and SDG 14—Life below Water. While the project was principally devised for Navotas City residents who depend on neighboring cities for their educational, employment, and social needs, it will rise in the heart of Navotas Tourism Site Map with in-city, intercity, and interregional linkages to the rehabilitated satellite stations and existing ferry terminals and port in Metro Manila. Hence, the project has four (4) phases of development. Through a mixed-method approach, the gathered data involve the perceptions and experiences of college-age and working-age intercity dependents of Navotas City, MMDA officers of the eleven (11) stations and docking yard of Pasig River Ferry Service, administrative and security officers of Esplanade Seaside Terminal, and the Director, Urban Planner, Architectural Apprentices, and GIS Specialist and Researcher of WTA Architecture and Design Studio. The findings reveal issues concerning passenger ferry ridership variables that affect the security and efficiency of transit processes. Hence, the study deductively imbibes Herron's Urban Design Framework, Asset-Based Community Development, Network Theory, and other sub-theories. This approach permits strengthened connectivity between the facility, the users, and the Blue Heritage. In turn, this study mobilizes the umbrella of architecture and urban design in empathizing with intercity dependents.

Keywords: blue heritage, intercity dependents, linkages, urban sphere, waterway transit system

A Study of Kansei Principle in Temporary Relief Centre (TRC) Planning: Enhancing Functionality and Design

Alyssa Mohd Khidzir[1] and Nik Elyna Myeda[2]

[1] Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; 22004907@siswa.um.edu.my,

[2] Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; elyna@um.edu.my

Abstract: This study investigates the application of the Kansei principle in Temporary Relief Centre (TRC) planning, aiming to enhance both functionality and design for improved disaster victim well- being. Current TRCs often prioritize logistics, frequently overlooking the crucial psychological and emotional comfort of displaced individuals. This research addresses this gap by evaluating how existing TRC space design and management align with Kansei, a human-centered approach that translates sensory and emotional needs into design considerations. A mixed methods approach was employed, combining qualitative data from in-depth interviews and case studies, focusing on public amenities that have been used as TRCs around Klang Valley and quantitative data from surveys. The targeted participants were victims that were staying at TRC. Data collection included site observations and semi- structured interviews with local council management, providing insights into TRC functionality and design priorities. A comprehensive questionnaire survey also gathered direct victim feedback on experiences related to immediate needs, communication, environment, and overall comfort, addressing user-centred design, sensory comfort, and emotional psychological support. The study's implications are significant for disaster management agencies, local councils, and design professionals, offering evidence- based recommendations to integrate Kansei principles into TRC planning and management guidelines. By fostering more humane, dignified, and emotionally supportive environments, this research contributes to effective disaster preparedness and recovery, enhancing the holistic well- being of victims in Malaysia.

Keywords: temporary relief centre (TRC), Kansei principle, space design, disaster management, human-centred design, victim well-being

A SERVQUAL-Based Study on Factors Influencing Student Satisfaction with Parking Services at Universiti Malaya Residential Colleges

Kasih Bilqis Binti Ghazali[1] and Mohamad Rizal Bin Baharum[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; kasihbalqis6@gmail.com
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; mrizal@um.edu.my

Abstract: The rising population and vehicle density within university campuses have heightened the need for efficient and user-centered parking systems. Universiti Malaya, as a leading academic institution in Malaysia, faces increasing pressure to provide accessible and satisfactory parking solutions for its staff, students, and visitors. This study investigates the current service quality of parking systems within selected areas of Universiti Malaya, employing the SERVQUAL model to assess five key dimensions: tangibles, reliability, responsiveness, assurance, and empathy. It also aims to identify the common challenges users face, particularly in relation to parking availability, system efficiency, and user interaction. To achieve these objectives, a mixed-method research approach is adopted. Quantitative data is collected through structured questionnaires to assess the gap between user expectations and actual perceptions, while qualitative insights are gathered to understand deeper user experiences. The SERVQUAL scoring method is applied to quantify service quality gaps and highlight the most critical dimensions affecting satisfaction. The findings of this study are expected to pinpoint core weaknesses in the current parking system and provide recommendations to enhance service delivery, thus contributing to more effective parking management across Universiti Malaya.

Keywords: parking system, service quality, SERVQUAL, Universiti Malaya, user satisfaction

Enhancing University Campus Experience with Better Facilities Services Provision for Students

Mahirah Binti Mahalil[1] and Shirley Chua Jin Lin[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; mahirahmahaliil02@gmail.com

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; shirleychua88@um.edu.my

Abstract: This study examines student satisfaction with facility services at public universities, focusing on the University of Malaya, to address the gap between service provision and student expectations. Despite the critical role of campus facilities in enhancing the student experience, there is a lack of alignment between planning and actual needs, leading to dissatisfaction. Using the SERVQUAL model, the research employed a literature review, questionnaire surveys, and data analysis (via Excel and SPSS) to evaluate discrepancies across key facilities, including academic, residential, recreational, health, dining, transportation, and IT services. Results revealed consistent gaps between expectations and perceptions, with students reporting unmet needs in all categories. The findings underscore the urgency for universities to prioritize student feedback in facility management to improve service quality. This study contributes to the built environment field by advocating for student-centric approaches in campus planning, ultimately fostering a safer, more comfortable, and inclusive academic environment. The implications call for collaborative efforts between management and students to bridge service gaps and enhance overall satisfaction.

Keywords: facility management, public universities, SERVQUAL model, student satisfaction

Enhancing Mall-Foot Traffic Through Effective Facilities Management: An Analytical Study

Nur Izzati Binti Fakhrurrazi[1] and Shirley Chua Jin Lin[2]

[1] Department of Building Surveying, Universiti Malaya, Wilayah Persekutuan, 50603 Kuala Lumpur; izzatifakhrurrazi@gmail.com

[2] Department of Building Surveying, Universiti Malaya, Wilayah Persekutuan, 50603 Kuala Lumpur; shirleychua88um.edu.my

Abstract: The phenomenon of low foot traffic referring to shopping centres experiencing low visitor traffic has become a growing concern in the Klang Valley. This issue arises due to evolving consumer behaviours, increasing competition from online retail, and the need for malls to adapt to multifunctional uses beyond traditional retail. This study seeks to explore the factors contributing to the decline of low foot traffic malls and evaluate how effective facility management practices can address these challenges. Through a mixed method approach that incorporates surveys, interviews, and case studies, the research identifies key issues such as location, tenant mix, competitive pressures, and design inefficiencies as primary contributors to mall underperformance. In addressing these factors, the study highlights innovative facility management strategies that include optimizing space utilization, fostering community engagement, and integrating smart technologies to enhance operational efficiency and the overall visitor experience. These strategies aim to transform underutilized shopping spaces into vibrant, dynamic hubs that cater to contemporary urban needs. The research provides actionable recommendations for revitalizing low foot traffic malls, ensuring their long-term sustainability, and enhancing their appeal to tenants and visitors alike. By offering insights into effective facility management practices, this study aims to guide mall operators, facility managers, and policymakers in developing resilient and adaptable retail environments that remain relevant in a rapidly changing market.

Keywords: competitive pressures, low visitor traffic, malls, low foot traffic, space

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Zero-Waste Awareness Among Universiti Malaya Students

Tan Ai Shan[1] and Shirley Chua Jin Lin[2]

[1] Universiti Malaya, Fakulti Alam Bina, 50603 Kuala Lumpur, Federal Territory of Kuala Lumpur; 22004939@siswa.um.edu.my

[2] Universiti Malaya, Fakulti Alam Bina, 50603 Kuala Lumpur, Federal Territory of Kuala Lumpur; shirleychua88um.edu.my

Abstract: This study aims to investigate zero-waste awareness among Universiti Malaya students, focusing on the implementation of zero-waste management practices, student awareness levels, and strategies to enhance engagement with sustainable waste practices. With Malaysia facing a critical waste management crisis and rising landfill saturation, public universities are identified as key contributors to municipal solid waste generation. Despite existing zero-waste initiatives and awareness campaigns, a significant gap persists between students' knowledge and their actual behavior towards waste reduction and recycling. The research employs a mixed-method approach, incorporating semi-structured interviews with university management and online questionnaire surveys targeting students from Universiti Malaya. Data collection will assess current implementation levels, measure students' awareness and attitudes toward zero-waste practices, and identify actionable measures to bridge the gap between awareness and behavior. Anticipated results are expected to reveal varying degrees of zero-waste implementation across institutions and highlight key factors influencing student participation in sustainable waste management. The study aims to propose evidence-based recommendations for enhancing zero-waste awareness and adoption, contributing to broader sustainability goals within higher education institutions in Malaysia.

Keywords: awareness, Universiti Malaya, sustainable, waste management, zero-waste

A Conceptual Assessment of Issues and Preventive Maintenance Strategy for University Public Toilet

Aminur Ruslan Bin Mohd Zaini[1] and Mohd Zailan Sulieman[2]

[1] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; aminurruslan@student.usm.my
[2] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; mzailan@usm.my

Abstract: This research delves into the pressing issue of public toilet maintenance in Malaysian public universities, with a particular focus on assessing the transformative impact of preventive maintenance strategies. The prevailing reliance on reactive maintenance has proven costly—not only in monetary terms but also in its toll on hygiene standards, service reliability, and user satisfaction. Frequent breakdowns and delayed repairs compromise both public health and the dignity of shared spaces, diminishing the overall campus experience. Guided by the principle that "prevention is better than cure," this study employs a case study methodology to gather robust quantitative data, including historical maintenance expenditures, user satisfaction survey responses, and detailed maintenance logs spanning three years. The findings illuminate a clear trajectory: adopting a proactive, preventive approach substantially reduces long-term maintenance costs, mitigates the frequency of facility failures, and enhances the quality of user experience. Beyond statistical improvements, this research underscores a deeper insight—that sustainable facility management is not merely a technical concern but a moral commitment to the well-being and comfort of every user. Preventive maintenance emerges not only as a cost-effective solution but also as a forward-thinking philosophy rooted in accountability, foresight, and care for the built environment. The study ultimately proposes a replicable and scalable framework for institutional maintenance practices, offering a roadmap toward operational excellence and enhanced public trust. As universities serve as both educational and societal benchmarks, the adoption of such strategies signals a broader commitment to responsible governance, efficient resource management, and the creation of healthier, more dignified communal spaces.

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Evaluating The Dynamics of Pre-War Commercial Property Value in Bandar Penggaram Heritage Zone (2014-2024)

Fitri Nadhirah Abdul Malik[1] and Sabariah Eni[2]

[1,2] Department of Real Estate Management, Faculty of Technology Management & Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia

Abstract: The dynamics of the commercial property market for pre-war buildings within heritage zones present a complex and evolving scenario. Challenges such as low transaction volumes, limited comparable evidence, and significant urban conservation issues have made it difficult to assess property values accurately. Additionally, economic fluctuations and recovery after the COVID-19 pandemic have further complicated trends in this sector. This study aims to analyze trends in the commercial property values of pre-war buildings in Bandar Penggaram's heritage zone from 2014 to 2024. It also seeks to identify key factors influencing these values. A quantitative research approach was adopted, relying on data collected through an extensive review of sales transaction documents. The primary data sources included sales data obtained from the Valuation and Property Services Department (JPPH) and property market reports from the National Property Information Centre (NAPIC), focusing on commercial property transactions during this period. To analyze the data effectively, Microsoft Excel was used to identify trends and dynamics in pre-war building transactions. Additionally, Multiple Regression Analysis (MRA) was conducted using the Statistical Package for the Social Sciences (SPSS) to gain deeper insights into the factors influencing property values. Overall, the research concludes that the trends and property values for pre-war commercial buildings in Bandar Penggaram are heavily influenced by economic factors, despite the lack of available transactions and the recovery process after COVID-19. A significant finding is that lot size preferences matter, with location being the main attraction for pre-war transaction trends and property values, shaping the market in profound ways.

Keywords: commercial property, pre-war buildings, heritage zone, property valuation

From Global to Local: Best Practices for Green Walls Maintenance in Malaysia's Built Environment

Lee Yung Seng[1] and Siti Hamidah Husain[2]

[1] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; yungsenglee02@gmail.com
[2] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; sitihamidahhusain@usm.my

Abstract: Green building and sustainability have become significant global concerns in the construction industry, with the construction stakeholders actively promoting sustainable development practices. Malaysia is now closely following the empowerment of these initiatives and is progressively integrating green technologies into its built environment practices. Among these technologies, sustainable green walls are gaining attention due to their significant contribution to sustainability, environmental and energy efficiency. However, despite the ongoing integration of green wall technology and sustainability development in the context of the Malaysian construction industry, green walls remain relatively new technology due to a lack of experience and technical knowledge. Available data and information are relied on mostly from countries with mature systems and processes for effective implementation and maintenance of green walls. This phenomenon, however, often leads to high costs and waste of resources to match Malaysia's unique climatic and infrastructure conditions. Therefore, this study aims to propose a tailored best practice approach for maintaining green walls that suits the Malaysian context. A qualitative research methodology was used to collect data, involving systematic literature review (SLR), document analysis, and semi-structured expert interviews to obtain comprehensive insights. The findings show that six factors influencing green wall maintenance are plant selection, irrigation and water management, structural and system integrity, environmental factors, cost and budget management, and human factors and expertise. Additionally, the best practices of maintenance procedures have been proposed, with the aim of helping the long-term sustainability of green walls in Malaysia to lead to a reduction in operation and maintenance costs. Significantly, this research bridges local industry with global practice by adapting and adopting international standards to fit Malaysian conditions, thereby contributing to sustainable development goals within the built environment industry.

Keywords: green walls, maintenance, tropical climate, long-term sustainability, Malaysian construction industry

The Factors Influence Industrial Real Estate Demand

Marisha Rizal Harahap[1] and Zarina Shamsudin[2]

[1] Jabatan Pengurusan Harta Tanah, Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, MALAYSIA;
marishaharahap02@gmail.com

[2] Jabatan Pengurusan Harta Tanah, Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, MALAYSIA;
zarinas@uthm.edu.my

Abstract: Industrial real estate supports global economic activities by providing essential manufacturing, logistics, and supply chain infrastructure. This study aims to determine the factors influencing industrial real estate demand in Klang, Malaysia and rank them. The key factors considered include e-commerce growth, locational advantages, market trends, economic factors, technological advancement, infrastructure, government policies and environmental factors. A quantitative methodology was adopted, with surveys answered by 116 real estate agents, and the data was analyzed using SPSS. The results indicate that locational factors and e-commerce trends are the most significant drivers of demand, emphasizing the importance of transportation hubs and logistics infrastructure. Market trends and government policies moderately influence demand, reflecting economic and regulatory conditions. These findings offer developers, investors, and policymakers actionable insights to align strategies with market needs and support sustainable industrial development in Klang. This study highlights the dynamic nature of industrial real estate and its critical role in economic growth. Future research should explore the effects of technological advancements and environmental considerations to further optimize industrial real estate strategies. The results of this study contribute to a better understanding of industrial real estate demand for enhancing the sector's resilience and efficiency in Klang and similar regions.

Keywords: industrial real estate, e-commerce, locational factors, demand drivers, Klang

Enhancing The Valuation Accuracy of Petrol Station

Muhamad Khairul Amin Mohd Khairulanis[1] and Rozilah Kasim[2]

[1] Jabatan Pengurusan Harta Tanah, Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, MALAYSIA;
aminkhairulanis@gmail.com

[2] Jabatan Pengurusan Harta Tanah, Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, MALAYSIA;
rozilah@uthm.edu.my

Abstract: Valuation of Petrol stations is critical for making informed investment decisions and accurate financial reporting. Petrol stations provide essential services to consumers, including the sale of fuel, convenience store items, car washes, and vehicle maintenance. However, there are significant valuation errors, biases, and variations stemming from differing methodologies and market expectations. To enhance the valuation accuracy of petrol stations, it is essential to identify and address these influencing factors systematically. This research aims to identify factors and evaluate the most significant factor affecting the accuracy of petrol station valuation. This research adopted the quantitative method, which involves distributing questionnaires to the 100 respondents consisting of valuer and assistant valuer officers of the Department of Valuation and Property Services (JPPH) in Selangor. The data obtained was computed using SPSS software as descriptive analysis. This research findings reveal four factors affecting the accuracy of petrol station property valuation, with the 'Valuation Method' factor being the most crucial in achieving more accurate petrol station valuations. The findings from this research serve as a guide and reference for the JPPH to compute and value petrol stations accurately.

Keywords: accuracy, factors, petrol station, valuation

Women in Real Estate: Risk Profiling in the Workplace

Risya Natasha Nor Izam[1] and Zarina Shamsudin[2]

[1] Department of Real Estate Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia; ap210127@student.uthm.edu.my

[2] Department of Real Estate Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia; zarinas@uthm.edu.my

Abstract: This study explores the hazards and risks faced by women in Malaysia's real estate industry (WIRE) and identifies the departments most affected. Women in this field encounter challenges such as work-related stress, safety hazards, and environmental discomfort, which influence their performance and career progression. The research aims to assess these risks and propose measures to enhance workplace conditions. A mixed-methods approach was adopted, combining quantitative surveys and semi-structure interviews to collect primary data, supported by secondary data analysis. 50 respondents from various real estate departments participated, and the data were analysed using descriptive and correlation analyse via SPSS. The findings indicate that health hazards, including stress and harassment, and safety risks, such as slips and falls, significantly impact WIREs. Environmental hazards, such as thermal discomfort, were identified as moderate risks. Property management and valuation departments were found to have the highest risks, although correlation between hazards and departments was weak. This study highlights the urgent need for targeted interventions to mitigate risks, such as improved safety protocols, supportive workplace policies, and enhanced risk management practices. By addressing these hazards, organizations can create a safer and more equitable work environment, promoting employee well-being and productivity. The research provides valuable insights for policymakers and industry stakeholders to better support women in real estate. Future studies should focus on risk mitigation strategies and their long-term implications for women's career development.

Keywords: gender challenges, occupational safety, risk management, women in real estate, workplace hazards

Evaluating The Role of Facility Management to Enhance User Comfort in Train Station Systems and Services

Nur Erina Yasmin Mazlan[1] and Nuratiqah Aisyah Awang @ Mat Nawi[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; 22004941@siswa.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; nuratiqahaisyahawang@um.edu.my

Abstract: This study evaluates the role of Facility Management (FM) in enhancing user comfort within train station systems and services in the Klang Valley, Malaysia. As urban populations grow and the reliance on public transport intensifies, ensuring commuter satisfaction becomes a strategic necessity for transport operators and policy stakeholders. The study utilizes a mixed-methods approach, combining data from 300 survey respondents and interviews with key facility managers from RapidKL-operated train stations, to assess environmental quality, infrastructure accessibility, and service responsiveness. Quantitative findings reveal that while satisfaction levels range from moderate to high, critical issues persist, particularly concerning station maintenance consistency, accessibility for Persons with Disabilities (PwDs), and responsiveness to complaints. Vulnerable populations such as the elderly and PwDs face significant navigation challenges due to poorly maintained infrastructure and insufficient inclusive design elements. Qualitative data underscores systemic shortcomings in preventive maintenance, staff preparedness, and coordination among stakeholders. The study highlights the transformative potential of user-centred FM strategies such as routine maintenance auditing, enhanced signage systems, real-time monitoring, and participatory feedback mechanisms. Recommendations include improvements in staff training on accessibility, integration of technological tools for maintenance prediction, and policy alignment with universal design standards. In conclusion, FM extends beyond maintenance operations; it is a critical component in shaping safe, inclusive, and satisfying transit experiences. This research provides empirical insights for public transport stakeholders aiming to align infrastructural operations with commuter expectations in a rapidly urbanizing context.

Keywords: facility management, user comfort, train stations, accessibility, Klang valley, public transport, inclusive design

Construction Site Accident in Highrise Building: Factor and Mitigation Strategies

Harma Weni binti Mohd Awal[1] and Syahrul Nizam bin Kamaruzzaman[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; 122005011@siswa.um.edu.my

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; syahrulnizam@um.edu.my

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Abstract: The construction industry is a key driver of Malaysia's economic development but is also recognized as one of the most hazardous sectors, particularly in high-rise building projects where complex structures, height-related activities, and tight deadlines increase the risks of accidents. In Kuala Lumpur, despite the existence of safety regulations, accident statistics remain high, leading to injuries, fatalities, and financial losses. This highlights the need for more effective approaches to safety management and enforcement in the sector. This study aims to examine the causes of accidents in high-rise construction projects in Kuala Lumpur and to identify effective mitigation strategies. The research employed a mixed-methods approach, combining primary data collected from questionnaire surveys distributed to 300 construction professionals, of which 115 valid responses were received, with secondary data obtained from relevant literature reviews. The survey involved contractors, engineers, safety officers, supervisors, and project managers, providing diverse industry perspectives. The findings indicate that human error (59%), inadequate safety training (57%), poor communication (44%), and time pressures (33%) are the main contributors to accidents. Other factors include lack of supervision, faulty equipment, and limited compliance with personal protective equipment (PPE) use. These results reveal that both behavioral and organizational issues strongly influence safety performance. Based on these findings, the study recommends improving safety training and refresher programs, strengthening enforcement of safety regulations, and adopting modern technologies such as drones, wearables, and Building Information Modelling (BIM) to enhance risk management. The research contributes to better understanding of accident causes and provides practical strategies to reduce workplace accidents, foster a stronger safety culture, and improve construction practices in Malaysia's high-rise projects.

Keywords: construction industry, high rise projects, construction safety, workplace accidents, hazardous activities

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Reducing Plastic Waste Problem with Eco Plastic Pavement Block

Jothiga A/P Murugan[1] and Noor Suzaini Mohamed Zaid[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; jothigamurugan666@gmail.com

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; suzaini_zaid@um.edu.my

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Abstract: The global plastic pollution crisis, driven by excessive consumption and inadequate waste management, presents a significant environmental challenge. In Malaysia, high levels of plastic production and importation have placed immense pressure on the national waste management system. At the same time, the construction industry is grappling with rising material costs and high carbon emissions, especially from cement production. Although recycled plastics have shown potential in construction, their structural viability as a substitute for cement in pavement blocks remains underexplored. This study investigates the feasibility of producing eco plastic pavement blocks by substituting cement with recycled PET and HDPE plastics, offering a sustainable alternative to traditional concrete. Various sand-to-plastic ratios (1:1, 1:2, and 1:3) and coarse aggregate combinations (1.3:1 and 1.3:2) were tested for compressive strength, flexural strength, and water absorption, in accordance with Malaysian Standard MS 1380:1995 and ASTM C902 specifications. The results showed that HDPE mixes exhibited higher flexural strength, while PET mixes achieved better compressive strength. The PET (1:1) mix met ASTM C902's minimum requirement for individual compressive strength samples ($\geq$17.2 MPa), although it did not meet the more stringent MS 1380:1995 requirement ($\geq$50 MPa). Both plastic types performed best at a 1:1 sand-to-plastic ratio. Increasing the plastic content beyond this ratio reduced mechanical strength. Water absorption decreased with higher plastic content, with HDPE showing superior moisture resistance due to its hydrophobic properties. The inclusion of coarse aggregates did not improve strength and weaken the matrix due to poor bonding. These findings demonstrate that recycled plastics, especially PET at a 1:1 sand-to-plastic ratio, can effectively substitute cement in light-duty pavement blocks for pedestrian walkways and park pavements.

Keywords: eco plastic pavement blocks, recycled plastic waste, sustainable construction materials, material optimization, pavement block performance

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Decarbonisation Impact Appraisal Based on Life Cycle Assessment Approach: Analytical Survey on Carbon Footprint of Materials Selection

Ling How Jing[1] and Brit Anak Kayan[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; howjing02@gmail.com
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur; brit284@um.edu.my

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Abstract: Decarbonisation has emerged as a critical approach in the building sector to address climate change. In the building sector, decarbonisation can be achieved by implementing sustainable practices across all stages of a building's life cycle. Notably, material selection plays a crucial role during the construction stage as it directly affects the carbon footprint of construction projects. In addition, there are some challenges in the building sector in Malaysia such as the cost and availability of sustainable materials can hinder efforts to reduce the carbon footprint of building construction projects. This study aims to evaluate the role of material selection and its impacts in achieving decarbonisation for the building construction phase within the Malaysia's building sector. The research will focus on the impact assessment of material selection on the carbon footprint of building construction projects within the context of wall construction. Carbon emissions from raw material extraction, transportation and construction processes vary depending on the materials used to construct building elements. Calculation of carbon footprint for each material used for constructing the wall based on the database using the Life Cycle Assessment (LCA) approach within cradle-to-site boundary, twinned with a comparative analysis for conventional and sustainable materials such as Masteel, AAC block and PFA-blended concrete to quantify their carbon impacts. The findings revealed that material substitution can lead to a 37.31% or 362160.35kgCO2e reduction in total embodied carbon emissions for wall construction. The study concludes that informed material selection with regional sourcing strategies can substantially enhance decarbonisation outcomes in Malaysian construction.

Keywords: building construction, carbon footprints, decarbonisation, life cycle assessment, material selection

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Mechanical Grip Between Tiles and Adhesive Material in Malaysia

Mior Haikal Ozair Mohd Ridzuan Rajen[1]and Zahiruddin Fitri Abu Hasan[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; 22004986@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; zahiruddinum.edu.my
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Abstract: In Malaysia, tiles are a preferred choice for flooring due to their durability and aesthetic appeal. However, unforeseen problems can affect their appearance and functionality, impact on the overall building design and posing safety hazards. Broken tiles with sharp edges, for instance, may cause injuries. Common tile defects include buckling, cracking, fading, chipping, and crazing. These issues often arise from factors such as dropping heavy objects, uneven surfaces, poor-quality tiles, substandard workmanship (incorrect installation methods or improper mixing of backing materials), environmental changes, and inadequate grouting. Proper tile adhesion plays a critical role in ensuring performance and longevity. Weak adhesion, caused by incorrect installation techniques, often reduces the bond strength between tiles and adhesive materials. This lack of bonding can lead to tile failure, including popping and detachment. Additionally, the compatibility between tile types and bedding materials is essential, as each requires a specific bonding strength. Without proper compatibility, the risk of defects and safety issues increases significantly. This study focuses on evaluating the bond strength of various tile and adhesive material combinations under different conditions. Comprehensive testing was conducted using a Universal Testing Machine, which measured the bond strength accurately. The output data were analyzed to determine the optimal bonding strength for different tile and adhesive combinations. By simulating real-world conditions during these experiments, the study provides reliable insights into the performance of tiles under stress. The results aim to identify the most suitable materials and techniques for achieving durable and safe tile. These findings will help improve the quality of tile products and their compatibility with adhesives, reducing the occurrence of defects in future applications.

Keywords: bond strength, adhesive materials, tile defects, tile compatibility, tile installation techniques

Achieving Zero Accidents in the Construction Industry – A Study of Efficiency of Safety Management and Application in High-Rise Building Construction Projects in Klang Valley

Muhamad Harris bin Rosli[1] and Imaduddin Abdul Halim[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
22005008@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
imaduddin@um.edu.my

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Abstract: The construction industry is inherently hazardous, and high-rise building projects present a number of risks to workers, including falls, equipment related accidents, and structural failures. While safety management practices have evolved over the years, zero accidents remain an elusive goal. The nationwide occupational accident rate in Malaysia dropped by 20% in 2020 compared to 2019, while workplace death cases decreased significantly by 45%. According to Deputy Human Resources Minister Datuk Awang Hashim, 32,674 occupational accidents were recorded in 2020, with 312 being fatal. This reduction brought the occupational accident rate to 2.18 per 1,000 workers, down from 2.71 in 2019. Similarly, the workplace death rate declined to 2.09 per 100,000 workers in 2020, compared to 3.83 in the previous year. Even though safety protocols do exist, little is understood about their actual implementation and effectiveness in attaining zero accidents within high-density urban regions like the Klang Valley. The study will thus try to evaluate the present status of safety management frameworks being practiced, identify potential barriers impeding the realization of zero accidents, and develop actionable recommendations to enhance safety performance. A single method approach was used, which is qualitative study targeting one of key stakeholders such as project managers, safety officers, or even construction workers, with in-depth structured interviews into safety practices. Data on high-rise construction sites were analysed to analyse the correlation of safety management efficiency with accident rates. Some of the key findings from the review show that even though the response for safety management systems implementation was highly positive, significant lapses persist in terms of worker training, hazard communication, and monitoring to ensure compliance. It was further noted in this study that a highly committal leadership coupled with very active worker participation reduces accident rates on projects. The findings will contribute to targeted improvements in safety training, real-time hazard monitoring, and inculcating a safety-first culture in realizing the goal of zero accidents.

Keywords: construction, high-rise, safety and health, safety management, zero accidents

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Smart And Eco-Friendly Water Solutions: Rainwater Filtration in Downpipe Systems

Muhamad Muhazri bin Md Nur[1] and Imaduddin Abdul Halim[2]

[1] Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; muhamadmuhazri@gmail.com
[2] Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia; , imaduddin@um.edu.my

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Abstract: Malaysia's high annual rainfall presents opportunities for rainwater harvesting (RWH), yet urban systems often fall short due to inadequate filtration, leaving collected water unsuitable even for non-potable uses. This study develops and evaluates a sustainable rainwater filtration prototype designed for downpipe integration in urban households. The system employs three natural, low-cost filter media—fine river sand, ceramic discs impregnated with silver, and activated carbon from coconut shells—each targeting specific contaminants: physical particles, microbial pathogens, and chemical pollutants respectively. Both field applications and laboratory analyses were conducted to assess system performance. Key water quality parameters, including pH, turbidity, microbial content (E. coli, total coliforms), and heavy metals (Pb, Zn), were measured pre- and post-filtration. Results demonstrated significant improvements: turbidity reduced from an average of 12.4 NTU to <3 NTU, pH stabilized near neutrality, microbial contaminants decreased by >90%, and heavy metal levels fell below WHO guidelines for non-potable use. Flowrate regulation further enhanced contaminant removal efficiency by ensuring adequate contact time with filter media. Statistical validation using paired t-tests and ANOVA confirmed the significance and reliability of the findings. The prototype's modular design, reliance on locally available materials, and total cost below RM100 enhance its affordability and scalability. The system aligns with UN Sustainable Development Goals, particularly SDG 6 (Clean Water and Sanitation) and SDG 11 (Sustainable Cities). Findings highlight the potential of decentralized, eco-friendly filtration solutions to strengthen urban water resilience and support sustainable infrastructure policies in Malaysia.

Keywords: activated carbon, ceramic filter, rainwater harvesting, sand filtration, sustainability

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Environmental Impact Assessment of Industrialize Building System Adoption: A Life Cycle Assessment (LCA) in Residential Construction in Klang Valley, Malaysia

Nurul Balqis Ismail binti Anuar[1] and Brit Anak Kayan[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
22004938@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
brit284@um.edu.my

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Abstract: Perhaps the main issues pertaining to the research subject matter are the significant environmental impacts of traditional construction methods, which contribute heavily to carbon emissions and resource depletion. This study aims to assess the environmental impacts, particularly carbon emissions, of adopting Industrialized Building Systems (IBS) in residential construction in Klang Valley, Malaysia, using Life Cycle Assessment (LCA). Traditional construction methods significantly contribute to environmental degradation, especially through high carbon emissions and resource depletion. IBS, which emphasizes off-site prefabrication, offers a sustainable alternative by reducing on-site activities, optimizing material use, and lowering both carbon emissions and waste. The research compares the environmental benefits of IBS to conventional construction techniques. It also examines the main barriers to IBS adoption, including high initial costs, skilled labour shortages, and resistance from stakeholders. Despite these challenges, the findings suggest that IBS can significantly reduce energy consumption and the overall carbon footprint of construction. The study proposes strategies to overcome these barriers, such as financial incentives, enhanced worker training, and increased government support. This research contributes to advancing sustainable construction practices in Malaysia, aligning with SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

Keywords: industrialized building system (IBS), life cycle assessment (LCA), carbon emissions, sustainable construction, environmental impact

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Lighting On the Go: Evaluating the Reliability of Lux Measurement Mobile Apps for Visual Comfort Monitoring

Adam Bin Azhar[1] and Raha Binti Sulaiman[2]

[1] Department Building Surveying, Faculty Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; 22004990@siswa365.um.edu.my

[2] Department Building Surveying, Faculty Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; rahasulaiman@um.edu.my

Abstract: Lighting efficiency plays a crucial role in ensuring optimal energy use and occupant comfort in indoor spaces. The reliance on lux meters for illuminance measurement is well-established, but mobile applications have emerged as potential alternatives due to their accessibility and convenience. However, concerns about their accuracy and reliability remain. Here we show the report that evaluates the performance of three mobile applications which are Light Meter LM-3000, Photone, and Lux Light Meter Pro, in measuring illuminance, compared to a calibrated professional lux meter. The results indicate that while the LM-3000 and Photone apps provide reasonably accurate readings, with a discrepancy of 5-10% compared to the lux meter, the Light Meter app consistently underestimates illuminance, making it less reliable for precise measurements. These findings highlight the potential for mobile applications to serve as practical tools for non-professional settings. Furthermore, promoting the use of mobile apps can raise awareness about proper lighting conditions, potentially preventing health issues such as Sick Building Syndrome (SBS) and related discomforts.
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Keywords: lighting efficiency, illuminance measurement, mobile applications, lux meters, accuracy

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A Study on Adaptation of Smart Energy Management System in Institutional Building

Azril Iqmal bin Ramlan[1] and Syahrul Nizam bin Kamaruzzaman[2]

[1] Department of Building Surveying, Universiti Malaya, Wilayah Persekutuan, 50603 Kuala Lumpur; 22005009@siswa.um.edu.my

[2] Department of Building Surveying, Universiti Malaya, Wilayah Persekutuan, 50603 Kuala Lumpur; syahrulnizam@um.edu.my

Abstract: The study focuses on the critical role of Smart Energy Management Systems (SEMS) in enhancing energy efficiency within institutional buildings in Malaysia. With increasing energy demands and the rising importance of sustainability, SEMS presents a transformative solution through the use of advanced technologies such as Internet of Things (IoT) devices and data analytics. These technologies enable real-time monitoring and control of energy consumption, allowing for the identification and rectification of inefficiencies across various systems like heating, ventilation, air conditioning (HVAC), and lighting. The research addresses several core areas: it investigates the primary barriers hindering the adoption of SEMS, such as outdated infrastructure and lack of awareness; examines factors contributing to high electricity consumption, particularly in institutional buildings with extended operational hours; and evaluates the impact of SEMS on energy usage patterns in multi-tenant environments. By analyzing these aspects, the study aims to quantify the potential economic benefits of SEMS implementation, including cost savings and enhanced energy efficiency. The methodology employed includes case studies and interviews with stakeholders in the institutional building sector, alongside a comprehensive literature review. This mixed-method approach ensures a holistic understanding of current energy management practices, the challenges faced, and the potential for SEMS to transform energy consumption dynamics. The study ultimately seeks to provide practical recommendations for SEMS integration, thereby promoting sustainable energy management and reducing operational costs in Malaysia's institutional buildings.

Keywords: smart energy management systems (SEMS), energy efficiency, energy consumption, sustainable energy

Indoor Air Quality on the Go: Evaluating the Accuracy of Mobile Apps for Building Performance Assessment

Ku Hasif Izzuddin bin Ku Shamsuri[1] and Raha Sulaiman[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; 22004903@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; rahasulaiman@um.edu.my

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Abstract: Indoor Air Quality (IAQ) significantly impacts the health and comfort of building occupants. While traditional IAQ measurement tools are highly accurate, their high cost and complexity hinder their widespread use. Alternatively, mobile applications provide a more accessible and user-friendly option for IAQ monitoring but often exhibit substantial discrepancies in data accuracy. This study investigates the accuracy of mobile applications compared to traditional measurement tools, identifies factors contributing to discrepancies, and evaluates the feasibility of mobile applications for continuous IAQ monitoring in various building types. A mixed-methods approach was adopted, combining case studies of urban residential buildings and questionnaire surveys targeting residents in high-density areas. Results indicate significant variations between mobile application readings and calibrated instruments, with mobile apps deviating by over 20% in some instances. Key factors identified include sensor limitations, environmental conditions, and device calibration issues. Despite these discrepancies, mobile applications demonstrate potential for continuous IAQ monitoring due to their affordability and ease of use, particularly in resource-constrained settings. This study highlights the need for improving mobile IAQ technologies and proposes recommendations for their integration into building management systems. The findings aim to bridge the gap between accuracy and accessibility, fostering better indoor environmental quality management practices.

Keywords: building performance, indoor air quality, mobile applications, traditional measurement, accuracy

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Comparing Mobile Applications and Sound Level Meters (SLMs) for Raising Awareness of Noise Pollution Among Occupants

Muhammad Syahmi bin Mohd Shariae[1] **and** Raha Sulaiman[2]

[1] Department of Building Surveying Faculty of Built Environment University Malaya; 22004942@um.edu.my

[2] Department of Building Surveying Faculty of Built Environment University Malaya; 22004942@um.edu.my

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Abstract: Noise pollution in university environments poses growing concerns due to its impact on student well-being, concentration, and academic performance. Although professional Sound Level Meters (SLMs) are highly accurate and comply with international standards (IEC 61672), their high cost and limited accessibility restrict their use among students (Smith et al., 2020). Mobile noise monitoring applications such as Decibel X, Decibel Meter, and NIOSH SLM offer more affordable and user-friendly alternatives, yet their accuracy and effectiveness in raising awareness remain under-researched (Jingchen Huyan et al., 2023). This study aims to compare the accuracy of selected mobile apps with a professional SLM and assess their potential as tools to increase student awareness of environmental noise. Using a mixed-methods approach, noise levels were measured in five rooms at Universiti Malaya under four controlled indoor scenarios. Additionally, a Google Form survey was administered to 176 students to evaluate their awareness, perceptions, and experience with noise monitoring tools. The results indicate that while the SLM produced the most stable and reliable readings, both Decibel X and Decibel Meter recorded values within close range under low to moderate noise conditions. The NIOSH SLM frequently overestimated readings. Survey findings revealed limited prior awareness or usage of noise-monitoring apps, yet many students expressed willingness to adopt such tools in the future. In conclusion, mobile applications, especially Decibel X, can complement SLMs as accessible alternatives for promoting noise awareness in university settings. These findings support the integration of mobile tools into broader environmental education initiatives to enhance student engagement with indoor noise issues.

Keywords: indoor environment, mobile apps, noise pollution, sound level meter (SLM), student awareness

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Adaptations of University Campus Towards Climate Resilience Using Sponge City Concept

Nik Zaritz Edzrain[1], Noor Suzaini Mohamed Zaid[2]

[1] Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; 22005064@siswa.um.edu.my

[2] Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; suzaini_zaid@um.edu.my

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Abstract: Urban campuses are increasingly affected by climate change, facing frequent floods, extreme heat, and unpredictable weather. Universiti Malaya, situated in the flood-prone Klang Valley, is no exception. These hazards threaten not only the university's infrastructure but also the safety of staff and students, the continuity of academic functions, and the long-term sustainability of campus operations. While current flood mitigation measures include elements of green infrastructure, they remain fragmented and lack a fully integrated sponge city approach. This thesis proposes a framework for adaptation that prioritizes cross-departmental coordination, clearer technical guidelines, targeted interventions, and broader awareness of water-sensitive urban design. By adopting sponge city strategies, the university can achieve multiple benefits. Features such as vegetated systems, permeable surfaces, and retention areas can reduce flood risk, ease pressure on drainage networks, and enhance resilience during extreme weather. At the same time, these natural systems improve campus microclimates by lowering surface temperatures, boosting evapotranspiration, and providing shade. This helps reduce the urban heat island effect and supports greater thermal comfort for campus users. Overall, the sponge city model offers Universiti Malaya a comprehensive and climate-resilient pathway to safeguard its community and operations against current and future environmental challenges.

Keywords: adaptation, climate change, Universiti Malaya, sponge city

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Evaluating Thermal Comfort in High-Rise Low-Cost Residential Buildings in Tropical Climates: Focusing on Occupant Comfort and Environmental Interdependencies in Kuala Lumpur

Alia Syakirah binti Masran[1] and Norhayati Mahyuddin[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
22004933@siswa.um.edu.my

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya;
hayati@um.edu.my

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Abstract: Maintaining thermal comfort in tropical regions like Malaysia poses challenges due to high temperatures and humidity, particularly in high-rise, low-cost residential buildings. These buildings often lack proper insulation and ventilation, leading to poor thermal performance and increased occupant discomfort. Consequently, residents rely on mechanical cooling, which raises energy costs and environmental impacts. This study aims to evaluate thermal comfort levels in such buildings in Kuala Lumpur by examining the interplay between indoor temperature, humidity, ventilation, and other environmental factors. Furthermore, it explores adaptive strategies used by occupants to mitigate thermal discomfort and analyses their effectiveness in achieving acceptable comfort levels. The research adopts a mixed-methods approach, integrating on-site measurements with occupant surveys and interviews. Temperature, humidity, and ventilation data are collected from multiple units within a selected residential building. Simultaneously, surveys and interviews are conducted to understand residents' adaptive behaviours and perceptions of comfort. The study also investigates the interdependencies between thermal comfort, air quality, and humidity to provide a comprehensive understanding of the indoor environmental conditions in low-cost high-rise residences. Preliminary findings are expected to reveal the extent of thermal discomfort and the role of environmental interdependencies in shaping occupant experiences. This research aims to propose cost-effective and sustainable strategies to improve thermal comfort and indoor environmental quality. The outcomes are expected to contribute to the development of climate-responsive building designs and policy recommendations, enhancing the living conditions in low-cost tropical housing while reducing reliance on energy-intensive solutions.

Keywords: adaptive strategies, high-rise residential buildings, indoor environmental quality (IAQ), thermal comfort, tropical climate

TargetEV: Modelling Target Market of Electric Vehicles Using Artificial Neural Network & GIS

Jacqueline Jackie Kennedy[1] and Nabilah Naharudin[2]

[1] School of Geomatics Science and Natural Resources, College of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia; jacjackie20@gmail.com
[2] School of Geomatics Science and Natural Resources, College of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia; nabilahnaharudin1290@uitm.edu.my

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Abstract: This study aims to integrate of Artificial Neural Network in GIS for modelling target market of electric vehicles (EV). This is to explore the possibility of eliminating human interference in decision-making which in this study, to model the target market of EV. To test the method, the target market was first determined using ranking given by expert for the socio-demographic criteria influencing EV target market. Then, the target market was divided into two datasets to test the usage of ANN to determine the target market. Half of the study area was used as training samples to predict the target market for another half. The results of target market value derived using ANN was compared with ranking method to analyse the differences in the indices. Then, to test the efficiency of ANN, regression analysis and RMSE values were used. Results show that, the RMSE is 0.39 while regression R value is 0.99 indicating the goodness of fit of the results. This show that, it is possible to predict the target market of EV without any human interaction. In addition, it is also possible to predict other areas' target market using the sample dataset derived in this study.

Keywords: Artificial Neural Network (ANN), electric vehicles, GIS, neural fitting, target market

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Comparative Analysis of Fly Ash Characteristics from Various Power Plants in Malaysia for Sustainable Applications

Mohammad Aziem Zurqarnaen Bin Zurkefili[1] and Nurshafarina Binti Jasme[2]

[1] Department of Building Surveying Faculty of Built Environment University Malaya Wilayah Persekutuan 50603 Kuala Lumpur; 22004909@siswa.um.edu.my
[2] Department of Building Surveying Faculty of Built Environment University Malaya Wilayah Persekutuan 50603 Kuala Lumpur; shafarina@um.edu.my

Abstract: Fly ash, a byproduct of coal combustion, holds promise as a sustainable alternative material in construction. However, in Malaysia, the inconsistent quality of fly ash due to variations in coal sources and combustion processes that limits its practical use. This research addresses the lack of comparative data on fly ash from different local power plants, aiming to evaluate their suitability for construction applications alongside an alternative pozzolanic material, Eco-Processed Pozzolan (EPP). The study examined fly ash from four major Malaysian power plants such as Kapar, Manjung, Jimah, and Tanjung Bin and alongside with Eco-Processed Pozzolan (EPP) and compared them to control sample using Ordinary Portland Cement (OPC). Tests were conducted to assess mechanical strength such as compressive and flexural, workability such as flow table and paste flow, and microstructure using Scanning Electron Microscopy (SEM) and Energy-Dispersive X-ray (EDx) analysis. All samples were evaluated at 7, 28, and 56 days of curing to track both early and long-term performance. Findings show that fly ash from Manjung outperformed the others in terms of strength, workability, and microstructural development. Tanjung Bin also demonstrated good pozzolanic characteristics, with high silica and alumina content and fair hydration. In contrast, Jimah fly ash showed weak early strength, poor flowability, and a fragmented matrix, showing low pozzolanic reactivity. Control 1 confirmed expected performance with a dense C-S-H structure, while EPP, despite higher water demand, showed good long-term strength and supports waste valorization goals. Overall, the study underscores the influence of material source, composition, and morphology on performance. It also highlights the potential of certain fly ash types and EPP as sustainable alternatives in construction, aligning with environmental goals and circular economy practices.

Keywords: eco-processed pozzolan, fly ash, microstructure, pozzolanic material, sustainable construction

Perceptions of Rice Husk Ash Bricks as a Construction Material in Malaysia

Lin Chong Yuan[1] and Imaduddin Abdul Halim[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; linchongyuan123@gmail.com
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; maduddin@um.edu.my

Abstract: This study explores the potential of Rice Husk Ash (RHA) bricks as a sustainable alternative in the Malaysian construction industry. Addressing environmental concerns related to traditional brick production, such as resource depletion and high carbon emissions, this research focuses on utilizing rice husks, an agricultural byproduct, to manufacture eco-friendly bricks. The primary objectives of the study include the physical and chemical properties of RHA, evaluating its structural performance in comparison to conventional bricks, and identifying strategies for integrating RHA bricks into Malaysia's construction practices. By assessing both the environmental and economic implications, the research aims to promote the widespread adoption of RHA bricks, reducing waste, conserving natural resources, and contributing to sustainable development within the construction sector. The findings of this study will provide valuable insights to industry stakeholders, encouraging a shift toward greener, cost-effective building materials.
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Influence of Calcium Silicate Hydrate (C-S-H) Seeding on the Properties of Mortar Incorporating High-Volume Industrial by Products Replacement

Muhammad Yussof Imran Bin Mohd Zin[1] and Nurshafarina Binti Jasme[2]

[1] Department of Building Surveying Faculty of Built Environment University Malaya;
22004989@siswa.um.edu.my
[2] Department of Building Surveying Faculty of Built Environment University Malaya;
shafarina@um.edu.my

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Abstract: The production of Ordinary Portland Cement (OPC) contributes substantially to global CO_2 emissions, motivating a transition toward more sustainable construction materials. This study investigates the effect of chemically seeded Calcium Silicate Hydrate (C-S-H) as a performance-enhancing admixture in high-volume industrial by-product mortars comprising Ground Granulated Blast Furnace Slag (GGBS), fly ash, and OPC in a 10:40:50 binder ratio. Four dosages of seeded C-S-H (0.5%, 1.0%, 1.5%, and 2.0% by binder weight) were tested alongside a polycarboxylate-based water reducer. Fresh properties were evaluated using flow table tests, while compressive strength was measured at various curing intervals. Microstructural changes were analyzed via Field Emission Scanning Electron Microscopy (FESEM) and Energy Dispersive X-ray Spectroscopy (EDX). Results indicated that a 1.5% dosage of C-S-H provided the optimal balance between workability and early compressive strength. Microstructural observations confirmed enhanced gel densification and lower porosity in seeded mixes, especially Mix 3. These findings suggest that C-S-H seeding significantly accelerates early-age hydration in low-OPC cement systems, promoting the development of high-performance, sustainable cementitious materials with reduced clinker dependency.

Keywords: Calcium Silicate Hydrate, GGBS, fly ash, sustainable cementitious materials, early strength, workability, microstructure, low OPC binder

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Fire Evacuation Study on the Movement Characteristics and Behaviour of Pre-School Children in Malaysia

Tee Jia Rong[1] and Farid Wajdi Akashah[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; jia.rong1842@gmail.com
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; faridakashah@um.edu.my

Abstract: Fire outbreaks in pre-school and kindergarten buildings pose a significant threat to the safety of children, as evidenced by numerous global and local incidents in recent years. While research has been conducted on the preparedness and awareness of educators in Malaysian pre-school settings, a noticeable gap remains in studies specifically focusing on the movement characteristics and behavior of Malaysian pre-school children during fire outbreaks. Hence, this research aimed to investigate the evacuation movement and behavior of pre-school children during fire drills in Malaysia, with the goal of enhancing fire safety measures for children in fire emergencies. Fire drill experiments are conducted in 3 pre-schools at Malaysia to gather data on movement parameters and behaviour of the pre-school children during the evacuation drills. The data collected is analyzed using descriptive and regression analysis. This research discovered that the average horizontal travel speed of 0.62 m/s and a vertical travel speed of 0.30 m/s among preschool children during evacuation drills in Malaysia. The findings of this research are aligned to the influencing factors of the evacuation movement and behaviour of pre-school children during fire emergencies, namely leadership, built environment and age demographic. Recommendations for improving fire safety measures specific to pre-school children during fire emergencies in Malaysia are outlined based on the findings. These insights will help designers, and policymakers create safer educational spaces by integrating fire resilience into early design stages. Future studies should incorporate larger datasets and assess movement behaviour in varied emergency scenarios.

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Keywords: behaviour, fire evacuation, movement, pre-school children, travel speed

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The Influence of Material Evolution on Structural Integrity and Defects for Residential in Malaysian Construction History

Umaireen Mardhiah binti Ahmad Zaidi[1] and Zahiruddin Fitri bin Abu Hassan[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; 22005037@siswa.um.edu.my

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; zahiruddin@um.edu.my

Abstract: The evolution of construction materials in Malaysia, from traditional timber and brick to modern options like reinforced concrete and steel, has significantly influenced building design and structural integrity. This study aims to explore the historical progression of construction materials and their associated defects to inform better practices in contemporary architecture and engineering. The objectives include analyzing how material evolution has impacted structural strength and lifespan, identifying prevalent defects across different eras, and examining the role of construction technology in material performance. The objectives also encompass a detailed examination of how the choice of construction materials has influenced the structural integrity and longevity of residential buildings in Malaysia, as well as the identification of common defects associated with the use of different materials over time. The methodology involves case studies of residential buildings from various historical periods, site inspections, comparative analyses, and questionnaire surveys targeting industry practitioners and residents. Anticipated findings are expected to provide practical insights into defect mitigation strategies, ensuring safer, more durable structures in Malaysia's future construction endeavors. The study will also investigate the economic and environmental implications of material selection, as well as the influence of evolving building codes and regulations on construction practices. By understanding the historical context and lessons learned, this research seeks to guide the development of sustainable and resilient construction solutions that address the unique challenges faced by the Malaysian residential sector.

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Keywords: building defects, construction materials, construction practices, structural integrity, sustainable construction

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Flood Risk and Mitigation Strategies of Historic Building in Primary Heritage Zone Kuala Lumpur

Zainal Mohd Sam[1] and Nur Farhana Azmi[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya 50603, Kuala Lumpur, Malaysia; zainalsam20@gmail.com
[2] Centre for Building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603, Kuala Lumpur, Malaysia; farhanazmi@um.edu.my

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Abstract: Flooding has emerged as a critical concern in Kuala Lumpur due to localized rainfall from convective storms, posing significant risks to historic structures. These heritage buildings, while currently intact, face potential deterioration from recurring floods, which threaten their structural integrity and aesthetic value. The absence of flood-specific conservation guidelines for heritage buildings in Malaysia, in contrast to international practices, further exacerbates the issue. This research aims to address this gap by proposing targeted flood adaptation strategies into a localized context. The main objectives of this research are to identify impact of flood risk on heritage buildings, to examine both local and international guidelines and strategies for flood mitigation, and to propose tailored flood adaptation strategies for preserving Kuala Lumpur's heritage sites. Methodologically, the research is conducted through literature review studies on real risk evidence, existing regulations and guidelines. Additionally, the research employs a qualitative approach, gathering data from interviews with individuals responsible for flood management and heritage building conservation, as well as assessments from case studies focused on the primary heritage zone of Kuala Lumpur. The anticipated findings are expected to contribute significantly to the conservation of historic buildings by developing context-sensitive flood mitigation strategies. The anticipated findings are expected to support the conservation of historic buildings by developing strategies that bridge climate change challenges with existing regulations and practices, thereby strengthening the resilience of Kuala Lumpur's heritage sites against future floods.

Keywords: conservation guidelines, flood adaptations, flood mitigation strategies, historic buildings, premier heritage zone Kuala Lumpur, risks of flooding

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Towards Digital Transformation in Building Surveying: A Study on BIM Adoption and Collaborative Strategies in Malaysia

Farahniesa Raman[1] and Siti Hamidah Husain[2]

[1] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; [1]farahniesaraman@gmail.com

[2] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; sitihamidahhusain@usm.my

Abstract: Transformative digital tools such as BIM offer enhanced capabilities in visualization, coordination, data management and collaboration. Despite its significant advantages, BIM adoption among building surveyors, in both industry and education in Malaysia remains inconsistent due to a range of barriers, including technological challenges, insufficient training, and a rejection of changes in work methods. Thus, this study aims to examine the adoption of Building Information Modeling (BIM) within the field of building surveying, a position that plays an impactful role in ensuring the construction is aligned with legal requirements and technical standards and provides a safe building to users. This study is directed by three objectives: to identify key barriers hindering BIM adoption among building surveying practitioners and academicians; to assess the current approaches employed by them in leveraging BIM in their workflows; and next, to propose effective collaborative strategies between educational institutions and the industry in Malaysia. The findings show that technological, educational, and cultural/organizational are the main themes that were pointed out as major obstacles. Additionally, the current adopted practical approaches in leveraging BIM in their workflows include BIM integration in the classroom of teaching and learning, use of BIM to track energy efficiency and system performance, and advocacy for university-industry partnerships to strengthen BIM use. Additionally, collaboration strategies between industry and education have been proposed, aiming to enhance BIM adoption and training for building surveyors. Significantly, this research contributes to bridging the knowledge gap between education and industry by discounting the technology adoption in the building surveying field. This research promotes strategic collaboration in enhancing digital transformation within the construction and education sectors, aligning with global trends and fostering a more innovative as well as inclusive and equitable quality education in support of sustainable development goals initiatives.

Keywords: BIM, technology adoption, building surveyor, building surveying education, educational and industrial collaboration

Analysis Of Workability Rainwater Harvesting Drainage System in Reducing Flash Floods Risk in Historical City

Muhamad Fathi Bin Abd Rahman[1] and Nuzaihan Aras Agus Salim[2]

[1] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; Muhdfathi0499@gmail.com
[2] School of Housing, Building and Planning, Universiti Sains Malaysia, 10800 Gelugor, Penang; nuzaihanaras@usm.my

Abstract: This research investigates the role of rainwater harvesting drainage systems in reducing the risk of flash floods in Historical City, a city increasingly susceptible to flooding due to urbanization and climate change. The study begins with an overview of the challenges faced by cities experiencing rapid development, but new building construction is being carried out in Historic Cities, including the impact of waterproof surfaces that prevent natural water absorption and increase runoff during heavy rain seasons. Through a combination of quantitative analysis and qualitative case studies, this research evaluates existing drainage harvesting systems in the area, exploring their design, implementation, and effectiveness in managing the flow of the water during rainfall. The findings will show that rainwater harvesting drainage systems can significantly reduce the risk of flash floods by effectively capturing and storing excess rainfall. The data taken by the researchers will be analyzed using SPSS so that the study findings obtained are accurate regarding the effectiveness of the drainage system in historic cities. Future data results will show the characteristics of the drainage system that can accommodate water flow during heavy rain. By promoting infiltration and reducing surface runoff, this system not only contributes to reducing flood risk but also supports sustainable urban water management practices. Overall, this study can provide many benefits to the country in terms of financial and economic terms, namely reducing the destruction of infrastructure or public buildings in historic cities. It can also have a good impact on the community when the destruction of their homes will also be affected and their livelihoods in each rainy season will increase because disasters such as flash floods will hit places full of development due to every surface to be covered with buildings, tar roads, and so on. The researchers hope that this study can help stakeholders to emphasize drainage systems through design, appropriate types of drainage, and smooth water flow during heavy rains that hit historic cities to reduce the risk of flash floods through good drainage systems and compliance with construction laws.

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Keywords: workability of rainwater harvesting, drainage system, risk of flash flood

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Best Defect Rectification Strategies: Low-Cost Residential Flat Near the Coastal in Teluk Kumbar, Penang

Salahuddin Yusuf Bin Mohamad Nasir[1] and Norsafiah Norazman[2]

[1] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; syusuf6892@student.usm.my
[2] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; safiahazman@usm.my

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Abstract: Low-cost residential flats near coastal areas, such as those in Teluk Kumbar, Penang, are frequently exposed to harsh environmental conditions that accelerate building deterioration and contribute to recurring structural defects. This study aims to identify common building defects and evaluate the most effective rectification strategies applicable to such environments. Utilizing a comprehensive methodology that includes on-site building condition surveys, questionnaires administered to maintenance staff, and interviews with industry experts, the research explores the root causes of defects and assesses the practicality and success of existing rectification practices. The investigation primarily focuses on external building components and main access corridors, which are most visibly affected by deterioration. Findings reveal that moisture-related issues are the most prevalent defects, exacerbated by environmental exposure and construction vulnerabilities. Key findings highlight the importance of initiating preventive maintenance from early stages, closely monitoring on-site workmanship to ensure construction quality, and incorporating durable, weather-resistant materials during construction or retrofitting to minimize future defect risks. These insights support the development of cost-efficient, sustainable, and context-sensitive maintenance strategies, ultimately enhancing the longevity and resilience of low-cost residential developments in similar coastal settings.

Keywords: defect rectification, preventive maintenance, coastal housing, low-cost flats, building resilience

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Factors Influencing Home Purchasing Decisions Among Young Working Adults in Johor Bahru, Johor

Chong Yu Jian[1] and Indera Syahrul Bin Mat Radzuan[2]

[1] Department of Real Estate Management, Faculty of Technology Management & Business, University Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia; ap210066@student.uthm.edu.my

[2] Malaysia Real Estate Institute (MyREI), University Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia; syahrul@uthm.edu.my

Abstract: This research investigates the factors influencing homebuying decisions among young working adults aged 23 to 45 in Johor Bahru, Johor, Malaysia. The study aims to identify which independent variables, such as location, financial aspects, neighborhood, property attributes, and developer brand, have the most significant impact on their decision-making process. Using a convenience sampling method, primary data was collected through self-administered surveys distributed via Google Forms across various digital platforms over three months. A total of 304 respondents participated, providing insights into their preferences and priorities. The findings reveal that Neighborhood Factors, Property Attributes Factors, and Financial Factors have a significant positive influence on homebuying decisions, highlighting the importance of safety, property features, and affordability. In contrast, Location Factors and Developer Brand Factors were found to have no significant effect. The study suggests further exploration into additional variables and the use of diverse sampling methods to enhance the reliability and generalizability of the results.

Keywords: buyer's preferences, consumer purchase decision, homebuying decision, homebuying factors, young-working adults

The Project of School For 825 Students

Maria Borisenkova[1]

[1] Saint Petersburg State University of Architecture and Civil Engineering, 4, 2nd Krasnoarmeiskaya Str., St Petersburg, 190005; mariaborisenkova.arch@gmail.com

Abstract: The project of a comprehensive school for 825 students exemplifies modern educational architecture. Designed for a new residential quarter on Matisov Island in St. Petersburg, school is serving primary, secondary, and high levels. The building is situated at the heart of the neighborhood, adjacent to a pedestrian street, ensuring safe access for children via a landscaped alley, by preventing the need to cross roadways en route to the institution. A cantilevered ledge housing the media library draws attention to the main facade, creating a striking visual identity. The building's form is conceived as an intersection of two volumes, offering a modern take on the classic Soviet school typology, where a central node connects two educational blocks. The sloping green multifunctional rooftop emphasizes the building's dynamic perspective while offering educational opportunities: the rooftop hosts science classes such as biology and physics and physical education, including skiing and snowboarding. Primary and middle school classrooms and the high school are located in separated wings. The intersection of the building volumes contains a naturally lit auditorium with skylights, adjacent to a canteen, ensuring clear separation between younger and older students. Workshops are situated on the semi-basement level, opening onto an inner courtyard that features an amphitheater and small vegetable gardens for hands-on science lessons accessible directly from the classrooms. The far ends of the intersecting volumes house gyms and pools with outdoor access to recreational areas located in the southern part of the site. Service and delivery access is provided via a public parking area beneath the pedestrian promenade. The school is characterized by balancing both modern functionality and a nod to historical typologies. Finishing material palette, including brick, wood-textured fiber cement panels, and micro-cement finishes, ensuring both aesthetic harmony and durability. The project creates a harmonious learning environment while addressing contemporary educational needs.

Keywords: cantilevered ledge, inner courtyard, modern educational architecture, multifunctional rooftop, nod to historical typologies

Challenges in the Conservation of the Perak Museum Building in Taiping

Mohamad Ikmal Mat Piyan[1] and Indera Syahrul Mat Radzuan[2]

[1] Department of Real Estate Management, Faculty of Technology Management & Business, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia; ap210437@student.uthm.edu.my

[2] Malaysian Real Estate Institute (MyREI), Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, Malaysia; syahrul@uthm.edu.my

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Abstract: The conservation of heritage buildings is a crucial effort to ensure the preservation of a nation's history and culture for future generations. This study focuses on the Perak Museum in Taiping, a historic building over 100 years old that holds significant historical value as an educational and tourism center. This study uses an interview method to answer the objective and the research questions. The objectives of this study are to explore the background of the Perak Museum, whilst to identify the challenges in its conservation efforts, and to examine the initiatives undertaken by the museum operator. The findings reveal several key challenges in conserving the Perak Museum, including difficulties in sourcing appropriate replacement materials, a shortage of skilled conservation professionals, and incomplete documentation regarding the historic building. Despite these challenges, the museum has undertaken various conservation measures to maintain the building's authenticity and integrity. This study highlights the importance of preserving heritage buildings specifically the Perak Museum, so as to ensure Malaysia's cultural heritage remains relevant and valued by the society. The findings not only raise awareness of the historical value of heritage buildings but also provide essential references for future conservation efforts in Perak, Malaysia.

Keywords: challenges, conservation, heritage building, Perak Museum

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Multipurpose Wardrobe for Rental Room Dwellers at Industrial Areas: A Space-Saving Solutions

Nurul Aqilah Binti Mohamad Zaki[1]

[1] Department of Applied Arts and Design, Kulliyyah of Architecture and Environmental Design, International Islamic University Malaysia, 53100 Gombak, Selangor, Malaysia; nurulaqilahmohdzaki59@gmail.com

Abstract: With Malaysia's ongoing industrial growth and urban migration, many individuals, especially students and workers choose to live in rental rooms located near industrial areas. These living spaces are often small and insufficiently furnished, creating challenges in terms of organization, comfort, and space management. Traditional wardrobes take up significant floor space and usually do not cater to multifunctional needs, especially when users also require work or study areas. This study aims to propose design considerations for a multipurpose wardrobe that integrates a working table, targeting rental room dwellers in compact spaces. These design considerations are also intended to tackle challenges like space limitations, disorganized environments, and the demand for integrated storage and working solutions within compact living areas. The research employed three key methods: (1) product line-up analysis, evaluating existing wardrobe designs based on dimensions, materials, features, usability, aesthetics, and functionality; (2) a questionnaire, involving 51 respondents, to gather data on user habits, challenges, and preferences; and (3) observation with a checklist, focusing on room layout, furniture types, organization, storage behavior, and space utilization. The findings reveal that rental room dwellers prioritize compact, efficient, and multifunctional furniture. Key design features identified include foldable tables, vertical storage, modular compartments, and lightweight yet durable materials. The results also highlight the importance of aligning design with user behavior, needs, and preferences, particularly in relation to storage patterns and study habits. This study provides practical design insights for creating space-saving furniture tailored to urban rental environments. Future recommendations include exploring adjustable and modular designs that can adapt to different room sizes and user requirements. The proposed design considerations aim to improve living quality while maximizing functionality in compact rental spaces.
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Keywords: multipurpose wardrobe, space-saving furniture, rental room dwellers, compact living, furniture design

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Concert Hall Complex Project

Sofiia Krivdina[1]

[1] Saint Petersburg State University of Architecture and Civil Engineering,4, 2nd Krasnoarmeiskaya Str., St Petersburg, 190005; Krivdinasofia@gmail.com

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Abstract: The design site is located in the historic center of Brest, bordered by Fomina Street, Heroes of the Defense of the Brest Fortress Street, and a recreational area. The concert complex design focuses on creating clear compositional axes and organizing pedestrian flows. Two main axes are defined: one parallel to Heroes of the Defense of the Brest Fortress Street, extending the park's alley, and another running along the length of the site. Pedestrian traffic comes from two main directions—public transport stops and the park alley—which determined the placement of the complex and the layout of its entrances. The -1st floor is designed as a pass-through space. The landscaping incorporates the park's water features, with added artificial ponds. A raised parking area is placed in the north to preserve green spaces, while an open-air amphitheater with a stage is located in the northwest for events. For the theater complex, special attention was given to connecting different functional zones and their interaction. The concert hall is the central element, with circulation supported by stairs, elevators, and a central ramp that doubles as an exhibition space. The concert hall's design draws inspiration from Brest's identity: The main hall volume references the lanterns of Sovetskaya Street. The Belovezhskaya Pushcha inspired the restaurant supports and ramp structure. Traditional Belarusian patterns are used in perforation details. Architecturally, the theater complex features bold elements like the protruding hall volume, which creates a strong vertical accent. This serves as a visual landmark, reinforcing the theater's cultural role and connecting different parts of the city through this focal point.

Keywords: artificial pond, cultural landmark, exhibition space, perforation, multifunctional rooftop

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Inventory of Historic Places: A Method for Establishing Place Significance

Nur Hamizah binti Md Afiza[1] and Nur Farhana binti Azmi[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; 22004934@siswa.um.edu.my

[2] Centre for building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; farhanazmi@um.edu.my

Abstract: This study explores the importance of maintaining up-to-date inventories of heritage sites, with a particular focus on regions lacking proper inventory systems which is in Sungai Lembing, Pahang. The research highlights the importance of conducting proper documentation to identify and protect culturally and historically significant sites. Also, to investigates why updating the inventory of places is crucial for preservation and proposes strategies for developing efficient inventory systems. By emphasizing the significance of comprehensive and accurate inventories, this study aims to provide valuable insights into improving heritage management practices and ensuring the protection of culturally and historically significant sites for future generations.

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Airport Interior Design Project "Bridge Over the Canal"

Yandubaeva Valeriia Ilinichna[1]

[1] Architectural faculty, Saint Petersburg State University of Architecture and Civil Engineering; yalera.gl@gmail.com

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Abstract: The airport building which was designed, is located in the Vyborg district of the federal city of St. Petersburg, Russia. The capacity of the airport terminal is 600 people per hour. A difficult task was set when the airport complex project was being created - the creation of an airport that takes into account the context of St. Petersburg. This revealed the main conceptual code of the project – the bridge over the canal. The main symbol of St. Petersburg are bridges, so the visual image was based on two main symbols of St. Petersburg - the Palace and Bolshoy Obukhov bridges, the first of which is a drawbridge, and the second is cable–stayed. Thus, the image of the projected airport complex resembles a drawbridge supported by cable-stayed structures. In addition to designing the exterior of the airport complex was created the interior design of the airport's main facility - the check–in area. So this project was submitted to the competition. The main spatial planning element of the terminal is the check-in hall. This is a two-light linear room. The space connects the forecourt with the apron. Two groups of escalators lift passengers onto the bridge connecting the catering and screening area. The main idea of the interior was to create an atmosphere of being under the bridge. The spatial truss of the coating, which is held by cable-stayed structures, is very delicate and its details resemble the glare of water under the bridge. Also, the street channel on the forecourt turns into a channel in the interior, passing along which passengers are directly below the drawbridge, watching the play of light, glare from the water. Large-span cable-stayed structures consisting of a spatial truss are connected above a two-light hall, creating a continuous transition between the forecourt and the apron. All the details of the interior are imbued with the idea of proximity to the water. Glass fish shades are suspended above the ceiling. LED filaments are used as lighting devices under the bridge crossing, which create a flow effect. The columns are made of glass and create a soft diffused light. The walls are decorated with 3D panels depicting streams of water. There is a map of the canals of St. Petersburg at the reception desks. Natural stone and light-colored wood were used as materials, which adds environmental friendliness and connection with nature to the interior.

Keywords: environmental friendliness and connection with nature, the bridge over the canal, the check–in area, the glare of water, St. Petersburg, to create an atmosphere of being under the bridge

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A Study on Sustainable Facilities Management (SFM) Practices Among Hotels in Klang Valley

Izzatul Zuhrah Binti Muhamad Zaidi[1] and Nik Elyna Myeda[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; 22005010@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; elyna@um.edu.my

Abstract: The hotel industry contributes significantly to environmental degradation through high energy consumption, water use, and waste generation. Sustainable Facilities Management (SFM) offers an effective pathway to reduce these impacts through energy management, water conservation, and waste management. Drivers for SFM adoption include regulatory compliance, cost reduction, corporate social responsibility, and increasing consumer demand for sustainable practices. This study explored current SFM practices, impacts, challenges, and strategies among selected 4- and 5-star hotels in Klang Valley through case studies, interviews, and observations. Common practices identified include energy-efficient lighting, low-flow water fixtures, and structured waste reduction initiatives. These initiatives help reduce utility costs and environmental impact. However, challenges such as financial constraints, lack of technical expertise, and limited staff training were identified. The study highlights the need for stronger internal policies, regular staff training, and government support to enhance sustainability in hotel operations. These findings contribute to advancing Malaysia's sustainability agenda.
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Keywords: sustainability, facilities management, sustainable facilities management, hotel industry

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Digital Transformation Challenges in Facility Management: Barriers to Implement Smart Maintenance Solutions in Office Building

Nurul Zarifah Binti Shaharuddin[1] and Cheong Peng Au-Yong[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur; 22004961@siswa.um.edu.my
[2] Centre for Building, Construction & Tropical Architecture (BuCTA) Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur; auyongcp@um.edu.my
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Abstract: Digital technologies are changing the management of buildings, as smart maintenance solutions present considerable chances to improve operations. These solutions employ technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and predictive analytics to optimize maintenance, lower energy use, and enhance efficiency. Smart maintenance reduces costs while promoting sustainability and increasing the lifespan of building systems through real-time monitoring, predictive repairs, and automated adjustments. Nonetheless, smart maintenance solutions adoption continues to be low, especially in office structures. This research investigates the barriers preventing the adoption of smart maintenance solutions. Main barriers consist of the substantial upfront expenses associated with technology implementation, barriers in integrating with outdated legacy systems, and insufficient skilled workers to oversee sophisticated tools. This research aims to provide actionable insights and recommendations to overcome the barriers to implement smart maintenance solutions, fostering a transition toward more efficient and sustainable facility management practices. The selected method used for collecting data is qualitative method approach by conducting interview session with experts from facility management team of chosen office buildings in Klang Valley. In this way, the research aims to connect the potential of smart maintenance with the actual circumstances of its implementation. The results will equip facility managers, building owners, and policymakers with understanding to address these challenges, promoting smarter, more energy-efficient, and sustainable practices in building management.

Keywords: digital technology, facility management, smart maintenance solutions, office building, sustainable practice

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Exploring The Challenges of Building Information Modelling (BIM) Implementation in Green Building Operation and Maintenance: A Pathway to Sustainable Building Practices

Wan Muhamad Ridzuan Wan Norisham[1] and Nuratiqah Aisyah Awang @ Mat Nawi[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, Wilayah Persekutuan 50603 Kuala Lumpur; 22004985@siswa.um.edu.my

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, Wilayah Persekutuan 50603 Kuala Lumpur; nuratiqahaisyahawang@um.edu.my

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Abstract: Building Information Modelling (BIM) has become a pivotal tool for driving digital transformation across all phases of a building's lifecycle, yet its integration during the operation and maintenance (O&M) stage, especially in green buildings remains underutilized. This study investigates the critical challenges associated with BIM implementation in the O&M phase of green-certified buildings in Malaysia, with a focus on enhancing long-term sustainability performance. Employing a qualitative case study methodology, the research draws insights from semi-structured interviews with key stakeholders and examines five buildings certified under the Green Building Index (GBI), varying from Platinum to Certified ratings. The findings reveal that despite policy advancements and growing BIM awareness, integration at the O&M stage is hindered by limited stakeholder expertise, resistance to workflow change, interoperability issues, and the lack of structured data management. Notably, only one out of the five buildings adopted BIM during O&M, underscoring the prevailing focus on early project phases. This study contributes to the literature by highlighting the misalignment between sustainability objectives and digital practice in building management. It also proposes a strategic pathway for bridging this gap through targeted capacity-building, policy reinforcement, and lifecycle-based BIM implementation frameworks, thereby supporting Malaysia's transition towards a greener built environment.

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The Challenges of Supply Chain Management (SCM) In Industrialised Building System (IBS): Case Study in Selangor

Amira Aisyah Binti Aini[1] and Seow Ta Wee[2]

[1] Department of Construction Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia; cp210020@student.uthm.edu.my
[2] Department of Construction Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia; tawee@student.uthm.edu.my

Abstract: This research explores the challenges in supply chain management (SCM) within the Industrialised Building System (IBS) in Selangor, focusing on fragmentation, inefficiencies, and a shortage of skilled labour. The objective for this study is the challenges of supply chain management in IBS and the solutions of supply chain management in IBS. The disjointed nature of the IBS supply chain hampers the timely arrival of components, causing project delays and increased costs. Moreover, a lack of collaboration among construction parties worsens these inefficiencies. A quantitative research method was used, gathering data from 30 IBS suppliers through structured questionnaires. Using SPSS, the data was analysed to find the links among challenges. The results indicate that the adoption of advanced technologies like Building Information Modelling (BIM), enhanced communication among all parties, and the standardisation of IBS components can greatly improve SCM efficiency. Additionally, proactive cost management strategies and workforce training programs are crucial to tackling labour shortages and enhancing project outcomes. These actions promote better coordination, reduce delays, and optimise resource use. The study highlights that effective collaboration, bolstered by strong digital tools, can alleviate fragmentation and allow real-time material tracking. By stressing the importance of strategic SCM approaches, this research offers practical insights to address operational challenges in IBS projects. The conclusions emphasise the necessity for sustainable SCM tactics to ensure the timely delivery of high-quality components and foster the wider adoption of IBS in Selangor. Ultimately, this study aids in the evolution of a more efficient, innovative, and sustainable construction industry in Selangor and beyond.
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Keywords: construction industry, industrialised building system (IBS), supply chain management (SCM)

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Integrating Internet of Things (IoT) Technology Adaptation for Smart Waste Management System in Penang

Ching Zhi Yi[1] and Nuzaihan Aras Agus Salim[2]

[1] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; Zhiyiching@student.usm.my
[2] Nuzaihan Aras Agus Salim' Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; nuzaihanaras@usm.my

Abstract: Rapid urbanization in Penang has led to a sharp increase in municipal solid waste, exposing the limitations of conventional disposal methods such as landfilling and incineration. These practices not only strain the island's environmental capacity but also incur rising operational costs, underscoring the urgent need for more sustainable waste management strategies. This study investigates the applicability of Japan's Smart Waste Management System (SWMS) which employs Internet of Things (IoT) sensors to optimize collection schedules, enhance recycling rates, and reduce environmental footprints to the Penang context. Through a mixed-methods case-study approach, site observations was conducted, distributed surveys to households and waste-collection crews, and interviewed key stakeholders at the Penang Municipal Council. A subsequent SWOT analysis identified critical strengths (e.g., data-driven decision support), weaknesses (e.g., infrastructure gaps), opportunities (e.g., public–private partnerships), and threats (e.g., regulatory barriers) associated with SWMS adoption. The research findings reveal that, while IoT-enabled monitoring can yield significant efficiency gains and community engagement, successful implementation in Penang hinges on targeted investments in digital infrastructure, stakeholder capacity building, and adaptive policy framework. By proposing a phased rollout plan and risk-mitigation strategies designed to guide policymakers and local authorities toward a scalable, high-impact smart-waste model advancing both environmental sustainability and operational resilience in Penang.
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Keywords: smart waste management systems, IoT-based waste management, waste management challenges, sustainable waste solutions, Japan waste management model, Penang waste management

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The Maintenance Challenges of Green Buildings in Malaysia

Gwyneth Lo[1] and Mohd Azrai Azman[2]

[1] Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, MALAYSIA; gwynethlo99@gmail.com
[2] Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, MALAYSIA; mohdazrai@uitm.edu.my

Abstract: The growing demand for green buildings in Malaysia, across residential, commercial, and institutional sectors, has been driven by national green building policies and sustainable procurement initiatives. However, currently, only a few buildings have been managed according to the expected high standards for maintaining certified green building, limiting their long-term environmental and performance benefits expected in the long run. Therefore, uncovering the maintenance challenges that hinder the long-term performance of green buildings in Malaysia is critical. In response, the study aims 1) to examine the operation and maintenance (O&M) management factors that affect green building performance, 2) to identify the issues and challenges involved in implementing green building maintenance. 3) to investigate the maintenance strategies to ensure sustain green building performance. A qualitative approach was adopted, involving semi-structured interviews with facility and building managers of certified green buildings in Selangor and Kuala Lumpur. Thematic analysis was conducted using ATLAS.ti application to code and interpret data. The findings reveal that inadequate technical expertise with experience in green building maintenance, limited access to certified sustainable materials, budget constraints, and insufficient planning contribute to maintenance challenges of green-certified buildings. Moreover, the study highlights that those proactive strategies, including regular inspections, skilled staffing, and preventive maintenance planning, are critical to ensure green buildings operate at optimal performance levels. The study contributes to both academic literature and practical understanding by highlighting the gaps in current green building maintenance practices and offering insights for policymakers, practitioners, and facility management teams to enhance sustainability outcomes in Malaysia's green building certifications initiative.
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Keywords: green building, Malaysia, operation and maintenance, sustainable performance, thematic analysis
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Life Cycle Assessment Approach of Vertical Green System: A Case Study of Green Building

Irwin Chai Ming You[1] and Brit Anak Kayan[2]

[1] Department of Building Surveying Faculty of Built Environment University Malaya;
mingyou11242002@gmail.com
[2] Department of Building Surveying Faculty of Built Environment University Malaya;
brit284@um.edu.my

Abstract: Vertical green systems (VGS) are innovative solutions that integrate plants onto building facades, enhancing sustainability and promoting the reduction in carbon emissions. Despite their benefits, the life cycle assessment (LCA) of VGS systems reveals significant carbon emissions, particularly during the maintenance phase. This research aims to evaluate the embodied carbon in maintenance phase of the VGS system. There are 3 aspects covered in this research including the embodied carbon emissions from VGS system using life cycle assessment approach, the maintenance method of VGS system and recommendation of repair strategies in reducing the carbon emission in maintenance of VGS system. This research adopted qualitative approaches, including semi-structured interviews, visual inspection, and online database analysis. The study is also adopted life cycle assessment approach within cradle-to-site boundary to quantify the embodied carbon emissions associated with VGS system maintenance. The findings highlight the carbon emissions during maintenance phase of VGS, providing a basis for establish repair impact strategies to reduce emissions and improve the system's sustainability. This study provides practical solutions for reducing maintenance-related carbon emissions but also seeks to raise public awareness about the sustainable repair in VGS system. By encouraging developers to adopt these systems, the research supports broader implementation of sustainable practices in the built environment. In the context of sustainable development, this research supports several United Nations Sustainable Development Goals (SDGs), including: SDG 11 (Sustainable Cities and Communities), by promoting greener and more liable urban environments; SDG 13 (Climate Action), through strategies that reduce greenhouse gas emissions; SDG 12 (Responsible Consumption and Production), by encouraging the use of durable, low-impact materials.
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Keywords: green maintenance, life cycle assessment, sustainable repair, vertical green system

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A Study of Traffic Congestion Problems in Bukit Tinggi City, Klang

Kho Teng Pang[1] and Seow Ta Wee[2]

[1] Department of Construction Management,Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia,86400, Parit Raja,Batu Pahat,Johor ,Malaysia; ap210076@student.uthm.edu.my

[2] Department of Construction Management,Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia,86400, Parit Raja,Batu Pahat,Johor ,Malaysia; tawee@student.uthm.edu.my

Abstract: Traffic congestion has become a significant issue in Bukit Tinggi, Klang due to rapid urban growth, poor public transportation infrastructure, inadequate urban planning, and high population density. This study aims to identify the causes of traffic congestion, analyze its impact on residents' quality of life, and propose mitigation strategies. The research employs a mixed-methods approach, combining quantitative surveys to identify issues and propose solutions, alongside qualitative interviews with the Public work Department of Malaysia for deeper insights. The respondents include local residents of Bukit Tinggi, Klang. The findings reveal that the proposed strategies, such as improving road infrastructure, enhancing public transportation, promoting bicycle and electric vehicle use, and implementing policy reforms, were strongly supported, with a mean score of 3.6138.The causes of congestion were rated at a moderate level (mean score 2.9974),and its impact on quality of life was also moderate (mean score 3.2594).In conclusion, implementing the proposed strategies in a comprehensive and coordinated manner is essential to improving residents' quality of life and addressing the traffic congestion issue effectively in Bukit Tinggi, Klang.
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Keywords: road, traffic congestion, descriptive data, problems, strategies

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Enhancing Quality Assessment System (QLASSIC) Implementation for Construction Companies

Muhammad Nurimran Bin Roslan[1] and Sulzakimin Bin Mohamed[2]

[1] Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn Malaysia, 86400, Batu Pahat, Johor Darul Takzim, MALAYSIA; cp210055@student.uthm.edu.my
[2] Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn Malaysia, 86400, Batu Pahat, Johor Darul Takzim, MALAYSIA; zakimin@uthm.edu.my

Abstract: This study was conducted to enhance Quality Assessment System (QLASSIC) implementation for the construction company. The Construction Industry Development Board (CIDB) and the Technical Committee on Quality Assessment in Construction have introduced QLASSIC for the Malaysian Construction to address the issue of impact on quality concerns in the construction sector like the quality assurance, working environment, productivity of workers and the lack of internalization recognition. Since its debut in November 2006, this assessment system has not been widely implemented. Contractors and developers in Malaysia did not fully apply QLASSIC and treated it nonchalantly. The purpose of this study is to ascertain how improvement on QLASSIC implementation can be made. To accomplish the goal, two objectives have been laid down, first, is to identify the current issues in QLASSIC and the second objective is to suggest strategies to improve QLASSIC. To achieve the objectives of this study, qualitative methods through interviewing 7 respondent were used for this study. The key findings are that time allocation can be impacted when to make sure that design details and specifications meet QLASSIC requirements, construction companies need to devote more time to project planning. Other than that, the main strategies to improve the QLASSIC implementation is for construction players to develop and enhancing the availability of high-quality materials. Availability and comprehension among supplier are critical for successful implementation. The results of this study are expected to provide information to various parties such as construction personnel and the future researcher.

Keywords: quality assessment system, enhancing implementation, construction company

Enhancing Student Wellbeing Through Effective Stress Management: A Study on Quantity Surveying Students in Malaysian Public Universities

Muhammad Razzdee Husin[1] and Mohd Arif Marhani[2]

[1] Studies of Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor; 2023125637@student.uitm.edu.my

[2] Studies of Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor; arif2713@uitm.edu.my

Abstract: The well-being of university students, particularly those in demanding academic disciplines, has become a growing concern in Malaysia. Quantity Surveying (QS) students in public universities are notably vulnerable to high stress levels due to academic pressure, time constraints, and performance expectations. This research aims to investigate the stress management strategies that can enhance the well-being of QS students in Malaysian public universities. The research specifically seeks to (i) identify the factors contributing to stress among QS undergraduates, (ii) determine the impact of the stress on their academic performance, and (iii) recommend effective strategies for stress management to improve student well-being. A quantitative research design was adopted, utilising a structured questionnaire distributed to 302 QS students from three Malaysian public universities. Data were analysed using descriptive statistics. The findings revealed that academic workload, time management issues, and future career concerns are primary sources of stress. The research also found that students commonly employ coping strategies such as time management techniques, social support, and physical activities, although the effectiveness of these strategies varied. It is recommended that universities implement targeted interventions, including stress management workshops, mental health awareness campaigns, and support systems specifically designed for the QS academic context. Research concludes that proactive stress management not only alleviates students' psychological burdens but also fosters a healthier, more productive learning environment. These findings provide valuable insights for educational policymakers and university administrators seeking to enhance student well-being through structured and sustainable stress reduction strategies.

Keywords: student wellbeing, stress management, quantity surveying students, higher education, strategies enhancing student wellbeing through effective stress management: a study on quantity surveying students in Malaysian public universities

Customary Land Rights and Government Acquisition for Land Development in Sabah

Noah J. Adrian Gulis[1] and Sulzakimin Bin Mohamed[2]

[1] Department of construction Management, Faculty of Technology Management and Business University Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, Johor, MALAYSIA; cp210044@student.uthm.edu.my

[2] Department of construction Management, Faculty of Technology Management and Business University Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, Johor, MALAYSIA; szakimin@uthm.edu.my

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Abstract: The management of land in Sabah, Malaysia, is shaped by a complex interplay of customary laws, colonial legacies, and modern regulations. Governed by the Chief Minister and State Cabinet, institutions like the Sabah Forest Reserve and Land and Survey Department oversee land governance. Native land claims, protected under the Sabah Land Ordinance, face challenges due to gaps in the legal framework, lengthy titling processes, and unresolved overlapping claims, leaving many communities unrecognized. This study investigates compensation mechanisms, socioeconomic impacts, and improvement strategies related to customary land rights and government land acquisition in Sabah. Using a qualitative approach, data was collected through semi-structured interviews with six respondents, Which are 3 government officials, 2 landowners, and 1 developer. Findings reveal that while formal procedures, such as compensation offer letters and direct bank deposits, are in place, challenges persist due to outdated valuation methods, bureaucratic delays, and lack of transparency. Indigenous communities struggle to secure fair compensation, with overlapping claims and limited public participation further complicating the process. Developers face obstacles related to Native Customary Rights (NCR) and local resistance, leading to project delays and increased costs. In addition, improvement strategies necessitate for increased transparency in land acquisition SOP and enhanced technology integration, increased government staff capacity training, fostering community engagement, and conducting public awareness campaigns. The results of this research aims offer significant insights for enhancing the management of land issues in Sabah and promoting more fair and sustainable land management practices.

Keywords: compensation mechanism, improvement strategy, land acquisition, socio-economic impact

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Foreign Labour Management from Contractor's Perspective in Malaysia Construction Industry

Nur Hanani binti Adnan[1] and Ku Mohammad Asyraf bin Ku Azir[2]

[1] Faculty of Built Environment, Universiti Teknologi MARA, Shah Alam, Selangor Malaysia; 2020873644@student.uitm.edu.my, 2asyraf765@uitm.edu.my
[2] Faculty of Built Environment, Universiti Teknologi MARA, Shah Alam, Selangor Malaysia; asyraf765@uitm.edu.my

Abstract: The increasing reliance on foreign labour to meet infrastructure demands has highlighted the need to understand and address the complex challenges contractors face in managing this workforce effectively. With this consideration, this paper was conducted to examine the current practices of foreign labour management in the Malaysian construction industry, identify the challenges faced by contractors, and to suggest effective strategies in managing foreign labour in Malaysia's construction industry. The method of this study involves quantitative method where primary data were collected using questionnaires that consist of 7 sections which were distributed among G4 to G7 contractors in Shah Alam, Selangor with the total number of respondents is 36 contractors. Statistical methods such as descriptive analysis and frequency analysis were employed to summarise and interpret the data, providing insights into response patterns, central tendencies, and the overall distribution of responses among the contractors. From the analysis, the findings shown the vital role of foreign labour in addressing workforce shortages and ensuring timely project completion in Malaysia's construction industry, while also emphasising the need for improved management strategies such as structured training programs, enhanced communication practices, and clearer guidelines to support more effective integration and oversight of foreign workers. Meanwhile, it identifies cultural differences and the complexity of Malaysia's legal and regulatory framework as the primary challenges faced by G4–G7 contractors in managing foreign labour effectively. Therefore, the study concludes that foreign labour is essential to the Malaysian construction industry due to local labour shortages, but effective management is crucial. Contractors must adopt strategies to ensure smooth operations and better workforce integration. This study suggests that effective foreign labour management is crucial for Malaysia's construction industry. By adopting better management practices, aligned with CIDB Malaysia's goals, contractors can improve efficiency and support the industry's growth and infrastructure development.

Keywords: foreign labour management, contractor, Malaysia construction

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The Role of Building Information Modelling (BIM) in Enhancing Cost Estimation Accuracy for Quantity Surveyors in Construction Projects

Nur Yumni Najihah Yusoff[1] and Anis Sazira Bakri[2]

[1] Centre of Studies for Quantity Surveying, Faculty of Built Environment Universiti Teknologi MARA Shah Alam; najihahyusoff01@gmail.com
[2] Centre of Studies for Quantity Surveying, Faculty of Built Environment Universiti Teknologi MARA Shah Alam; anis333@uitm.edu.my

Abstract: Accurate cost estimation is a vital part of the construction project lifecycle, particularly in the tendering and budgeting phases. However, Quantity Surveyors (QS) often face challenges in producing reliable estimates due to factors such as incomplete project data, design changes, and scope uncertainties, leading to complications in budget control, cost overruns, and increased risk of estimation errors. Building Information Modelling (BIM) has emerged as a powerful digital solution to address these issues by improving the precision, efficiency, and reliability of cost estimation methods. BIM enables more accurate quantity take-offs, fosters better collaboration among project teams, saves time, and aligns budgeted costs with actual expenditures. This study examines the role of BIM in enhancing cost estimation accuracy for Quantity Surveyors in Kuala Lumpur's construction projects, a region known for its rapid urban development and complex project demands. This study examines the role of BIM in enhancing cost estimation accuracy for Quantity Surveyors in Kuala Lumpur's construction projects, a region known for its rapid urban development and complex project demands. The research objectives are to evaluate the impact of BIM integration on the accuracy and reliability of cost estimation techniques used by Quantity Surveyors, to identify and analyse key challenges in implementing BIM for cost estimation, and to propose strategies to enhance cost estimation accuracy through effective BIM application. Although BIM offers significant benefits, challenges such as high initial costs, lack of training, software complexity, and data integration issues can hinder its adoption. This research, grounded in a comprehensive literature review, aims to provide insights into the effectiveness of BIM in the early stages of project cost estimation, supporting more accurate budgeting and financial planning. The expected outcomes highlight that BIM enhances cost estimation accuracy, reduces time, and promotes stronger collaboration, ultimately contributing to more efficient cost management in construction projects.

Keywords: budget control, BIM, cost estimation, construction projects, quantity surveyors

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Facility Management & Quality of Living for Elderly in Old Folk Homes

Nurul Fatini binti Mohd Nizam[1] and Nuratiqah Aisyah Awang @ Mat Nawi[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; [1]22004906@siswa.um.edu.my

[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya; nuratiqahaisyahawang@um.edu.my

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Abstract: The rapid aging of Malaysia's population, projected to become an aged nation by 2040, has highlighted the critical need for improved facilities in old folk homes. Elderly residents in old folk homes rely heavily on facilities to maintain their quality of life. Many elderly residents face challenges related to inadequate facility design, including limited accessibility, safety risks, and insufficient inclusivity, which adversely affect their quality of life. These issues are compounded by a lack of comprehensive guidelines for planning and managing elderly care facilities. Current practices often fail to address the specific needs of residents, leading to dissatisfaction and discomfort among the elderly population. The methodology involves a mixed-methods approach. Quantitative data will be collected through structured surveys targeting elderly residents, staffs and facility managers. Qualitative insights will be gathered through interviews and observational studies to understand the lived experiences of the elderly. Case studies, surveys, and interviews with elderly residents, staffs and facility managers are utilized to identify critical factors influencing the quality of life in old folk homes and propose actionable recommendations for improvement. The findings emphasize the importance of implementing resident-centered designs, improving safety measures, and aligning facilities with established guidelines such as Pelan Struktur Kuala Lumpur 2040 (PSKL2040). These proposed strategies aim to create safer, more inclusive environments, ultimately improving the quality of life for elderly residents in Malaysia's old folk homes.

Keywords: aged population, elderly care, facility management, old folk homes, quality of living

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Study on the Maintenance Level of Heritage Buildings in Sandakan, Sabah

Pang Shao Dong[1] and Indera Syahrul Mat Radzuan[2]

[1] Department of Real Estate Management, Faculty of Technology Management & Business, University Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, MALAYSIA; ap210074@student.uthm.edu.my
[2] Malaysian Real Estate Institute (MyREI), University Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, MALAYSIA; syahrul@uthm.edu.my

Abstract: This research studies the maintenance level of heritage buildings in Sandakan, Sabah. The current maintenance level on heritage buildings and the maintenance impacts on heritage buildings are the objectives in this research. There are six heritage buildings within the Sandakan Heritage Trail that have become the subject of study. While two methods are adopted in this research to collect data which the qualitative and quantitative methods. The triangulation method was used to ensure the reliability and validity of the findings by cross-verifying data from these multiple sources. Thought interviews with related individuals or parties, surveys on visitors and the heritage buildings observation, the data collected for analysis purposes. The findings are to determine the currents maintenance level and evaluate the maintenance impacts on heritage buildings in Sandakan, Sabah. This study improves the maintenance field knowledge, especially the heritage buildings. The outcomes provide valuable insights for policymakers, conservationists, and building managers, offering recommendations to enhance maintenance efficiency and preserve heritage building for future generations.

Keywords: heritage buildings, maintenance impact, maintenance level, maintenance practices

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The Relationship Between Satisfaction Among Residents and the Service Quality in a Mixed-Use Development

Raudhahtul Fitri Razali[1] and Zarina Shamsudin[2]

[1] Department of Real Estate Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, MALAYSIA; [1]ap210460@student.uthm.edu.my
[2] Department of Real Estate Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, MALAYSIA; zarinas@uthm.edu.my

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Abstract: To meet the city's expanding population and land scarcity, vertical buildings and mixed-use buildings are being created, rather than single-purpose structures like apartments and businesses. Despite its complexity, this building poses several challenges to property management. Property management firms must understand residents' current requirements and need to maintain the residents' satisfaction and service quality. This research aims to ascertain how well property management firms manage mixed-use buildings and how satisfied the residents are. The researcher seeks to identify the service quality factors that enhance residents' satisfaction with property management. This research explores how service quality impacts the residents' satisfaction in a mixed-use building. Content analysis identifies tangible aspects of service quality, such as reliability, responsiveness, assurance, and empathy. The method used in this research is qualitative, which uses a questionnaire distributed to 100 respondents living in mixed-use buildings and interview with the property manager in the building. Correlation analysis is used in this research to identify the correlation between satisfaction and service quality. The results of the first objective show that service quality dimensions like assurance and empathy significantly influence the perceived quality of management services in maintenance responses. However, tangible factors and some reliability aspects seem to have less impact. The second objective shows that property management faces several challenges to satisfy the residents, including managing the property, operational and financial management, safety and security, and crisis management.

Keywords: mixed-use building, residents' satisfaction, property management

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The Influence of Critical Success and Failure Factors on Recycling Effectiveness at UM Faculties

Siti Hajar Binti Jelani[1] and Mohamad Rizal Bin Baharum[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 5063 Kuala Lumpur; 22004935@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 5063 Kuala Lumpur; mrizal@um.edu.my

Abstract: This study investigates the influence of critical success and failure factors on recycling effectiveness at UM faculties. Guided by three research objectives, it identifies challenges, evaluates current existing recycling initiatives implemented and recommends better ways for the improvement effectiveness of recycling initiatives. A mixed-methods approach was employed, focusing on the Faculty of Built Environment, Faculty of Medicine and Faculty of Science. Quantitative data were gathered via Google Forms from students and staff, while qualitative insights were obtained through semi-structured interviews with cleaning contractors and JHB representatives. The findings revealed most dominant barriers were lack of awareness (M = 0.7074). ANOVA results showed significant differences in implementation levels between faculties (F = 45.508, p<0.01), with the Faculty of Built Environment scoring the highest. However, Pearson correlation analysis found no significant relationship between the perceived importance of success factors and their actual implementation, highlighting a gap between planning and practice. The study recommends improving bin accessibility, faculty-level leadership and sustained awareness programs to strengthen recycling performance across UM.

Keywords: recycling effectiveness, critical success factors, failure factors, recycling initiatives

Developing a Building Maintenance Strategy for Low-Rise, Low-Cost Housing in Malaysia's Northern Region: A Conceptual Framework for Addressing Tropical Climate Challenges

Siti Zulaika Zubir[1] and Mohd Zailan Sulieman[2]

[1] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Pulau Pinang, MALAYSIA; sitizka@gmail.com
[2] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Pulau Pinang, MALAYSIA; mzailan@usm.my

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Abstract: This conceptual paper explores the development of an effective building maintenance strategy for low-rise, low-cost housing in Malaysia's northern region, emphasizing the challenges posed by the country's tropical climate. The region's high humidity, intense rainfall, strong solar radiation, and occasional storms accelerate structural deterioration, affecting both the functionality and longevity of these buildings. Key issues such as water penetration, corrosion, mold growth, and thermal expansion contribute to increased wear and tear, compromising structural integrity and aesthetic value. By adopting a mixed-methods approach, this study synthesizes insights from literature reviews, surveys, interviews with occupants, and site observations to assess climate-induced maintenance challenges. The findings aim to establish a conceptual framework for proactive maintenance strategies, ensuring the sustainability and resilience of low-rise housing in tropical environments. This study is limited by the availability and accessibility of detailed maintenance records and cost data, which may have restricted the depth of financial analysis. Additionally, the scope is confined to selected low-rise, low-cost housing in Malaysia's northern region, making the findings less generalizable to high-rise or non-residential buildings. Constraints in time and respondent availability also limited broader stakeholder engagement, particularly among government agencies and private developers. This research offers a novel contribution by developing a climate-responsive maintenance strategy specifically for low-rise, low-cost buildings in Malaysia's northern region, an area often underrepresented in facility management studies. By integrating environmental challenges, on-site data, and digital maintenance technologies into a unified framework, the study presents a localized, practical solution that addresses both climatic stressors and resource constraints in the Malaysian context.

Keywords: building maintenance strategy, low-cost housing, low-rise buildings, tropical climate, Malaysia, structural durability, sustainability, climate resilience, mixed-methods approach, building performance

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A Study on Risk Management in Highway Operation in Malaysia

Siti Zulaikha Binti Sabaruddin[1] and Raja Rafidah Binti Raja Muhammad Rooshdi[2]

[1] Department of Built Environment Studies and Technology, Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA (UiTM), Selangor Branch, Shah Alam Campus, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia; sitizulaikhasabaruddin@gmail.com
[2] Department of Built Environment Studies and Technology, Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA (UiTM), Selangor Branch, Shah Alam Campus, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia; raja_rafidah@uitm.edu.my
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Abstract: Risk management plays a crucial role in ensuring the safety, efficiency, and sustainability of highway operations. In Malaysia, the growing complexity of highway projects presents various challenges, with natural calamities and human errors being prominent contributors to operational risks. These risks can significantly impact the longevity and safety of highway infrastructure, thereby emphasizing the need for effective risk management strategies. Hence, the objectives of this study are (i) to identify the potential risks associated with highway operations, (ii) to investigate the factors influencing operational risks in highway systems (iii) to determine effective risk mitigation strategies for highway operations. Survey questionnaires are used as a research instrument for getting primary data. Simple random sampling, we use as a probability sampling technique in collecting the data. A total of 157 respondents of G7 contractor companies in Shah Alam, Selangor registered with Construction Industry Development Board (CIDB) Malaysia participated in the study. With a reliable number of samplings, the data has been analyzed by using SPSS 29.0 version with descriptive analysis. The findings revealed that potential risks in highway operation include technical, financial, and operational. Workforce inexperience and insufficient training, funding and budget constraints, and regulatory non-compliance among top three factors influencing operational risks in highway projects. The results of this study are expected to provide a guideline to stakeholders in transforming and enhancing risk management frameworks, for better highway operation including minimizing highway-related accidents particularly in Malaysia.

Keywords: highway operation, risk management, risk mitigation
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The Effectiveness of Concrete Properties Towards Building Acoustic Improvement

Amy Nursarah Ahmad Zahidi[1] and Norsafiah Norazman [2]

[1] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; amyss@student.usm.my
[2] Department of Building Surveying, School of Housing, Building and Planning, Universiti Sains Malaysia, Penang, Malaysia; safiahazman@usm.my

Abstract: Building acoustic is an important consideration in the design, operation and construction of most buildings, and can mainly effects on quality of health and wellbeing, communication and productivity. Concrete is a common building material that had been used in construction work however often faces challenges with sound absorption and noise transmission. Rather than absorb noise, concrete is workable in reflect the sound. Therefore, the aim of this research is to analyse the effectiveness of concrete properties for enhancing acoustic performance in buildings. By examining various concrete formulations and how its properties influence sound behavior, this research will offer practical recommendations for concrete selection based on acoustic needs. Research shows that noise pollution, particularly in urban settings, can lead to adverse physical and psychological effects, making the need for enhanced acoustic design in buildings more urgent. Studies indicate that the level of sound absorption and transmission in such modified concretes depends largely on specific aggregate types, pore size and distribution, and other changes in mix composition. By evaluating high-density, lightweight, porous concrete, and others modified concretes the research aims to close the gap between structural and acoustic efficiency. The methodology of this study based on secondary data such as literature reviews, academic report analysis and comparative analysis. Hence, the findings indicate that porous concrete is the most effective type of concrete for improving acoustic performance, as its porous structure significantly enhances sound absorption. The aim of this research is to analyze the effectiveness of various concrete properties in enhancing the acoustic performance of buildings. Future study should investigate the long-term acoustic performance of different concrete compositions across a range of environmental conditions, with the goal of identifying and optimizing material properties that contribute most effectively to building acoustic enhancement.

Keywords: building acoustic, concrete, acoustic performance, sound absorption, noise reduction

Enhancing Cost Estimation with Building Information Modeling (BIM) in Construction Industry: A Case Study in Kuala Lumpur

Cheok Ka Yee[1] and Seow Ta Wee[2]

[1] Department of Construction Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Malaysia; ap210286@student.uthm.edu.my
[2] Department of Construction Management, Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Malaysia; tawee@uthm.edu.my

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Abstract: Cost estimation is a critical component of construction project management, directly influencing project success by ensuring economic feasibility and effective resource allocation. However, traditional cost estimation methods in Kuala Lumpur, Malaysia, struggle to meet the increasing demands of urbanization and complex project dynamics, often leading to inaccuracies and cost overruns. The purpose of this study is to assess the accuracy of traditional cost estimation methods, to investigate the relationship between Building Information Modeling (BIM) and cost estimation, and to recommend strategies to enhance the adoption of BIM in the construction industry. Data were collected through a quantitative survey of 234 respondents and analyzed using SPSS and Microsoft Excel with descriptive statistics, reliability analysis and Pearson correlation techniques. The results of the study indicate that traditional methods have significant limitations and are not adaptable to dynamic market conditions and project complexity. BIM has the potential to improve the accuracy of cost estimates, reduce errors, and enhance collaboration among stakeholders. However, barriers such as high implementation costs and lack of expertise hinder its widespread adoption. The discussion highlighted the need for government incentives, affordable training programs, and clearer guidelines to encourage BIM implementation. Future research should explore the integration of machine learning models and statistical methods to further improve prediction accuracy, as well as expanding research to other regions. These efforts will support the development of more accurate and efficient cost estimating practices, ultimately advancing the construction industry.

Keywords: building information modeling (BIM), cost estimation

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The Potential of Bamboo as Building Material in Malaysia

Dayang Nur Syasya Binti Abang Mohd. Alwi[1] and Irma Hanie Binti Ibrahim[2]

[1] School of Construction & Quantity Surveying, Faculty of Built Environment (FBE);
nsyasya.1209@gmail.com
[2] School of Construction & Quantity Surveying, Faculty of Built Environment (FBE);
irmah659@uitm.edu.my
.

Abstract: Bamboo, recognized for its rapid growth, sustainability, and structural strength, holds significant potential as a building material in Malaysia. Despite its abundance and versatility, the adoption of bamboo in the Malaysian construction industry remains limited due to knowledge gaps, regulatory constraints, and misconceptions regarding its durability and economic viability. This study investigates the potential of bamboo as a sustainable building material, examining the challenges associated with its utilization and proposing strategies to enhance its acceptance. Utilizing a quantitative survey, the research highlights key barriers, such as limited professional expertise, insufficient standards, and inadequate policy support. Findings suggest that improving public awareness, training skilled professionals, and developing standardized treatment and certification processes are essential for promoting bamboo as a viable alternative to conventional materials. This paper contributes to sustainable construction discourse by outlining practical solutions to mainstream bamboo use in Malaysia's building sector.

Keywords: bamboo, sustainable building material, construction industry, Malaysia

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Assessing the Awareness and Challenges on Building Information Modelling (BIM) Usage Amongst Contractors in Sabah Construction Industry

Farzanah Mohd Tahir[1] and Noor Akmal Adillah Ismail[2]

[1] Fakulti Alam Bina, Universiti Teknologi MARA, 40450, Shah Alam Selangor, Malaysia; farzanahan17@gmail.com.

Abstract: Building Information Modelling (BIM) has emerged as a transformative tool in the architecture, engineering, and construction (AEC) industry, delivering notable improvements in project efficiency, cost management, and stakeholder collaboration throughout the project lifecycle. Despite these advantages, BIM adoption in Sabah remains relatively low, indicating a pressing need for greater engagement from both public and private sectors. This study aims to examine the level of BIM awareness, identify key challenges, and propose strategic solutions to facilitate BIM implementation among contractors in the Sabah construction industry. Data was collected via a close-ended questionnaire survey and analysed descriptively using SPSS, focusing on frequency and mean score analysis. Findings reveal that a significant proportion of contractors lack awareness and practical experience with BIM, primarily due to limited exposure and insufficient training opportunities. A major barrier identified is the inadequate provision of BIM-focused courses by educational institutions, contributing to a skills gap within the industry. The study highlights the need for construction leaders to cultivate a culture of innovation and adaptability to drive change. It underscores the importance of targeted support programs, enhanced educational initiatives, and increased policy advocacy to accelerate BIM adoption across contractor grades. By prioritising skills development and raising awareness, the Sabah construction industry can move towards more effective and widespread BIM integration.

Keywords: awareness, building information modelling, challenges, contractors, Sabah construction industry

Towards Enhanced Technology Adoption in Construction SMEs: Barriers and Enablers

Ani Saifuza Abd Shukor[1] and Muhamad Khairulanwar Zulkifli[2]

[1] Centre of Studies for Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA (UiTM), Shah Alam; anisa278@uitm.edu.my
[2] Centre of Studies for Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA (UiTM), Shah Alam; khairulzuliey24@gmail.com

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Abstract: This study explores the gap between the growing need for technological advancement and adoption among small and medium-sized enterprises (SMEs) in the construction industry. As digital tools become increasingly vital for improving productivity, efficiency, and competitiveness, SMEs often struggle with limited resources, knowledge, and support structures that hinder successful integration. This research aims to understand the enablers and barriers influencing technology adoption in small- and medium-sized construction firms. The objectives of this research are (1) to examine the barriers that obstruct technology adoption, and (2) to analyse the enablers that facilitate successful implementation. Data were collected using a structured questionnaire and analysed using the Statistical Package for the Social Sciences (SPSS) software version 22. The findings reveal that cost constraints, lack of technical expertise, and resistance to change are primary challenges, while governmental support, affordable solutions, and targeted training are key enablers. This study offers practical insights for bridging the digital divide, providing recommendations for policymakers, technology providers, and industry leaders to support the digital transformation and long-term sustainability of construction SMEs

Keywords: barriers, enablers, construction, small-medium enterprise (SME), technology adoption

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Building Information Modeling (BIM) Adoption in Small and Medium-Sized Construction Firms: A Way Forward

Muhammad Johan Mukhreez Bin Jafree[1] and Anis Rosniza Binti Nizam Akbar[2]

[1]Centre of Studies for Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA Shah Alam; jmukhreez.work@gmail.com
[2] Centre of Studies for Quantity Surveying, Faculty of Built Environment, Universiti Teknologi MARA (UiTM), Shah Alam; anisrosniza@uitm.edu.my

Abstract: Building Information Modelling (BIM) is an innovative technology that has transformed the construction industry by increasing efficiency, lowering costs, and fostering greater coordination. Despite its widespread use in large companies, small and medium-sized construction firms encounter considerable hurdles in implementing BIM, such as financial limits, a lack of experience, and resistance to change. This study investigates the problems, tactics, and possibilities connected with BIM adoption in small and medium-sized construction firms, with a specific focus on the Malaysian construction industry. The study adopts a qualitative methodology, with data gathered through semi-structured interviews with contractors from small and medium-sized construction firms in Selangor. The findings show that, while budgetary constraints, technical challenges, and cultural resistance impede BIM adoption, strategic interventions including phased implementation, targeted training programs, government subsidies, and industry-recognized certifications can help. Furthermore, BIM adoption provides small and medium-sized construction firms with various benefits, including higher project efficiency, coordination, and competitiveness. This study emphasizes the importance of structured support systems in helping small and medium-sized construction firms to properly implement BIM. By addressing the unique issues that small and medium-sized construction firms encounter, the study provides vital insights into how to build a more inclusive and technologically sophisticated construction sector.

Keywords: BIM, SME, quantity surveyors, cost estimation, project management

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Investigating The Adoption of Digital Technologies Among G7 Contractors in Klang Valley

Nur Syahmina Zamzuri[1] and Har Einur Azrin Baharuddin[2]

[1] Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia; 2023873598@student.uitm.edu.my

[2] Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia; hareinur@uitm.edu.my

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Abstract: The construction industry plays a significant role in Malaysia's economic development. In recent years, the adoption of digital technologies has become increasingly important for enhancing competitiveness and supporting sustainable industry growth. However, many construction companies, especially local contractors, are still slow in using these new technologies. This study aims to explore the challenges and barriers to the implementation of digital technologies among G7 contractors in the Klang Valley. A quantitative research approach was employed, using a semi-structured survey that included both closed-ended and open-ended questions. The closed-ended items focused on the availability and readiness of digital infrastructure among G7 contractors, while the open-ended questions explored challenges and strategies related to digital adoption. This study employed purposive sampling, where G7 contractors in the Klang Valley were intentionally selected as respondents due to their relevance to the research on digital technology adoption based on CIDB databases. A sample size of 190 respondents gathered from CIDB data was determined using Raosoft software. Preliminary findings indicate that digital technology uptake among G7 contractors remains relatively low, with usage largely limited to data management applications. The study identified high implementation costs, resistance to change, and inadequate digital literacy and technical skills as the main barriers to adoption. These findings highlight the need for targeted initiatives by industry stakeholders and policymakers to overcome these challenges. Addressing these barriers is crucial for driving broader digital integration across the construction sector. The study provides insights that may support future strategies for accelerating digital transformation and improving overall productivity and efficiency in the industry.

Keywords: digital technologies, G7 contractors, Klang Valley, adoption

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The Study of Carbon Footprint Reduction Among Contractor Practices in Construction Industry

Sandra Romy[1] and Rozlin Zainal[2]

[1] Department of Construction Management, Faculty of Technology Management & Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia; ap210507@student.uthm.edu.my

[2] Department of Construction Management, Faculty of Technology Management & Business, Universiti Tun Hussein Onn Malaysia, 86400, Parit Raja, Batu Pahat, Johor, Malaysia; rozlin@uthm.edu.my

Abstract: A carbon footprint measures greenhouse gas emissions from Human activities, including transportation, energy use, and Construction. In Malaysia, the construction industry drives Economic growth but significantly contributes to Environmental challenges like resource depletion, energy consumption, and greenhouse gas emissions. Therefore, the Research aims to identify the main challenges faced by Construction contractors in implementing carbon footprint Reduction and the key strategies they adopt to address these Challenges. Additionally, it examines the relationship between These challenges and strategies within the construction Industry. The study employed quantitative correlational Research design, utilizing data from g7 contractor companies in Sepang district, Selangor. A total sample size was 103 respondents and was required for the study. The study collected primary Data from 103 respondents (49.5% response rate) through Questionnaires distributed in hard copy and via google forms, Using in-person meetings, WhatsApp, and email. As the result, Construction contractors face supply chain constraints, lack of Standardized guidelines, and limited access to advanced Technologies in reducing carbon footprints, with a key strategy Being the adoption of sustainable materials integrated into Building codes. Meanwhile, the strongest correlation is between "carbon footprint reduction challenges related to cultural and behavioral resistance to change" and "efficient waste Management strategies promoting recycling and reuse". The Study underscores the critical role of sustainable material Utilization, energy-efficient construction practices, and Renewable energy integration, while highlighting the necessity for policy support and industry collaboration to address Challenges like high initial costs and limited awareness, there by advancing sustainability in Malaysia's construction sector.

Keywords: carbon footprint, construction industry, contractor, reduction, strategy

Potential & Challenges of Digital Twin Application in Malaysian Construction Industry

Wan Nurul Fatihah Binti Ghazali[1] and Siti Nor Azniza Binti Ahmad Sekak[2]

[1] B139, Kampung Seberang Baroh Chabang Tiga 21000, Kuala Terengganu, Terengganu; fatihahghazali11@gmail.com

[2] Centre of Study in Quantity Surveying, Faculty of Built Environment, Universiti Teknologi Mara (UiTM), 40450 Shah Alam, Selangor; syniza@uitm.edu.my

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Abstract: Recently, digital twin technology has been one of the most promising technologies that has the potential to revolutionize the Malaysian construction industry by enhancing project performance and enabling data-driven decision-making. However, the challenges in digital twin technology, such as financial uncertainties, technological complexity, and the lack of standardization, hinder its widespread adoption. This research seeks to understand how the digital twin technology can increase and improve through the Malaysian construction industry and the obstacles they have constructed in response. This study is the application of digital twin applications to the construction industry; the objective of this study are to investigate the challenges in digital twin application in the construction industry; to identify the strategy in digital twin application in the construction industry. This quantitative research used a Google Form-based online questionnaire. The Board of Quantity Surveying Malaysia (BQSM) website reported 110 questionnaires for quantity surveying firms in November 2024. The response rate was 27%, with 30 questionnaires returned for examination. The IBM SPSS Statistics Version 29.0 investigation showed that the Malaysian construction industry from quantity surveying firms understands the digital twin technology. These quantity surveying firms agree that strategies of digital twin technology are important in the Malaysian construction industry. Respondents agree that using digital twin technology is effective and useful for the Malaysian construction industry. These proven methods have several challenges, demonstrating their usefulness in addressing and easing construction industry through digital twin issues. The respondents' recognition validates the identified strategies' efficacy, focusing on their importance in mitigating immediate problems, which is to encourage sustainability and resilience in the construction industry through digital twins. The study highlighted the need to address the current issues in digital twin technology through the Malaysian construction industry.

Keywords: digital twin; application; Malaysian; construction; industry

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Augmented Reality (AR) Application in the Construction Organisations: Benefits and Challenges

Zulkarnain Nazirwan[1] and Nurul Afida Isnaini Janipha[2]

[1] College of Built Environment, University Technology MARA, Shah Alam,
zulkarnainnaz43@gmail.com
[2] College of Built Environment, University Technology MARA, Shah Alam;
nurulafida@uitm.edu.my

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Abstract: A pillar of economic growth, construction industry always involved with the evolution of technologies; improving efficiency and creativity. Among these technologies, Augmented Reality (AR) has become a transforming tool with great power to change project visualisation and execution. AR involves with overlaying digital information onto the physical environment, which enabling a hybrid experience. Although AR is becoming more popular, its integration into Malaysian construction industry is still developing. This research aims to investigate the AR application in the Malaysian construction industry. Two objectives were outlined: to identify the benefits of implementing AR and to determine its challenges in the Malaysian construction industry. An extensive literature review was done to obtain the general information related to AR and a total of 531 questionnaire surveys were distributed to G7 construction companies, registered under Construction Industry Development Board (CIDB), to learn in-depth in the Malaysia context. A 55% of responses were obtained and analysed using Statistical Package for Social Sciences (SPSS) software. Findings revealed that AR has a great benefit such as emergence of visualisation tools, improve decision making and collaboration, proactive risk management and others. Despite the benefits, AR also have challenges in implementing it, but not limited to; limited adoption of advanced technologies, skills and training gap, and cost and resources constraints. The results of this research open the path for next studies to enhance the AR application in project visualisation and can offer valuable information to the industry players.

Keywords: augmented reality, construction organisation, construction industry, digital information

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Investigating Universiti Malaya's Campus Community Awareness in Reaching Zero Carbon and Sustainability Goals

Nur Huda Binti Ismail[1] and Noor Suzaini Mohamed Zaid[2]

[1] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; 22004905@siswa.um.edu.my
[2] Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, 50603 Kuala Lumpur, Malaysia; suzaini_zaid@um.edu.my

Abstract: Universiti Malaya (UM) has committed to becoming a carbon-neutral campus by 2030 and achieving zero-carbon status by 2050. This study investigates the awareness, understanding, and engagement levels of the UM campus community toward these sustainability goals. Using a mixed-methods approach, data were collected through structured questionnaires distributed among 144 stakeholders, including students, faculty, and administrative staff, and semi-structured interviews with institutional bodies such as the Universiti Malaya Sustainable Development Centre (UMSDC) and Jabatan Harta Benda (JHB). Findings reveal significant awareness of general sustainability but limited understanding of UM-specific carbon policies. Institutional stakeholders highlighted behavioural inertia, infrastructural constraints, and disjointed policy communication as key barriers. Comparative insights from the National University of Singapore and the University of Edinburgh suggest the need for integrated sustainability governance and data-driven decision-making. This article offers strategic recommendations for UM and similar institutions to align community behaviour with climate commitments, enhance policy coherence, and foster an institutional culture of environmental accountability.

Keywords: climate action, stakeholder engagement, sustainability policies, zero-carbon campus

Preliminary Study on the Awareness of Exoskeletons Devices Among the Stakeholders in Malaysian Construction Industry

Nur Alia binti Amberin[1] and Noor Syafiqah binti Mohd Sabri[2]

[1] Department of Quantity Surveying, Faculty of Built Environment, UiTM Shah Alam;
2023898254@student.uitm.edu.my
[2] Department of Quantity Surveying, Faculty of Built Environment, UiTM Shah Alam;
syafiqah970@uitm.edu.my

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Abstract: The construction industry is one of the most dangerous industries. It has been known as 3D, which stands for dangerous, difficult, and dirty. In Malaysia, most of the construction workers who are working on site are foreign workers because not all Malaysians can adapt to the environment and surroundings of the construction industry. Construction workers are also exposed to easily getting injured due to the hot weather in Malaysia. Therefore, new technology such as exoskeletons should be adopted in the Malaysian construction industry. This study aims to identify the technology of exoskeletons as wearable devices in the construction industry and to study the level of awareness of the technology of exoskeleton devices among the stakeholders in the Malaysian construction industry. This preliminary quantitative study involved a survey of 94 construction stakeholders to achieve the objectives. Data were collected using a structured questionnaire and analyzed descriptively. Throughout the research, there are two types of exoskeletons that have generally been introduced in the construction industry, which are active exoskeletons and passive exoskeletons. This research found that the awareness of exoskeletons among Malaysian construction stakeholders is currently at a moderate level. To summarize, awareness regarding the existence of exoskeletons among Malaysian construction stakeholders should be taken seriously to ensure that exoskeletons can be fully adopted in the Malaysian construction industry. Plus, Malaysian construction stakeholders could also grab many opportunities through the adoption of this wearable device technology.

Keywords: awareness, construction stakeholders, exoskeleton, wearable devices

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Fresh and Mechanical Properties of Mortar Incorporating Cuttlefish Bone as a Partial Sand Replacement

Siti Farhanabila binti Abdul Ayub[1] and Nurshafarina Binti Jasme[2]

[1] Department of Building Surveying Faculty of Built Environment Universiti Malaya; 122004940@siswa.um.edu.my

[2] Department of Building Surveying Faculty of Built Environment Universiti Malaya; shafarina@um.edu.my

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Abstract: The construction industry's intensive consumption of natural sand the world's second most exploited resource has raised pressing environmental concerns, including habitat destruction, coastal erosion, and the degradation of aquatic ecosystems. In response, sustainable alternatives are urgently needed. This study investigates the potential of utilizing cuttlefish bone, an abundant byproduct of seafood processing, as a partial substitute for natural sand in mortar production. Despite the rising emphasis on circular economy practices, limited research has assessed the feasibility of incorporating marine waste materials into building materials. A quantitative experimental methodology was adopted, focusing on the effects of cuttlefish bone on mortar's compressive strength, workability, and density. Microstructural characteristics were analyzed using Scanning Electron Microscopy (SEM) to evaluate the bonding behavior between cuttlefish bone particles and the cement matrix. Findings reveal that incorporating cuttlefish bone at replacement levels up to 10% maintains acceptable mechanical and physical properties while reducing reliance on natural sand. These results underscore the material's potential as a sustainable alternative, aligning with environmental conservation goals and promoting waste valorization within the construction sector. By integrating a novel marine waste material into mortar, this study supports both cost reduction and sustainable development objectives, providing new insights into resource efficient construction practices.

Keywords: circular economy, cuttlefish bone, mortar, sand replacement, sustainable construction

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