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WELCOME SPEECH FROM THE CHAIRMAN

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

بسم الله الرحمن الرحيم السلام

عليكم ورحمة الله وبركاته

Greetings to all,

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

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

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

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

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

Wishing everyone a productive and memorable conference.

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

WELCOME SPEECH FROM CO-CHAIRMAN

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

Bismillahirrahmanirrahim.

السلام عليكم ورحمة الله وبركاته and greetings to all.

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

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

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

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

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

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

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

WELCOME SPEECH FROM THE PROJECT DIRECTOR

RISM 17th International Surveying Conference for Undergraduates 2025

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

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

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

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

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

Wishing everyone a rewarding and inspiring conference experience.

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

ENVIRONMENT, SOCIAL AND GOVERNANCE (ESG) PRACTICES IN HIGH-RISE RESIDENTIAL BUILDINGS: BUILDING OCCUPANTS' PERSPECTIVE

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ABSTRACT

The rising demand for sustainable and ethical practices underscores the need to integrate Environmental, Social, and Governance (ESG) principles into the built environment. While existing research focuses on industry perspectives, limited attention has been given to building occupants, despite them spending 90% of their time indoors, which directly impacts their health and well-being. This study aims to bridge the gap between industry-driven ESG initiatives and occupant expectations, promoting a more holistic approach to sustainable living. Thus, this study explores ESG practices from the perspective of high-rise residential occupants. The literature review identified 23 ESG criteria in property, categorised into 9 environmental, 8 social, and 6 governance aspects, assessing impact, sustainability, and responsible practices. Questionnaires will be distributed to high-rise residents in Klang Valley, with data analysed using reliability tests, including Cronbach's Alpha, Arithmetic Mean, Mann-Whitney U, and Kruskal-Wallis. Findings obtained will offer valuable insights for industry practitioners to enhance ESG implementation by addressing occupant needs. Strengthening ESG integration in real estate can improve sustainability, ethical practices, and living conditions while increasing tenant satisfaction and potentially boosting property values.

Keywords: Environmental, Social, Governance, ESG practices, Building occupants

I. INTRODUCTION

The rapid urbanisation and economic growth in Malaysia have driven the widespread development of high-rise buildings, particularly in the Klang Valley. This construction surge significantly heightened energy consumption and greenhouse gas (GHG) emissions, exacerbating global warming and placing the built environment at the forefront of environmental challenges. With approximately 77% of Malaysia's population residing in urban areas (Ministry of Health, 2020), the escalating demand for housing and infrastructure amplifies the urgency of sustainable development. Malaysia's pledge to reduce carbon intensity by 45% by 2050 further underscores the need to integrate sustainable practices into built environment to mitigate these impacts effectively (Ministry of Economy, 2023).

In this context, Environmental, Social, and Governance (ESG) principles emerge as a critical framework to foster a sustainable and inclusive future. Mahanama et al. (2023) discovered that investors, developers, and property owners have increasingly recognized the importance of integrating ESG principles into their decision-making processes in recent years. The environmental pillar promotes energy efficiency and carbon reduction, the social pillar enhances occupant well-being and community engagement, and the governance pillar upholds ethical management and regulatory compliance. In response, Malaysia has introduced the National Construction Policy 2030 to promote sustainable construction (Sajat et al., 2024) and has incorporated ESG practices into policies such as Budget 2023, which prioritises inclusive and sustainable growth (Krishnan, 2023). The Environmental Quality (Amendment) Bill 2023 further reinforces regulations to address environmental concerns (Mokhtar et al., 2025). However, regulatory efforts alone are insufficient without incorporating perspectives from building occupants as building occupants play a key role in driving sustainability through daily practices. Thus, understanding ESG practices in high-rise residential buildings from the occupants' perspective is vital to enhancing implementation and advancing Malaysia's 2050 carbon reduction goal.

I. Problem Statement

Research on ESG principles has been conducted globally across various industries, including manufacturing (Zhou et al., 2023), banking (Yadav et al., 2024), and corporate profitability (Treepongkaruna & Suttipun, 2024). In the real estate sector, studies have examined ESG's influence on the commercial market (Robinson & McIntosh, 2022), financial performance (Morri et al., 2024), property values, and investment significance (Olteanu & Ionascu, 2023). In Malaysia, ESG research has primarily focused on its impact on firm performance, financial performance in the healthcare sector (Chua et al., 2023), challenges in the wood and furniture industries (Ratnasingam et al., 2023), and ESG implementation in SMEs (Tan et al., 2023).

Moreover, research has explored ESG considerations from the perspectives of industry practitioners, including investors, property owners, and managers (Bowen et al., 2024). However, previous research revealed a gap in studies that focus on ESG considerations from the perspective of building occupants. Mannan and Al-Ghamdi (2021) stated that building occupants spend about 90% of their time in indoor environments which has significant implications for their health, well-being, and overall quality of life. Hence, this conceptual paper aims to fill the gap by investigating ESG considerations from the perspective of building occupants in Malaysia.

J. Research Aim and Objectives

The research aims to uncover the environmental, social and governance (ESG) considerations from building occupants' perspective in Malaysia. To achieve the aim of the research, two objectives are formulated.

i. To examine the ESG criteria from building occupants' perspective.
ii. To evaluate the ESG practices from building occupants' perspective.

K. Scope of Research

This study will be conducted using a questionnaire survey targeting occupants of high-rise residential properties in Klang Valley.

V. LITERATURE REVIEW

Malaysia is among the largest CO_2 emitters in Southeast Asia (Priyanto et al., 2024), with per capita emissions reaching 7.6 tonnes in 2021 (Zaidi & Haw, 2023). In comparison, China, Thailand, and Indonesia recorded emissions of 8.4, 3.8, and 2.2 tonnes per capita, respectively (Zaidi & Haw, 2023). Notably, carbon emissions from buildings are projected to grow by 1.8% annually over the next decade, making it the fastest-growing sector by 2030 (Zainordin & Zahra, 2020). This issue is particularly evident in Klang Valley, where rapid urbanisation and high-rise residential developments contribute to rising energy consumption, air pollution, and waste generation (Ellisha and Chan, 2024). Beyond environmental concerns, urban expansion has exacerbated social challenges such as unaffordable housing, safety risks, and limited accessibility (Harun et al., 2024). In addition, governance issues persist, with transparency deficits in the property market enabling unethical practices, thereby making governance a key consideration in real estate decisions (Musa et al., 2020).

In response to these challenges, the adoption of the ESG framework has gained significant traction. ESG principles have become central to addressing environmental and social concerns while ensuring ethical governance in the real estate sector. Given the construction sector's substantial influence on sustainability outcomes, real estate investors are increasingly integrating ESG criteria into their decision-making processes to enhance long-term returns and mitigate risks (Newell et al., 2023). Olteanu and Ionascu (2023) defined ESG as a framework used by investors, stakeholders, and developers to evaluate a property's sustainability and ethical impact. Izyumov (2023) further emphasised that ESG considerations influence a property's environmental footprint, social impact on surrounding communities, and governance practices of the managing entity.

Mottola et al. (2022) revealed that only 21% of a sample of 1,228 respondents knew what the letters in ESG stand for. There is no exact definition of ESG, as industry practitioners and scholars have provided different explanations (Boffo et al., 2020). For instance, some studies defined ESG as a framework that extends beyond traditional financial indicators used by investors to assess the viability of investments in the financial sector (Somelar, 2024). Other studies described ESG as a framework that investors, stakeholders, and developers use to assess a property's sustainability and ethical impact in the real estate sector (Olteanu and Ionascu, 2023). Hence, the definition of ESG may vary across different industry sectors, but overall, it serves as a comprehensive framework for evaluating a property's environmental, social, and governance performance.

A. Key Components of ESG Criteria

ESG criteria refer to a set of practices that integrate environmental, social, and governance factors to enhance property sustainability and ethical impact. Incorporating ESG principles into real estate offers significant benefits, including risk mitigation, increased market value, and long-term resilience. Sustainable real estate practices help address regulatory compliance, climate resilience, and reputational risks, ensuring that properties remain

competitive in an evolving market.

Beyond risk management, ESG-compliant properties tend to attract greater demand from investors and tenants, particularly those prioritising energy efficiency, eco-friendliness, and responsible business practices. Sustainable features such as efficient HVAC systems and renewable energy sources not only reduce operational costs but also contribute to long-term asset appreciation (Olteanu and Ionascu, 2023). Additionally, global regulatory bodies, including the European Union, are increasingly strengthening ESG compliance requirements, encouraging stakeholders to align with these principles to enhance long-term investment security.

However, achieving sustainability requires a balanced approach. Focusing on a single ESG pillar alone is insufficient, as real estate sustainability relies on the interconnected nature of environmental, social, and governance aspects. If any of these components is lacking, the property may struggle to achieve long-term resilience and value creation. Stakeholders must consider all three ESG dimensions to develop a comprehensive and transparent strategy. Hence, this section examines ESG criteria from the perspective of building occupants, highlighting how the environmental, social, and governance pillars collectively shape sustainable real estate practices, which as shown in Table 1.0.

Table 1.0 ESG Criteria

Environmental (E)		Social (S)		Governance (G)	
E1	Energy efficiency	S1	Indoor air quality	G1	Transparency
E2	Waste management	S2	Natural lighting	G2	Risk management
E3	Water conservation	S3	Thermal comfort	G3	Stakeholder engagement
E4	Sustainable material	S4	Noise disturbances	G4	Ethical conduct
E5	Biodiversity protection	S5	Safety and security	G5	Accountability
E6	Carbon management	S6	Community engagement	G6	Corporate social responsibility
E7	Encourage green rating tool	S7	Social inclusion		
E8	Public transport usage	S8	Affordable housing		
E9	Adopt green lease				

Environmental Pillar

The environmental impact of properties has been a critical concern for real estate investors. ESG's environmental aspect as a property's effect on the natural environment, emphasizing ecological sustainability. Key practices included incorporating energy-efficient features, using environmentally friendly materials, implementing water conservation measures, and adopting waste segregation and rooftop planting initiatives (Boffo et al., 2020). However, relying solely on energy-efficient technology was not sufficient to address energy consumption and environmental concerns. Integrating occupant behavior, such as turning off unused lights, further contributed to reducing energy use (Clements, 2020).

Proper waste segregation can reduce waste volume by more than 60% (Kihila et al., 2021), while easy access to recycling facilities encourages greater participation in waste reduction programs (Rosenthal & Linder, 2021) aim to manage per capita waste of half a tonne. Water conservation through efficient appliances, such as waterless urinals, and the use of low-VOC sustainable materials improved resource efficiency and promoted occupant health (Pavate et al., 2024). Wooster et al. (2022) highlighted that biodiversity protection was enhanced through green spaces like rooftop gardens, which improved air quality and reduced urban pollution.

Renewable energy integration, such as rooftop solar photovoltaic (PV) systems, helped lower CO_2 emissions while reducing electricity costs (Yoon et al., 2023). Green building rating tools, like the Green Building Index (GBI), benchmarked sustainability performance and offered benefits such as energy and water savings, improved indoor air quality, and better waste management (Abdel-Basset et al., 2021). Additionally, Transit-Oriented Development (ToD) reduced reliance on private vehicles, cutting emissions and improving urban mobility (Wan, 2023), which was an especially relevant strategy for Malaysia's high traffic congestion and CO_2 emissions. Lastly, green leases encouraged collaboration between tenants and building owners to enhance sustainability efforts (Wong & Chan, 2024).

Social Pillar

Bowen et al. (2024) defined the social pillar as the impact of a property on communities, occupants, and society at large. This pillar encompassed affordable housing, community involvement, tenant health and safety, inclusion, and the well-being of individuals associated with the property. Previous studies have shown that properties located in walkable areas with access to good amenities tend to command higher rents and property values (Olteanu & Ionascu, 2023). Properties that contribute to the social well-being of the community can also help reduce vacancy

rates and improve tenant retention, ultimately leading to better returns for investors. Social inclusion ensures accessibility for individuals with disabilities through features such as ramps, smart technologies, and clear signage, thereby promoting equal participation in the living environment (Setiawan, 2024).

Smart ventilation systems improved indoor air quality by ensuring a continuous flow of fresh air and reducing pollutants, minimizing risks like Sick Building Syndrome (Hopkins, 2023). Natural lighting, achieved through large windows and open layouts, enhanced occupant well-being, lowered energy costs, and reduced instances of eyestrain. Additionally, thermal insulation in walls and floors, along with energy-efficient HVAC systems, allowed occupants to regulate indoor temperature and humidity, further enhancing comfort (Jayalath et al., 2024). Incorporating soundproofing measures, such as insulated walls and windows, created quieter and more conducive living environments (Kumar, 2025). Furthermore, integrating cost-efficient housing solutions near transit hubs and incorporating energy-efficient designs helped reduce financial burdens on residents while strengthening community connections (Olteanu & Ionascu, 2023). Collectively, these ESG-driven approaches contributed to creating healthier, safer, and more connected high-rise living environments, enhancing the overall quality of life for residents.

Governance Pillar

The governance pillar of ESG establishes a framework for ethics, transparency, and accountability in the real estate sector. Strong governance reduces risks, enhances market reputation, and safeguards investor interests. Yin (2023) highlighted that governance involves stakeholder engagement, regulatory compliance, and risk management, ensuring long-term financial and operational stability. Transparency through open financial reporting and sustainability disclosures fosters trust among investors, tenants, and regulatory bodies. Properties with strong governance structures tend to achieve better long-term value creation and financial performance (Khan et al., 2020). Clear ethical guidelines, such as anti-corruption policies and responsible decision-making frameworks, further support accountability and operational efficiency (Olteanu & Ionascu, 2023).

Effective governance ensures compliance with environmental regulations, reducing legal risks related to waste management, water conservation, and air quality control (Wang & Xue, 2023). Ethical policies, such as anti-discrimination measures and data protection, promote inclusivity and fairness in property management (Hyatt & Gruenglas, 2023). Stakeholder engagement through meetings and feedback mechanisms strengthens community relationships, fostering a cohesive living environment (Bowen et al., 2024). Additionally, corporate social responsibility (CSR) initiatives contribute to governance by promoting green building certifications and energy efficiency programs (Tylzanowski et al., 2023). CSR reporting highlights these efforts, encouraging resident participation and reinforcing sustainability. Governance also ensures accountability in maintenance, safety, and financial transparency, leading to well-managed properties. Ultimately, governance in ESG benefits investors, property owners, and occupants by fostering a more responsible and sustainable real estate sector.

VI. METHODOLOGY

This study will adopt a quantitative research method to ensure objectivity, reliability, and the ability to generalise findings across a broader population. By utilising numerical data and statistical analysis, this approach provides a structured and measurable way to assess ESG practices from the perspective of building occupants in Malaysia.

A survey questionnaire will be used as the primary data collection method due to its efficiency in gathering a large volume of responses. Surveys allow for systematic data collection, minimizing researcher bias while providing measurable insights that can be analyzed using statistical tools such as statistical package for the social sciences (SPSS). Additionally, the structured format of surveys ensures consistency, making the results more reliable and easier to interpret.

A. Questionnaire Design

This research questionnaire will be designed to consist of three main sections.The cover page includes the researcher's details, a brief introduction, and an explanation of ESG practices. Section A focuses on collecting demographic information, such as age, gender, income, education, and marital status, using a combination of closed-ended and semi-open-ended questions. Section B evaluates ESG criteria in high-rise residences covering environmental, social, and governance aspects, with responses rated on a scale from 1 (Least Important) to 5 (Very Important). Lastly, Section C assesses the adoption level of ESG practices in high-rise residences. Respondents rate the extent to which these practices are implemented in their residential properties using a scale from 1 (Never Adopt) to 5 (Always Adopt).

B. Sampling Size and Technique

Respondents will be approached through online distribution of an electronic questionnaire via Google Forms. The survey link will be shared across multiple social media platforms, including Facebook, Instagram, WhatsApp,

WeChat, and Messenger, to reach a diverse group of participants efficiently. This study will require a total of 384 participants determined with Cochran's formula on sample size calculation, as shown in (1).

$$n = \frac{Z^2 p(1-p)}{e^2} \quad (1)$$

$$n = \frac{1.96^2(0.5)(1-0.5)}{0.05^2} = 384$$

The above calculation is based on the following assumption:

i. Level of confidence = 95% (Therefore, Z = 1.96)
ii. Margin of error (e) = 5% or 0.05

There is no prior knowledge or estimate for the population proportion, therefore p is assumed to be 0.5, which will produce the largest possible sample size and results in the narrowest and most precise confidence interval.

C. Proposed Data Analysis

The data collected from the questionnaire survey will be processed with SPSS for descriptive and inferential statistical analysis. Several statistical tests will be conducted to assess the reliability and differences in respondents' perceptions of ESG criteria and practices. First, a reliability analysis will be performed using Cronbach's alpha to assess the internal consistency of the questionnaire items. A Cronbach's alpha value greater than 0.7 will indicate that the measurement scale is reliable. Next, the Arithmetic Mean Test will be applied to analyze respondents' perceptions regarding the criteria and adoption of ESG practices. Additionally, the Mann- Whitney U Test will be used to examine differences in ESG criteria and practices between tenants and building owners. The null hypothesis (H_0) for this test states that there is no significant difference in ESG criteria and practices between the two groups, while the alternative hypothesis (H_1) suggests that a significant difference exists. Furthermore, the Kruskal-Wallis H Test will be employed to determine if there are significant differences in ESG criteria and practices across various demographic groups, such as ethnicity, age, education level, employment status, marital status, and residential location. The null hypothesis (H_0) for this test states that there is no significant difference between these groups, whereas the alternative hypothesis (H_1) asserts that a significant difference exists.

CONCLUSION

The study will provide insights into how building occupants perceive and prioritize ESG criteria in high-rise residential properties. It will identify gaps in awareness and knowledge about ESG among residents. Besides, this study will measure the current level of ESG practice adoption in high-rise residences, highlighting which aspects (Environmental, Social, or Governance) are well-implemented and which need improvement. It will reveal whether ESG practices are resident-driven, management-driven, or influenced by external regulations.

In a nutshell, this study provides valuable insights into ESG practices in high-rise residential buildings from the perspective of building occupants. By analysing these practices, the findings contribute to a deeper understanding of sustainability challenges and opportunities within the real estate sector. The results serve as a foundation for future research and industry advancements in ESG implementation. From a governmental perspective, the study supports policymakers in refining regulations to promote sustainable property management, aligning with goals like Malaysia's National Construction Policy 2030 to enhance environmental sustainability, social well-being, and governance transparency.

For the industry, the study equips developers, property managers, and investors with data-driven insights into ESG adoption trends and occupant preferences, which enabling them to anticipate challenges, implement effective sustainability initiatives, and enhance property value while ensuring regulatory compliance. In academia, the findings enrich the growing body of knowledge on ESG practices, offering educational institutions material to prepare future professionals for sustainable real estate development and management. Ultimately, this study provides a holistic perspective on ESG adoption in high-rise residential buildings, serving as a reference for policymakers, industry stakeholders, and academics in driving sustainable development and responsible property management.

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