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Objective
The Journal of Valuation and Property Services is a publication specifically intended for property professionals to keep abreast with the developments in the property industry as well as the real estate profession.

This journal serves as a platform for the exchange of information and ideas on property issues. It seeks to:

i. address areas of major interest and practical relevance to the real estate profesion.
ii. create awareness of new theories, techniques and applications as well as related concepts relevant to the real estate profession.
iii. discuss policy issues and regulations and their implications on the property market.

We therefore welcome articles with theoretical and practical relevance to the real estate industry and profession, property valuation, property management, property investment and market analysis.

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REFEREE PANEL

A SYSTEMATIC LITERATURE REVIEW OF VALUATION FOR RIVER ECOSYSTEM SERVICES IN MALAYSIA

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ABSTRACT

In Malaysia, ecosystem valuation has not been practised and has rarely been conducted. Most of what is conducted in Malaysia is using traditional methods such as the Comparison Method and Cost Method. Often this method is used as an example for logging activities for production purposes. However, to evaluate ecosystems where the focus is on production, the touch will be done on the ecosystem so that it harms the ecosystem and biodiversity particularly river ecosystem will be evaluated using the ecosystem valuation method which is a new and special valuation method. The absence of this method of ecosystem evaluation in Malaysia causes difficulties for valuation professional to determine value for ecosystem particularly ecosystem services. This study evaluates 414 research articles to evaluate the development trend of valuation of ecosystem services research and to outline the various methodologies employed in this field.

Keywords: *Ecosystem, valuation, river, systematic, literature*

1. INTRODUCTION

Evaluating the unique and uncommon aspects of river ecosystems in Malaysia presents significant challenges due to the absence of standard benchmarks for guidance. The scarcity of comprehensive data complicates the process of establishing a definitive valuation metric. This research navigates through these complexities to arrive at a conclusive valuation. Valuation, an intricate blend of science and art, is inherently dynamic and adaptable. It demands a thorough and holistic consideration of all environmental facets to achieve an informed and comprehensive valuation of these ecosystems. The valuation of river ecosystems in Malaysia is a complex and dynamic process, requiring a holistic consideration of all environmental facets (Rahman, 2020). This is particularly challenging due to the absence of standard benchmarks and comprehensive data (Pandeya, 2016). Various studies have attempted to address this challenge by employing different valuation methods. For example, Abidin (2020) used a combination of research methods to assess the landscape character of urban river corridors, while Abdullah (2022) estimated the economic value of forest ecosystems for watershed services. Mamat (2020) and Rahman (2020) both used willingness to pay (WTP) methods to estimate the economic value of protected natural environments and seagrass meadows, respectively. However, these studies also highlight the need for more locally relevant valuation approaches and data collection, as well as the importance of capturing the temporal disturbance profile and the role of institutional arrangements in determining which values are captured (Turner, 2003; Pandeya, 2016).

The importance of valuing ecosystem services and biodiversity is increasingly acknowledged as essential in decision-making processes (Atkinson, 2012). Despite this, current valuation methods often face limitations, particularly in fully capturing the diverse range of ecosystem services and accounting for temporal disturbances (Turner, 2003). In Malaysia, the practice of ecosystem valuation is still in its nascent stages, with most existing studies relying on traditional methods such as comparison and cost methods. These approaches are frequently applied in contexts like logging for production, where they may adversely impact ecosystems and biodiversity. The lack of specialised ecosystem valuation methods in Malaysia poses challenges, as adapting foreign studies to the Malaysian context can introduce discrepancies due to varying environmental and socio-economic conditions. Recognising the urgency to understand the impact of threats on ecosystems and human well-being, there is a growing trend towards the economic valuation of ecosystems (Toman, 1997). This trend has spurred the development of various monetary valuation techniques (Nijkamp, 2008). However, challenges persist in this field due to the inherent complexity of ecosystems, limitations in existing economic valuation methods, and evolving human preferences regarding ecosystem services. Despite these challenges, acknowledging and quantifying the economic value of nature and its services is imperative for guiding sustainable development initiatives (Turner, 2010).

Conducting a systematic literature review is critical for grasping the complexities of river ecosystems in Malaysia and for the development of uniform benchmarks for their economic assessment (Lee, 2022; Weng, 2020). This is particularly important given the degradation of these ecosystems due to mismanagement, pollution, and abuse (Weng, 2020). The valuation of ecosystem services, including those provided by rivers, is a key aspect of this review, with a focus on the Malaysian context (Lee, 2022; Matthew, 2019). The need for a multi-stakeholder approach, including public-private partnerships, in river management is also highlighted (Weng, 2020). The development of a multimetric index for river health assessment, incorporating biological aspects, is a valuable tool for this review (Arman, 2019; Arsad, 2012). The review should also consider the various methodologies used for ecosystem services valuation, particularly those applicable at the local scale and in data-scarce regions (do Carmo Martinelli, 2023; Pandeya, 2016).

In addition, the scarcity of comprehensive data makes it imperative to develop tailored standards and methods that are specific to the Malaysian context. Valuation is a dynamic and multifaceted process, requiring an integrated approach that encompasses all environmental aspects to create a robust valuation framework. This review is essential for synthesising various methodologies to offer a cohesive and context-specific understanding of ecosystem valuation. Moreover, there is a clear need for valuation approaches that are relevant to the local environment, reflecting the temporal disturbances and the influence of institutional arrangements. The review can bring together disparate studies, highlighting the necessity for locally adapted valuation methods. It can also elucidate the gaps in current valuation methods that do not fully capture the diverse range of ecosystem services, thereby influencing decision-making processes. These insights are crucial for developing comprehensive valuation techniques that inform sustainable management and policy-making.

The adaptation of valuation methods to Malaysian conditions is critical, especially in practices like logging, which have the potential to adversely impact ecosystems and biodiversity. A systematic review can examine how traditional methods can be adapted or improved, ensuring they are culturally and environmentally appropriate. It underscores the importance of economic valuation of ecosystems in guiding sustainable development initiatives, consolidating various monetary valuation techniques, and addressing the challenges of ecosystem complexity and evolving human preferences. Such a review is necessary for recognising the economic value of nature and its services, which is imperative for the advancement of sustainable development in Malaysia.

2. METHODOLOGY

2.1 Bibliometric Analysis

A range of studies have explored the use of bibliometric analysis in various fields. De Oliveira (2019) and Moresi (2021) both present methods for mapping the state of the art and identifying research gaps and trends, with Moresi's approach integrating qualitative analysis. Zupic (2014) and Ellegaard (2015) discuss the use of bibliometric methods in management and organisation, with Zupic introducing specific methods and a workflow. Thanuskodi (2010) and Kanna & Thanuskodi (2019) apply bibliometric analysis to specific journals, Library Philosophy and Practice, and The Electronic Library, respectively, to identify patterns in publication and authorship. Hussain et al., (2012) uses bibliometric analysis to measure the impact of individual online journals. These studies collectively demonstrate the value of bibliometric analysis in understanding the scholarly landscape and identifying research trends and gaps.

A range of studies have employed bibliometric analysis to explore the valuation of ecosystem services. Velasco-Muñoz (2022) and Liu (2019) both highlight the importance of this approach in understanding the economic value of these services, with Velasco-Muñoz emphasising the need for further research on temporal and spatial scales. Gölgeci (2021) and Binoy (2021) provide broader perspectives on the use of bibliometric analysis in the fields of service ecosystems and property valuation, respectively. These studies underscore the potential for this method to reveal trends and gaps in research. However, the specific application of bibliometric analysis to the valuation of ecosystem services is not extensively discussed in these studies. Further research is needed to explore the potential of this approach in this specific context.

Bibliometric analysis serves as a crucial tool in ecosystem service valuation for Johor River, allowing for a comprehensive examination of the literature encompassing economic analyses, ecological evaluations, and policy-making implications. By employing specific search phrases, the analysis can effectively map scholarly work, revealing the depth of research in areas such as the economic efficiency of conservation efforts, interdisciplinary valuation of ecological systems, and quantification of the monetary benefits of ecosystem services.

The methodology for this study involves a systematic literature review with a focus on journal articles sourced from two major databases: Scopus and Web of Science. The rationale for selecting these databases is their comprehensive coverage of peer-reviewed literature across various disciplines, which is crucial for interdisciplinary topics such as ecosystem services valuation. The process begins with the development of search phrases that are directly related to the valuation of ecosystem services within the context of Sungai Johor. These phrases are carefully chosen to cover a broad spectrum of economic and ecological valuation methods and their applications in river ecosystems. Each phrase is justified based on its relevance to the research objectives.

For instance, "Cost Benefits Analysis of Ecosystem Services" seeks studies that conduct an economic analysis comparing the costs and benefits of actions affecting ecosystem services. This is essential for understanding the economic efficiency of conservation efforts specific to river ecosystems. Similarly, "Ecological Economics Valuation" focuses on interdisciplinary studies that combine economics and ecological systems, providing insights into the economic value of the ecological services offered by Sungai Johor.

"Environmental Valuation" looks for methods to value the environment and its services, which is applicable to the multifaceted aspects of Sungai Johor's ecosystem. Phrases like "Nature Capital Valuation" are included to capture studies valuing natural capital, including natural resource stocks and living organisms, which is crucial for grasping the value of Sungai Johor's natural resources. Once the search phrases are established, they are used to query the databases. The search yields a set of journal articles that are then screened based on specific inclusion criteria, such as relevance to the research questions, methodological rigor, and the context of Sungai Johor. Articles may be excluded based on factors such as being outside the scope of the ecosystem services valuation, lack of focus on river ecosystems, or insufficient methodological details. The selected articles undergo a thorough review, where data on various valuation methodologies, applied case studies, and the implications of the findings for policy and decision-making are extracted and analysed. The sampling of journal articles ensures a diverse and comprehensive set of perspectives and methodologies, which contributes to a robust synthesis of current knowledge on ecosystem service valuation in the context of Johor River.

Table 1 summarises the number of articles related to various aspects of ecosystem services and their economic and environmental valuation. The majority of the categories, including "Cost Benefit Analysis of Ecosystem Services," "Economic Valuation of Ecosystem Services," "Ecosystem Services Assessment," "Ecosystem Services Pricing," "Ecosystem Services Valuation," "Environmental Economics of Ecosystem Services," "Environmental Valuation," and "River Ecosystem Services," have a significant number of articles, each containing 51 articles. However, "Ecological Economics Valuation" and "Valuation of Ecosystem Services" have a notably lower count, with seven articles each. "Nature Capital Valuation" has the least, with only four articles. This summary indicates a strong research interest and literature

availability in most areas related to the economic and environmental aspects of ecosystem services, with a particular emphasis on valuation and pricing methodologies.

Table 1. Number of papers based on the phrases

Phrases	Number of Articles
Cost Benefit Analysis of Ecosystem Services	51
Ecological Economics Valuation	7
Economic Valuation of Ecosystem Services	51
Ecosystem Services Assessment	51
Ecosystem Services Pricing	51
Ecosystem Services Valuation	51
Environmental Economics of Ecosystem Services	51
Environmental Valuation	51
Nature Capital Valuation	4
River Ecosystem Services	51
Valuation of Ecosystem Services	7

Table 2 illustrates list of phrases for the purpose of systematic literature review in this study. The phrases like "Cost-Benefit Analysis of Ecosystem Services" target studies that weigh the economic trade-offs in ecosystem conservation, which is pivotal for optimising resource allocation in river ecosystems. "Ecological Economics Valuation" captures the intersection between ecology and economics, shedding light on Johor River's ecological worth. "Economic Valuation of Ecosystem Services" directs the search toward literature that places monetary value on these services, thereby informing decision-making processes.

Further, terms such as "Ecosystem Services Assessment" identify qualitative appraisals of ecosystem services, outlining the range of services provided by Johor River. "Ecosystem Services Pricing" and "Ecosystem Services Valuation" encompass methodologies for assigning monetary values and estimating the value of these services, respectively. These are fundamental for policy and economic decisions impacting the river ecosystem.

Additionally, "Environmental Economics of Ecosystem Services" reveals the economic impact of environmental changes on the services, relevant for Sungai Johor's policy-making and environmental management. "Environmental Valuation" and "Nature Capital Valuation" delve into methods for valuing the environment and its natural capital, crucial for understanding Sungai Johor's natural resource value.

Specifically, "River Ecosystem Services" zeroes in on the unique contributions of river ecosystems, while "Valuation of Ecosystem Services" ensures a broad inclusion of valuation methods. Utilising these terms, bibliometric analysis provides a structured overview of research, highlighting publication trends, key themes, research gaps, and the network of scholarly communication. This methodical approach can influence future research directions, shape local environmental policies, and promote the sustainable management of Sungai Johor's natural resources.

Table 2. Search Phrases and Justifications

Phrases	Justifications
Cost Benefits Analysis of Ecosystem Services	Seeks information on the economic analysis that compares the costs and benefits of actions affecting ecosystem services, essential for understanding the economic efficiency of conservation efforts in river ecosystems.
Ecological Economics Valuation	Focuses on the interdisciplinary study of economics and ecological systems, relevant for understanding the economic value of ecological services provided by Sungai Johor.
Economic Valuation of Ecosystem Services	Explores the monetary value of ecosystem services, crucial for quantifying the economic benefits provided by the Sungai Johor ecosystem for informed decision-making.
Ecosystem Services Assessment	About assessing the services provided by ecosystems, important for understanding the range of services provided by Sungai Johor.
Ecosystem Services Pricing	Looks for information on assigning monetary values to ecosystem services, crucial for policy and economic decisions affecting Sungai Johor.
Ecosystem Services Valuation	Encompasses various methods and approaches to estimate the value of ecosystem services, fundamental for a comprehensive valuation of Sungai Johor's ecosystem services.
Environmental Economics of Ecosystem Services	Aims to understand the economic impacts of environmental changes on ecosystem services, relevant for economic policy-making and environmental management in the context of Sungai Johor.
Environmental Valuation	Seeks methods and approaches to value the environment and its services, applicable to various aspects of Sungai Johor's ecosystem.
Nature Capital Valuation	Focuses on valuing natural capital, including natural resource stocks and living organisms, essential for understanding the value of Sungai Johor's natural resources.
River Ecosystem Services	Specific to river ecosystems like Sungai Johor, seeks information on the unique services rivers provide.
Valuation of Ecosystem Services	A broad term for any methods and approaches to estimate the value of ecosystem services, highly relevant for a comprehensive understanding of the value provided by Sungai Johor's ecosystem.

3. FINDINGS

3.1 Cost Benefit Analysis from Ecosystem Services

From the previous findings from the theme of cost benefit analysis from ecosystem services delves into a multifaceted research spectrum, centering on the appraisal and application of economic and ecological models within environmental policy and conservation. It underscores the necessity of meticulous cost-benefit analyses in environmental policies, considering both immediate and enduring impacts like global warming and biodiversity diminution. The pivotal role of strategic investments, guided by such analyses for optimal conservation funding allocation, is exemplified by a Paraguayan Atlantic Forest case study. The study emphasises the paramount economic value of global ecosystem services, surpassing global gross national product, thereby highlighting their essential contribution to human welfare. The introduction of Social Multi-Criteria Evaluation (SMCE) to navigate complex policy dilemmas is discussed, incorporating political and social elements into economic frameworks. The compilation addresses the integration challenges of ecosystem service assessments in environmental governance and explores the role of institutions in environmental policy formulation. It also touches upon the complexity inherent in public preferences for biodiversity conservation, noting a general lack of public awareness and reluctance to prioritise biodiversity over other benefits. Furthermore, the anthology critiques contingent valuation methods in environmental economics, probing into ethical aspects and the comparability of environmental values.

The evolution of cost-benefit analysis in British environmental policy and its current challenges, including the validity of benefits transfer, are reviewed. The inherent weak comparability of values in ecological economics is highlighted, proposing multicriteria evaluation to manage value incommensurability. The paper also discusses Amartya Sen's perspectives on development and freedom, linking individual liberty, institutional roles, and development. The notion of economic sustainability and the long-term maintenance of natural resources are explored, considering individual time preferences for consumption and resource amenities. It advocates for defined units of account in environmental valuation to accurately quantify nature's contributions to human welfare, aiding policy decisions. The integration of economic principles into ecosystem service research is suggested to augment policy relevance via cost-benefit evaluations.

The paper challenges the monetary depiction of ecosystems, advocating for value pluralism and participatory decision-making processes. It underlines the strategic significance of recognising nature's value in conservation endeavours and proposes a framework for incorporating ecosystem services into decision-making. The Millennium Ecosystem Assessment's approach is scrutinised, stressing the necessity for research that encompasses the entire gamut of social-ecological system processes and feedback. The cost-efficiency of ecological restoration is examined, exemplified by a Latin American forest restoration study.

Lastly, several findings also critique mainstream environmental economics' normative economic valuation of ecosystem benefits and proposes a balanced approach for decision support, illustrated through an Indian wildlife sanctuary case study. This comprehensive methodology accentuates the need to develop economic, social, and governance systems that safeguard life-support mechanisms for sustainable human prosperity. The previous research under the theme of cost benefit analysis from the ecosystem services have collectively emphasise the imperative of interdisciplinary methodologies, merging ecological, economic,

and social aspects, underscoring the challenges in policy execution and the formation of robust valuation and decision-making frameworks for sustainability and conservation initiatives.

3.2 Ecological Economics Valuation

The bibliometric analyses under the phrase ecological economics valuation provides a comprehensive examination of the valuation and accounting of ecosystem services and natural capital. A pivotal study estimates the economic value of 17 ecosystem services for 16 biomes to be between US$16-54 trillion per year, suggesting that the planet's ecological systems and natural capital stocks form an essential component of the Earth's life-support system and contribute significantly to human welfare. This value surpasses the global gross national product, emphasising the substantial, yet often unaccounted for, contribution of ecosystem services to the global economy.

Another finding delves into the methodologies for measuring passive use values, a key issue in environmental economics. It compares choice experiments and contingent valuation, concluding that choice experiments are particularly useful for eliciting preferences that inform the valuation of environmental states. The discussion extends into wetland ecosystem restoration, employing a latent class choice model to evaluate the effects of different ecological characterizations on individual preferences and values for restoration projects, with a case study focusing on the Greater Everglades.

The need for standardised environmental accounting units is also highlighted, advocating for consistently defined units to measure nature's contributions to human welfare. Such units would facilitate comparability with conventional goods and services within GDP and other national accounts, thus bridging the gap between ecological contributions and economic assessments. In a critical discourse, the question of whether to monetarily value nature is debated, with a reframed approach that asks when and how to apply such valuations. This approach is guided by principles of environmental improvement, distributive justice, the preservation of pluralistic value-articulating institutions, and a consideration of the socio-political context of valuation.

The findings collectively underscore the importance of integrating ecosystem services into economic valuation and decision-making processes. It calls for refined tools and metrics that accurately reflect the value of the natural environment, thereby ensuring that it is preserved and enhanced for future generations.

3.3 Economics Valuation for Ecosystem Services

The latest studies in the field of ecosystem services and natural capital valuation demonstrate a substantial collaborative endeavour to measure and incorporate ecosystem values into economic frameworks. A specific research paper estimates the value of global ecosystem services, proposing a baseline value between US$16-54 trillion annually, a figure that exceeds the worldwide gross national product. Another piece of research emphasises the substantial non-tradable public benefits provided by ecosystems and warns against their over-exploitation, which jeopardises the livelihood of the poor and future generations. A further study updates the global value of ecosystem services to $125-145 trillion per year, with considerable losses due to land use change since 1997, highlighting the need for better accounting to inform decisions on biodiversity conservation and sustainable management.

The role of benefit transfer in ecosystem service valuation is also examined, as it provides a method to generate timely monetary estimates for nonmarket goods and services. Additionally, a conceptual framework is proposed to categorise and value ecosystem functions, goods, and services in a coherent manner, facilitating ecological economic analysis. Moreover, the articles recognise the importance of including ecosystem services in decision-making, especially in the conservation sector, where recognising the value of nature could potentially foster significant investments in conservation.

A quantitative review calls for a methodological blueprint for ecosystem services research, identifying key facets that include biophysical realism, consideration of local trade-offs, off-site effects, and stakeholder involvement. Furthermore, the ecosystem services agenda is poised to bridge gaps between natural science, economics, and public policy, with a strong focus on improving knowledge and the use of that knowledge in policy and practice. This includes mapping and modelling ecosystem services for better integration into national accounts and policy decision-making.

The review concludes by advocating for a comprehensive valuation approach sensitive to various actions affecting water quality, acknowledging that water quality is a critical contributor to many services from recreation to human health. Lastly, the valuation of ecosystem services is not just an academic exercise but a critical component in guiding real-world decisions and policies, where it must be aligned with broader goals of environmental sustainability and poverty alleviation.

3.4 Ecosystem Services Assessment

The extensive body of research on ecosystem services, as outlined in the provided studies, underscores a unified theme: the intricate value and indispensability of ecosystem services to human welfare and the global economy. The economic valuation of these services is vast, with conservative estimates suggesting an annual worth of $33 trillion for the biosphere, a figure that dwarfs the global gross national product. This valuation, however, is acknowledged as a baseline due to the complexities involved in precise quantification.

A critical area of focus within these studies is the supply and demand dynamics of ecosystem services. Human land use and the resultant changes significantly influence ecosystems' ability to deliver services that are vital for the sustainability of human-environmental systems. The research emphasises the need for robust indicators and data, both quantitative and qualitative, to match ecosystem service supply with societal demand, considering the significant spatial and temporal scales involved.

Biodiversity's connection to ecosystem services features prominently, with the degradation of ecosystem services identified as a significant barrier to achieving developmental goals. The literature explores the utilitarian value of biodiversity, its contribution to human livelihoods, security, and health, and the need for its integration into environmental management and policy through the Ecosystem Approach.

The classification and typology of ecosystem services are recurrent themes, highlighting the scattered nature of data and the incompatibilities across disciplines. This fragmentation has prompted calls for a standardised framework to assess ecosystem functions, goods, and services comprehensively. Such frameworks are not only essential for ecological economic analysis but also for facilitating comparative studies across different ecosystems.

Stakeholders' varying values and perspectives on ecosystem services necessitate frameworks that can capture this diversity. The valuation of ecosystem services often involves multiple stakeholders, each attributing different values based on their spatial and institutional contexts. Thus, enhancing valuation frameworks to accommodate these differences is crucial for ecosystem management. Methodological challenges in integrating ecosystem service assessments into landscape planning, management, and decision-making are central concerns. The literature points to the need for operational definitions and classification schemes relevant to decision-making contexts to address these challenges effectively.

Mapping the demand for ecosystem services has emerged as a critical tool for conservation planning and land-use management. A clear conceptual understanding of ecosystem service demand, its drivers, and temporal dynamics is essential for policy and management decisions. Human impact on ecosystems has been substantial, with a significant portion of Earth's land surface transformed, affecting the availability and quality of ecosystem services. This human domination of ecosystems highlights the urgency of implementing effective management and conservation strategies.

Frameworks for ecosystem service assessment are being developed to support sustainable management and decision-making. Identifying and mapping ecosystem service flows, capacities, demands, and trade-offs is essential for informed policymaking and effective conservation. Methodological advancements in the field are diverse, spanning biophysical modelling, spatial analysis, and the incorporation of socioeconomic data. Despite progress, there is a call for standardised, interdisciplinary approaches to improve the accuracy and applicability of ecosystem service assessments. These previous studies have indicated collectively underscore the critical role of ecosystem services in sustaining human life and the global economy. They call for integrated, standardized methodologies to ensure accurate valuation and sustainable management of these precious resources.

3.5 Ecosystem Services Pricing

The bibliometric analysis highlights the multifaceted and integral role of ecosystem services and natural capital in human welfare and the global economy. The total value of these services is estimated to be as high as $54 trillion per year, which is significantly higher than the global gross national product. These services encompass goods such as seafood, forage, timber, and the processes of cleansing, recycling, and renewal, all of which are essential for life and economic activities.

The literature underscores the importance of quantifying these services accurately, given their substantial contribution to human well-being. These ecosystem services have been systematically evaluated by scientists from diverse disciplines to understand their character, value, and the impact of their degradation on human society. The findings emphasise the pressing need to protect the earth's life-support systems. The studies also discuss the challenges in measuring the values of environmental changes, with a focus on methodologies like the contingent valuation technique, property value models, and the travel cost approach. They address the issues of optimality principles in biology, production, consumption, externalities, and the integration of environmental considerations into economic systems.

One study offers a comparative static theory for ecological systems, suggesting that components of ecosystems behave to maximise resource storage, leading to equilibrium states

that mirror economic concepts. Meanwhile, other works propose frameworks and models that integrate ecosystems into economic analysis, revealing the importance of considering ecological constraints like spatial interdependence, irreversibility, and uncertainty in forest management. The debate on contingent valuation and its role in policymaking, particularly in the context of non-use benefits of forest biodiversity, suggests that substantial values are generated through efforts to enhance biodiversity. Similarly, the economics of extinction are revisited to offer a generalized framework for analysing issues related to endangered species and biodiversity losses.

Moreover, the research advocates for ecosystem-based management, highlighting the need for robust valuation methodologies and interdisciplinary collaboration to manage ecosystems effectively. It recognizes that the valuation of ecosystem services often lacks clarity, advocating for processes that involve open deliberative judgment rather than just monetary valuation. In a nutshell, these studies call for a comprehensive approach to ecosystem service valuation, incorporating economic principles and scientific understanding to foster conservation efforts and inform decision-making processes. They emphasise the need for a scientific basis and policy mechanisms to integrate natural capital into resource and land-use decisions to promote conservation and human well-being on a large scale.

3.6 Ecosystem Services Valuation

The bibliometric analysis underscores the complex and essential role of ecosystem services and natural capital in supporting human welfare and the global economy. This research encompasses a range of services, including the provision of goods such as seafood, forage, and timber, as well as crucial processes like cleansing, recycling, and renewal, which are indispensable for sustaining life and economic activities. This economic contribution is mainly derived from goods like seafood, forage, timber, and essential processes such as cleansing, recycling, and renewal, which are fundamental to human survival. Notably, these services are often not captured by market mechanisms, suggesting a need for innovative institutional approaches to manage these common asset resources effectively.

The findings underscore the importance of incorporating ecosystem service values into decision-making and policy formation to enhance biodiversity conservation and sustainable management. Valuation studies across various biomes reveal that the benefits of ecosystem services are largely public and non-tradable, necessitating improved accounting and management practices to inform better conservation strategies and decision-making processes. Challenges and methodologies in valuing ecosystem services are also a central theme, with discussions on contingent valuation, benefit transfer methodology, and the need for integrating economic valuation into effective landscape planning and management. Additionally, the findings highlight the attention to the necessity of preserving and restoring ecosystem services within urban areas to reduce ecological footprints, bolster resilience, and enhance the quality of life for urban populations.

The integration of ecosystem service valuation is emphasised as essential for comprehensive ecosystem management, combining economic principles with scientific insights to support conservation and informed policy-making. An inclusive approach to valuation is advocated, one that encompasses the diverse perspectives and values of stakeholders, particularly in the context of frameworks like the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

Moreover, the abstracts advocate for the consideration of cultural and social dimensions in ecosystem service valuation, often neglected in traditional economic valuation methods. They highlight the significance of understanding and incorporating these non-material values to ensure a holistic approach to ecosystem management. Lastly, the findings provide insights into the practical application of ecosystem service valuation in real-world decision-making, emphasising the need for robust policy and financial mechanisms that can integrate natural capital into resource and land-use decisions effectively.

In summary, the findings collectively argue for the critical need for interdisciplinary approaches, inclusive valuation methods, and the integration of ecosystem services into policy and decision-making. This is crucial for ensuring sustainable and equitable utilization of natural resources, recognising the full breadth of ecosystem services' contributions to humanity and the planet.

3.7 Environmental Economics of Ecosystem Services

The bibliometric analysis provided reflects a significant body of research on the economic and ecological valuation of ecosystem services worldwide. The overarching theme is the critical importance of ecosystems to human welfare, both directly and indirectly, and the substantial economic value they represent. These studies underscore the need for comprehensive approaches to mapping ecosystem service supply, demand, and flow, as well as the challenges and methodologies for integrating ecosystem services into decision-making and landscape planning.

Several papers highlight the complexity of defining and classifying ecosystem services, the relationships among them, and the trade-offs that often occur when prioritising certain services over others. The research suggests that urbanisation and land-use changes have considerable impacts on the provision of ecosystem services, often leading to a mismatch between supply and demand. This is particularly evident in studies focusing on urban areas, where ecosystem services are crucial for maintaining quality of life. The research also points to the need for a multidisciplinary approach to assess and manage ecosystem services, incorporating spatial analysis, socio-economic factors, and environmental policy objectives. Some studies specifically address the valuation of services such as mangrove ecosystems in Southeast Asia or river restoration projects, demonstrating the practical implications of ecosystem services valuation. In sum, the collected research emphasizes the indispensable role of ecosystems, the need for sustainable management practices, and the integration of ecosystem service valuations into broader socio-economic planning and policy frameworks to ensure the well-being of current and future generations.

3.8 Environmental Valuation

The bibliometric findings delve into environmental valuation, a field that intersects ecological, economic, and social dimensions within public decision-making. Central to these studies is the exploration of environmental appraisal methods, including their institutional contexts and the intricate valuation of ecosystem services and natural capital. These works cover a wide range of topics, starting with the various methods used for environmental appraisal, acknowledging that the choice of method can significantly influence decision outcomes. They highlight the importance of understanding individual versus social rationality in environmental decisions. Benefit transfer principles are also discussed, emphasising the need for appropriate methods tailored to specific contexts, especially when sites under consideration are dissimilar.

A notable theme is the concept of weak comparability of values within ecological economics, focusing on the tools needed to handle value incommensurability in decision-making at different scales. The complexity of summing public good demand curves is addressed, particularly the challenge of aligning political and economic jurisdictions for natural resource public goods valuation.

The metaphor of "ecosystem services" is critically examined, suggesting that while it has brought attention to the relationship between humans and nature, it risks oversimplifying the complexity of the environmental challenges. The findings propose more comprehensive frameworks for ecosystem service assessments, integrating economic theories and methodologies to capture the full range of ecosystem values. Comparisons between survey and hedonic approaches to valuing quasi-public goods call for validation and consistency in valuation methodologies. The role of ethical considerations in environmental management is exemplified by a focus on fisheries management, introducing an ethical scenario process for future strategy development.

The debate over the use of prices in biodiversity management is also present, questioning the effectiveness of monetary valuation in environmental decision-making and suggesting alternative approaches. The concept of social multi-criteria evaluation (SMCE) is explored, discussing its methodological foundations and how it can inform operational practices. The challenges faced by the TEEB initiative in framing the economics of ecosystems and biodiversity are underscored, aiming to underline the global economic benefits of biodiversity conservation. Spatial preference heterogeneity in environmental valuation is examined, especially in the context of forest recreation and onshore wind power, showing how spatial factors influence willingness to pay. Lastly, the integration of revealed and stated preferences in environmental valuation is presented, with applications ranging from beach recreation to assessing the impacts of forest logging, highlighting the need for interdisciplinary approaches and the consideration of spatial and social dimensions in valuation processes. The findings collectively underscore the need for nuanced, interdisciplinary approaches to environmental valuation that are informed by economic theories and methodologies, and that take into account the spatial and social complexities of ecosystem valuation in policy-making.

3.9 Nature Capital Valuation

The findings under the theme of nature capital valuation provide insights into the valuation of the world's ecosystem services and natural capital, emphasising their critical role in supporting Earth's life-support system and human welfare. One of the research estimates the economic value of ecosystem services for various biomes, suggesting a substantial worth that surpasses the global gross national product. The other research highlights the fragmented nature of information on the value of ecosystem goods and services, proposing a standardised framework for assessment to enable a more coherent ecological economic analysis. Other findings also critique current valuation efforts as metaphorical rather than practical, offering a method to approximate the value of natural capital that considers ecological and economic estimates and real-world management conditions.

A common limitation across these sources is the inherent uncertainty and the scattered nature of data, which leads to challenges in creating a standardised, comprehensive valuation framework. The findings also suggest the limitation lies in the uncertainty of the estimates, emphasising that the provided figures should be considered a minimum due to the non-

market nature of many ecosystem services. Moreover, the findings also highlight the lack of coherence in existing data, which is dispersed across disciplines and often incompatible in scale and classification, hindering comparative analysis. Furthermore, it also implies that existing valuation methods are largely metaphorical and do not adequately account for inefficient management institutions, necessitating a more integrated approach that considers the dynamic interplay between natural capital stocks, human behavior, and institutions. While these works advance the understanding of ecosystem valuation, it also calls attention to the need for more accurate and integrative approaches that reflect the complexity and interdisciplinary nature of ecosystem services and natural capital. It also advocates for advancements in methodology that can bridge the gaps between theoretical, ecological, and economic perspectives to achieve more practical and effective valuation.

3.10 River Ecosystem Services

The collection of research articles examines the intricate dynamics of ecosystem services (ES), emphasising the valuation, the influence of land use changes, and the incorporation into decision-making processes. The studies collectively recognise the critical role that ES play in supporting human welfare and the Earth's life-support systems. There is an effort to quantify their economic value, which, in certain cases, is found to exceed the global gross national product. Central to these discussions is the necessity for a standardised framework that can classify, describe, and value ES. This need arises from the observation that current data on ES are dispersed across various sources and lack a cohesive structure. The relationship between the supply, demand, and flow of ES is scrutinised, particularly concerning the sustainability of their provision. Urbanisation's impacts on ES are also a focal point; it is noted that urban expansion can alter ecosystems' productivity, sometimes enhancing regional net primary production (NPP) but also disrupting natural plant growth cycles tied to water and nutrient availability.

The use of Local Indicators of Spatial Association (LISA) emerges as a valuable tool in identifying spatial association patterns and assessing the impact of individual locations on global metrics. The multifunctional nature of ecosystems is acknowledged, necessitating careful management of trade-offs between various ES, especially in landscapes that are undergoing urban and agricultural transformations. There is a call for ecological insights to be more deeply integrated into decision-making to manage ES more effectively. This includes a focus on biodiversity's role in delivering these services. Moreover, meta-regression analysis is applied to synthesize the economic valuation of wetlands in developing countries, revealing factors like wetland size and type as significant determinants of their estimated values.

The research underscores the complexities involved in ES valuation and management and the need for interdisciplinary approaches that consider ecological, economic, and social factors. Identified challenges include creating a coherent framework for classification and valuation, better integrating ES into policy and decision-making, and gaining a more profound understanding of ES's spatial dynamics, particularly under the pressures of rapid urbanisation and environmental changes. The studies suggest that managing ES successfully requires not just scientific understanding but also innovative policy development that can respond to the dynamic interdependencies between ecosystems and human societies. There is an emphasis on ES's significance for human well-being and the necessity for sustainable management practices to ensure the resilience and continuity of these services in the long term.

3.11 Valuation of Ecosystem Services

The research under the theme of valuation of ecosystem services highlights the economic valuation of wildlife resources and ecosystem services, underlining their crucial role in human welfare and the Earth's life-support system. This body of work focuses on quantifying the economic importance of ecosystem services, demonstrating that their value significantly exceeds the global gross national product. However, these valuations are considered minimal estimates due to inherent uncertainties. The limitations of these studies include the complexity of ecological and economic systems, which are not fully captured by conventional valuation methods. Current valuation approaches are criticised for being too cumbersome and not widely applicable, with a tendency to be driven by short-term human preferences. This leads to a need for a system to compare one wildlife resource with another, ultimately correlating to monetary values, but also considering factors like resource scarcity, accessibility, and species diversity.

There is an urgent call to shift valuation from choosing among resources to valuing the avoidance of catastrophic ecosystem changes, acknowledging the non-linear dynamics and inherent complexity of ecosystems. The potential for catastrophic ecosystem change requires a new valuation perspective that prioritises long-term sustainability over short-term gains. Moreover, the research underlines the need for a standardised framework to describe, classify, and value ecosystem functions, goods, and services. Such a framework would help integrate economic and ecological concepts for valuing ecosystem services, making trade-offs more apparent and aiding decision-making processes aimed at sustainability.

The studies collectively emphasise the need for more refined valuation methods that appreciate the complexity of ecosystem services, including their non-linear and dynamic properties. They highlight the essential role that natural systems play in supporting human life and the need for greater efforts to protect these systems. There is also a recognition that as human impact on the environment grows, the importance of valuing ecosystem services to guide future human activity becomes increasingly critical.

4. CONCLUSIONS

The systematic literature review on ecosystem valuation in the Johor River context is poised to make a substantial contribution towards establishing a detailed taxonomy and a refined methodological approach for ecosystem valuation. This endeavour draws upon the extensive range of studies encompassing cost-benefit analysis, ecological economics valuation, and economic valuation for ecosystem services. Such a diverse knowledge base provides the foundation for developing a taxonomy that categorizes the array of ecosystem services and natural capital specific to the Johor River, facilitating systematic assessment and valuation. This taxonomy will classify services such as provisioning, regulating, cultural, and supporting services, along with their respective valuation methodologies.

In terms of methodological approaches, the review underscores the importance of integrating social, political and economic dimensions into valuation frameworks. This integration is crucial for addressing complex policy dilemmas and capturing public preferences. Methodologies like social multi-criteria evaluation and choice experiments can be adapted to the Johor River's unique context. This adaptation allows for a more comprehensive valuation process that includes non-market and

passive use values and considers the diverse perspectives of stakeholders within the socio-political landscape of the Johor River region.

Additionally, the review emphasizes the need for standardization in environmental accounting and aligning ecological valuation with conventional economic assessments. By adopting standardized units and methodologies that are in sync with global economic frameworks, the valuation of the Johor River's ecosystem services can be accurately compared and integrated into broader economic planning and decision-making. Such standardization is key to effectively communicating the economic and welfare significance of these services to policymakers and stakeholders. Moreover, incorporating biophysical realism and stakeholder involvement ensures that valuation methodologies are not only ecologically sound but also responsive to local community needs and preferences. This approach bolsters the relevance and applicability of the valuation in local conservation strategies, sustainable management practices and policy development.

Ultimately, the literature review lays the groundwork for increased investments in the conservation and sustainable management of the Johor River. By highlighting the economic value of ecosystem services and advocating for their inclusion in decision-making, particularly in conservation, the review serves as an essential tool for promoting these investments. It provides evidence-based justifications for prioritizing ecosystem services in regional development and conservation policies, thereby playing a pivotal role in informing sustainable management decisions and conservation efforts in the Johor River area.

The compendium of research on the cost-benefit analysis of ecosystem services reveals a multifaceted examination into the economic and ecological frameworks that underpin environmental policy and conservation efforts. It is evident that these analyses are indispensable for understanding the economic efficiency of conservation and the profound economic value of global ecosystem services, which is emphasised to surpass the global gross national product. Challenges in integrating ecosystem services into environmental governance are evident, particularly in addressing the complexity of public preferences for biodiversity conservation. The studies advocate for the incorporation of social and political dimensions into economic frameworks, such as the social multi-criteria evaluation, to navigate the intricacies of policy dilemmas. Furthermore, the research findings also underscore the need for clearly defined units of account in environmental valuation and suggest the adoption of multicriteria evaluation to manage the inherent weak comparability of values in ecological economics.

The body of work under ecological economics valuation offers a comprehensive perspective on the economic assessment of ecosystem services and natural capital. Highlighting the immense value ecosystems contribute to human welfare, studies estimate this economic contribution to be in the tens of trillions annually, far exceeding the global gross national product. The research delves into the methodologies for capturing passive use values and examines various valuation techniques such as choice experiments. It also calls for the standardization of environmental accounting units to align with conventional economic assessments. The collection emphasizes the need for valuation practices that are informed by principles of environmental improvement and distributive justice, reflecting a reframed approach that considers socio-political contexts.

Research on the economic valuation for ecosystem services showcases an interdisciplinary effort to integrate the value of ecosystems into economic frameworks. The significant monetary value attributed to these services underscores their critical role in sustainable management and biodiversity

conservation. The literature points to the necessity of benefit transfer for nonmarket goods valuation and proposes conceptual frameworks for categorizing ecosystem functions and services. The inclusion of ecosystem services in decision-making, particularly in conservation, is highlighted as a means to foster significant investments. A call for methodological blueprints emphasises the need for biophysical realism and stakeholder involvement in ecosystem service research, aiming to bridge gaps between science, economics and policy-making for improved environmental sustainability.

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RESIDENTS' PERCEIVED PROPERTY PRICE FAIRNESS CONCERNING THE INFRASTRUCTURAL DEVELOPMENT IN GREATER KUALA LUMPUR

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ABSTRACT

Residential property prices in Malaysia have been steadily rising in recent years, with bright prospects for the future. However, the prices of residential properties in Malaysia vary greatly depending on the level of infrastructure development in each area. This research aims to determine the adequacy of infrastructural development in Greater Kuala Lumpur and to examine residents' perceived property price fairness concerning the infrastructural development in this area. A questionnaire survey was distributed via Google Forms to collect approximately 400 responses from a sample of residents in Greater Kuala Lumpur, and the data was analysed using Statistical Package for Social Sciences (SPSS). Through Relative Importance Index analysis, this study evaluated the adequacy of infrastructural development such as railways, roadways and highways, airports, water and sanitation, telecommunications, educational infrastructures, retailers, health facilities and recreational facilities. This research then assessed the relationship between the adequacy of infrastructural development and residents' perceived property price fairness via Spearman correlation analysis. According to the findings, there is a positive significant relationship between the adequacy of infrastructural development and property price fairness perceived by the residents in Greater Kuala Lumpur. A positive correlation indicates that as the adequacy of any infrastructural development increases, the other variable, residents' perceived property price fairness, tends to increase or vice versa. The research findings will be valuable to real estate developers, agents, investors and owners in Greater Kuala Lumpur.

Keywords: *Greater Kuala Lumpur, adequacy of infrastructural development, residential property price fairness, relative importance index*

1. INTRODUCTION

Infrastructure is a critical driver of economic growth in any country. It includes the essential services that drive economic activity, such as electricity, roads, water systems, public facilities, airports, railways and telecommunications. However, infrastructural development refers to the establishment of the basic amenities and services required for a specific activity or pursuit. According to Oxford Business Group (2012), several critical infrastructure projects are being implemented in Malaysia as part of the Economic Transformation Programme (ETP). Consequently, the real estate market remains positive, while the construction sector in Malaysia is experiencing a comparatively active economic cycle.

Large infrastructure projects are a crucial part of Malaysia's construction industry development. Large infrastructure refers to the basic physical system of a business or country. For instance, new trunk roads, airports, ports, power plants, nuclear facilities and chemical industries are included in the large infrastructure projects. In addition, large infrastructure may also include transportation, communication, sewage, water and electric systems (Masrom et al., 2015). Multinational studies have shown that investments in transportation, electricity and telecommunications infrastructure have significant positive effects on GDP growth in the long run (Timilsina et al., 2023; Nisa & Khalid, 2024).

Tan (2012) stated that infrastructural developments necessitate the provision of sufficient accommodation in a high-standard and peaceable living environment for all Malaysians in need, regardless of race or religion. Therefore, the widespread assumption is that infrastructure provision in residential property will continue to attract potential home purchasers (Olujimi and Bello, 2009). According to Oduwaye (2009), the rising demand for residential property in a city will continue to pique the interest of real estate investors. Thus, the availability of infrastructural development in the residential property market is crucial and can be categorized into transport infrastructure, utility infrastructure and social infrastructure (Hardekar et al., 2018).

New infrastructure developments are likely to directly or indirectly impact residential property demand and market value. Thus, this research will examine the adequacy of infrastructural development and residents' perceived property price fairness in Greater Kuala Lumpur.

1.1 Background Study

The availability and adequacy of infrastructure are critical factors influencing the demand and choice of residential property. Individuals with good socioeconomic status often seek to reside in residential properties surrounded by a maximum supply of basic infrastructure at an affordable cost. In these circumstances, most residents in Greater Kuala Lumpur prefer to live near their workplaces, schools, shops, recreational areas and transport stations. Besides, most homeowners may prioritize neighbourhood characteristics like the standard of housing, the standard and expense of public utilities, the social environment, the omission of noise and pollution and any reputation associated with the region.

It is critical to provide infrastructural facilities that will enhance the living conditions of neighbourhood residents. Infrastructure and the provision of housing are closely related, whereby to provide sustainable housing, infrastructural facilities must also be provided (Otegbulu and Adewunmi, 2009). In Malaysia, about RM450 billion to RM500 billion is spent on infrastructure investments (Rashid, 2021). As a result, infrastructure services are expected to increase, leading to increased productivity and a higher standard of living.

Greater Kuala Lumpur is a key focus of Malaysia's Economic Transformation Program, aiming to develop a vibrant metropolitan area (Yau et al., 2016). Greater Kuala Lumpur is experiencing rapid urbanization and growth. In recent years, this area has shown significant progress in enhancing its infrastructure to support the growing population and economic activities. Infrastructure development significantly influences housing prices. Studies have shown that improved accessibility, road networks and availability of facilities like transportation, utilities and public services can lead to increased land and housing prices (Prabowo & Adianto, 2022; Dabara et al., 2016). The adequacy of infrastructure in housing developments is crucial for improving the quality of life and ensuring sustainable housing environments (Ogunsanya et al., 2016). Also, properties with better infrastructure and physical conditions generally command higher rental values (Dabara et al., 2016).

According to Chung (2022), the average property prices in Greater Kuala Lumpur showed significant growth from 2000 until the first quarter of 2021. The Juwai IQI Malaysia Property Survey and Index Q3 2022 revealed that property prices are expected to increase significantly over the next 12 months. Due to the challenging economic situation, including rising interest rates and a higher cost of living, the housing market price in Greater Kuala Lumpur is climbing. Wong (2024) also mentioned that Malaysia's average sub sale and new property unit prices in the first quarter of 2024 are slightly higher than in 2023.

Nonetheless, the rapid urbanization of Greater Kuala Lumpur has led to significant urban management challenges, including land use changes, rural encroachment, and environmental degradation (Yasin et al., 2022). Flash floods have also hit Greater Kuala Lumpur in recent years due to the unsupported drainage system towards heavy downpours (Rajendra, 2021; Rodzi, 2022). Furthermore, the water disruption issue is another topic that has been frequently raised and discussed. A study estimated that property valued at RM459,041 million was at risk due to frequent water supply disruptions in Selangor and parts of Kuala Lumpur in 2020, with business losses amounting to RM2,053 million (Raihan et al., 2023). These rising issues led to the question of how adequate the infrastructure developments in Greater Kuala Lumpur are in supporting its growing population and economic activities.

With this question in mind, the fluctuations in residential property prices related to infrastructure development may raise concerns among residents regarding the fairness of these price shifts. Some residents may perceive the rising property prices as positive, indicating increased desirability and potential for future returns on investment. In contrast, some residents may view these price increases as unfair, especially if they result in affordability issues or socioeconomic disparities. Therefore, this research aimed to determine the adequacy of infrastructures in Greater Kuala Lumpur and examine its relationships with the residents' perceived property price fairness in Greater Kuala Lumpur.

1.2 Research Objectives

The objectives of the research are as follows:

i. To determine the adequacy of infrastructural development in Greater Kuala Lumpur.
ii. To examine residents' perceived property price fairness concerning the adequacy of infrastructural development in Greater Kuala Lumpur.

2. LITERATURE REVIEW

2.1 Residential Property

Residential properties, primarily houses used for living, are a crucial component of household assets and expenses (Balk et al., 2013). Adequate housing should consider factors such as good location, housing market choices and access to public services (Satterthwaite, 2020). Additionally, housing should incorporate essential amenities such as water, electricity and waste management systems to improve residents' quality of life (Gyimah & Gyimah, 2014). Furthermore, studies have shown that residents' satisfaction is influenced by the quality of facilities and maintenance services provided (Oluwunmi & Emoka, 2022; Sia et al., 2018). Providing adequate housing with necessary services is crucial for meeting residents' physical and biological needs.

2.2 Infrastructure

Infrastructure is the fundamental facilities, structures, and systems that support the functioning and development of a society and its economy (Wafer, 2019). Besides, infrastructures constitute a network of structures and frameworks that connect emerging cities and metropolitan regions (Ijaiya and Akanbi, 2009). Infrastructure typically refers to the physical components of interconnected systems that provide commodities and services required to enable, sustain, or improve societal living conditions. It encompasses physical elements like roads, pipes, cables, and public goods and services essential for economic growth and quality of life (Wafer, 2019). The World Health Organisation (WHO) expanded this definition of infrastructure to include basic services, amenities, appliances and mechanisms required or preferred for physical and mental health and the group's and individual's social welfare.

2.3 Adequacy of Infrastructural Development

Infrastructure development is crucial for sustainable economic growth and national development (Susantono & Berawi, 2018; Asaju, 2023). Adequate infrastructure for both physical and social components is essential for providing necessary public services and fostering growth (Berawi, 2017; Susantono & Berawi, 2018). The provision and maintenance of reliable infrastructure, including public utilities, works and transport systems are fundamental to increasing productivity, expanding trade, reducing poverty and improving living standards (Susantono & Berawi, 2018).

2.4 Relevance of Infrastructural Development to Residential Property

By investigating the property market in hundreds of German cities, Belke and Keil (2018) discovered that local infrastructure was inextricably linked to residential property prices. According to Abidoye et al. (2021), the construction of new infrastructure will impact the surrounding area's property, economy, environment and housing value. Weisbrod et al. (1980) proposed that infrastructure construction in urban regions can potentially widen urban boundaries and impact residential property values in adjacent areas.

Access to good roads, drainage and electricity, among other things, increases property values (Oduwaye, 2009). Property and land values tend to rise more quickly in areas with expanding transportation networks and less quickly in areas without such improvements. According

to Chen et al. (2022), residential property values in the Yangtze River Delta have increased simultaneously with the fast infrastructural development. A considerable quantity of funds drifts into the Yangtze River Delta due to rapid infrastructural development, accelerating the flow of industrial components, extending the economic scale and rising geographical inhabitants. Different types of infrastructure are discussed in the following sections.

2.4.1 Transportation Infrastructure

In particular, transportation infrastructures like roads and public transit systems are essential in improving efficiency and quality of life, especially in greater and crowded metropolitan regions like Greater Kuala Lumpur in Malaysia (Dziauddin, 2022). The provision of transportation, such as roads, railways, airports, seaways and waterways, facilitates the movement of people from one location to another.

2.4.1.1 Railways

According to Dziauddin (2019), rail transit investment increases the property's accessibility to key activity centers and, in most cases, increases the appeal of locations near transit stations. The train line increased access to the CBD for a catchment area of homes, likely to have increased the value of residential properties (Melser, 2020). According to Dziauddin (2022), since the mid-1990s, the Malaysian government has burnt billions of dollars for capitalizing on the establishment of various types of urban rail transit systems in Greater Kuala Lumpur, the latest of which is mass rapid transit (MRT).

Numerous studies have demonstrated that high-capacity transit stops, such as metro or light rail stations, significantly influence property prices. Because of the increased demand for goods from purchasers, the improved accessibility of urban transportation may raise the price of surrounding property. Studies in various cities, including Houston, Zhengzhou and Greater Kuala Lumpur, have found significant increases in property values near rail stations (Pan, 2019; Zhang & Jiao, 2019; Dziauddin, 2023). The impact varies with distance, with properties closer to stations generally experiencing higher premiums (Dziauddin, 2023; Zhang & Jiao, 2019).

2.4.1.2 Roadways and Highways

Roads are the country's primary mode of domestic transportation, accounting for well over 90% of all passenger and freight traffic. In his classical theory, Ratcliffle (1995) conceptualized that general access routes or road improvements influence residential property prices favorably.

According to Langley (1981), prices for residential properties positioned too close and too far from the highways may be lower, whereas those located at a moderate distance may be higher. A study examined the impacts of highway noise on housing prices and discovered that every decibel of noise near the highways reduces residential property prices by up to 0.63% (Nelson, 1982). According to Riccioli et al. (2021), being too close to a rail

transit line's main road would cause severe traffic congestion and pollution, lowering housing prices.

2.4.1.3 Airports

According to Efthymiou & Antoniou (2013), while the negative externalities generated, such as noise, have a negative impact, the proximity to the airport implies higher residential property prices because of the increased accessibility. Cohen and Coughlin (2009) investigated the case of Atlanta International Airport and concluded that the estimation is biased when the accessibility variable is omitted.

2.4.2 Utilities Infrastructure

Utility facilities encompass a variety of urban infrastructure and utilities like water supply, drainage and sewerage, waste disposal, street lighting, electricity, bus and truck terminals, and so on (Nahrin, 2018). The author also stated that the supply of utility infrastructure and firms to offer jobs in the emerging urban regions will make these locations appealing to the city people.

2.4.2.1 Water and Sanitation

Choumert et al. (2014) stated that purchasing residential property with existing water connections is a sound way for households who cannot afford the expense of installing a new connection to gain access to the water network. Therefore, connecting a residential property to the piped water network is likely to raise its property value (Choumert et al., 2014). Sohn and Kim (2020) examined the capitalization impact of rainwater treatment ponds on residential property prices in water supply and drainage infrastructure.

Ibrahim (2011) studied sanitation and solid waste disposal as infrastructures that promote healthy living by removing trash from the human environment, whether domestic, industrial or commercial. It consists of refuse collection facilities, treatment plants, incinerating plants, disposal facilities, landfills and other similar facilities.

2.4.2.2 Telecommunications

The cellular and internet segments will experience the most growth in the telecommunications sector. According to Bandias & Vemuri (2005), enhanced telecommunication may provide communities with benefits beyond greater communication capability. Telecommunication is a critical instrument for overall community development, positively affecting education, health, economy and social cohesion.

According to Akin and Margaret (2014), there is a relatively high correlation between staying around the telecommunication mast for an extended period and property value decline on the one hand and property patronage on the other. This correlation implies that prospective buyers prefer to stay elsewhere rather than in houses near the telecommunication mast.

2.4.3 Social Infrastructure

Social infrastructures include amenities and services like health care, education and various government agencies, among others, frequently act as the drivers of social and economic activity (Ijaiya and Akanbi, 2009). According to Chulanova (2007), developing social infrastructure is critical in modern communities because education and health care are important variables for economic growth, social progress and a country's competitiveness in worldwide markets.

2.4.3.1 Educational Infrastructure

The desire of wealthy Chinese parents to equip their children with a high-standard education, in particular, boosts their willingness to pay high expenses for residential properties (Feng and Lu, 2013). Chan et al. (2020) stated that high-quality schools in a neighbourhood might result in a 14% rise in district residential property prices, a phenomenon common in urban China.

According to Ibrahim (2011), promoting far-reaching social and economic changes requires the nation to have a modern and progressive educational system. Sufficient infrastructure should be supplied from elementary schools like nursery or primary to secondary and higher institutions like polytechnics, universities and colleges of education to encourage a high standard of education and training.

2.4.3.2 Retailers

According to Wang and Li (2006), the convenience of daily goods shopping is an important factor for home ownership preferences in China. Mikelbank (2004) indicated that residential property prices increase due to transportation enhancements along the shortest-path routes connecting individual residences to the region's CBD or the local shopping centre. Interestingly, despite accessibility advantages to retailers, a high concentration of retailers might dissuade residents from buying specific locations because of overcrowding and noise pollution (Hurtubia et al., 2010).

2.4.3.3 Health Facilities

Cui et al. (2018) stated that hospital accessibility influences housing prices and rents. Even though hospitals are rarely considered and studied in terms of capitalization, the distance to areas with high-standard hospitals positively impacts housing prices in such areas (Yuan et al., 2018).

According to Ibrahim (2011), population and economic growth necessitate the provision of sufficient and enhanced healthcare infrastructures. This provision can be accomplished by placing sufficient and effective medical facilities, clinics, hospitals and maternity houses within an appropriate proximity of beneficiaries.

2.4.3.4 Recreational Facilities

According to Ibrahim (2011), some examples of social infrastructure include recreational infrastructures like playgrounds, sports facilities, gardens, geographical and zoological parks and natural recreational centres such as waterfalls, warm water springs, beaches, etc. These facilities have been designed to relieve stress, promote relaxation, see illusions and encourage a long and healthy life.

Studies showed that proximity to sports facilities and parks increases residential property values (Feng & Humphreys, 2018; Bottero et al., 2022). Furthermore, residential property units located close to green or recreational parks are extremely desirable and preferred by the residents (Lo & Jim, 2010). Accessible green spaces near residences have been demonstrated to increase residential property prices by 5–6% (Tajima, 2003).

3. RESEARCH METHODOLOGY

3.1 Data Collection

Data collection is the most critical part and a prerequisite process before data analysis. The data can be collected from two main sources: primary sources and secondary sources. Primary data is obtained via a questionnaire survey designed specifically for the study. However, secondary data is obtained by reviewing relevant literature, journals and papers. To determine residents' perceived property price fairness towards the adequacy of infrastructures, a self-administered survey was carried out to obtain data needed for the research.

3.2 Sampling

Data is collected within a sample from a population. However, examining only a subset of the population is often preferable rather than the entire population. Therefore, this research mainly focused on respondents currently residing in Greater Kuala Lumpur. Based on Krejcie and Morgan's Table, a sample size of 400 residents in Greater Kuala Lumpur was required to investigate their perceived property price fairness towards the adequacy of infrastructural development. The questionnaire was generated using Google Forms. Then, the snowball sampling method was used to facilitate and broaden the process of questionnaire distribution to the relevant respondents through online platforms.

Snowball sampling is a purposeful method used in qualitative research to study hard-to-reach populations (Naderifar et al., 2017). This method involves identifying initial respondents who refer researchers to other potential participants, creating a chain of referrals (Atkinson and Flint, 2001). It has been successfully applied in various fields, including real estate development and housing studies (Sari & Prayogi, 2019). In this study, the questionnaire survey started with distribution to the targeted respondents who were known to be living in Greater Kuala Lumpur by researchers. After that, the respondents were asked to help further distribute the questionnaire to their friends and families who live in Greater Kuala Lumpur or referred to the next eligible respondents to the researcher to form a chain of referrals to collect the necessary data.

3.3 Data Analysis

Data analysis was carried out after data collection from the respondents and inserted into Microsoft Excel to proceed with data analysis. Descriptive, content and Spearman correlation analyses used the Statistical Package for Social Sciences (SPSS) to analyse the collected data and obtain relevant findings.

3.3.1 Descriptive Analysis

Descriptive analysis refers to a constructive way of describing and summarizing data. At the same time, descriptive analysis converts the data into a more understandable and interpretable format to facilitate data analysis. After data collection, descriptive analysis is carried out to calculate the number of respondents to each category of the demographic background. The results of descriptive analysis can be presented in tabular and histogram form with relevant explanations.

Frequency distribution is one of the descriptive analyses that can summarize the data in graphical forms that are simple to understand and interpret. The frequency distribution is a graphical representation of the number of individuals in each group on a measurement scale. It is capable of effectively summarizing a large amount of raw data. The component with the highest percentage or frequency in the data analysis indicates the highest favoured responses from the targeted population.

3.3.2 Relative Importance Index Analysis (RII)

Relative Importance Index Analysis (RII) is a non-parametric method commonly applied to identify which determinants are essential based on respondent responses and an appropriate tool for prioritizing indicators rated on the Likert scale. The result obtained from the first phase is applied as input in the second phase, which is then assessed using the RII to identify the most significant determinants. The highest index value implies that the respondents place a high value on the determinants under consideration. Ranking of the determinants in terms of their significance as assessed by the respondents can be calculated using the RII formula as follows:

$$\text{RII} = \sum \frac{\text{W}}{(\text{A} \times \text{N})}$$

Where:
W = Weightage given to each determinant by the respondents
A = Highest weight
N = Total number of respondents

3.3.3 Content Analysis

Content analysis is a versatile methodology for studying human communication in various forms, including written texts, images, and audio (Baxter, 2020; Bengtsson, 2016; Neuendorf & Kumar, 2015). Content analysis is a unique method in that it contains both quantitative and qualitative methodologies and can be applied in an inductive or deductive way. In quantitative content analysis, details from the contents are reported in the form of frequency stated as a percentage or actual numbers

of major classifications (Neuendorf & Kumar, 2015). Such an approach summarizes rather than presents all information about a message set; the researcher is looking for answers to how many there are. However, in qualitative content analysis, data is given in words and themes, leading to further interpretation of the findings. This content analysis was used to analyse the data collected from the open-ended questions in the questionnaire survey.

3.3.4 Spearman Correlation Coefficient Test

Spearman's rank-order correlation refers to a non-parametric form of the Pearson product-moment correlation. According to Artusi et al. (2002), the Spearman correlation coefficient is typically applied if the assumption of bivariate normal distribution is not viable. This transformation allows it to transfer data from the original scales to the same scale, such as rankings. The Spearman's correlation coefficient (ρ, also signified by r_s) is a statistical measure of the strength of a monotonic relationship between two data sets.

The explanation of Spearman's correlation coefficient is similar to that of Pearson's, namely that the closer r_s is to ± 1, the stronger the monotonic relationship. If they are close to 1, there is a strong positive correlation; if they are close to -1, there is a strong negative correlation. If they are close to zero, that means there is no association. A positive correlation indicates that as one variable increases, the other variable also tends to increase. A negative correlation, on the other hand, indicates that as one variable increases, the other variable tends to decrease.

4. DATA ANALYSIS AND FINDINGS

4.1 Demographics of Respondents

According to the data collected, 400 respondents responded to the questionnaire survey. This section is to identify the demographic background of the respondents who are residents of Greater Kuala Lumpur. The demographic background includes the general information of the respondents, such as gender, age, educational level, employment status, monthly household income, and residential property ownership. This section also includes the respondents' opinions on whether the residential property price is affected by its infrastructural development. Moreover, their perception of the residential property price and the existing infrastructural development in Greater Kuala Lumpur and their intention to purchase are involved in this section as well. Table 1 shows the descriptive analysis used to analyse the demographic data and identify the frequency of the choices selected by the respondents based on the questions in the questionnaire. Table 2 shows the results of the content analysis, which are the key comments of the respondents regarding residential property price fairness in Greater Kuala Lumpur, as well as infrastructure development.

Table 1: Demographic Analysis – Respondents' Profile

		Frequency	Percentage (%)
Gender	Male	181	45.3
	Female	219	54.8
Age	Below 18	4	1.0
	18 - 24	255	63.7
	25 - 34	105	26.3
	35 - 44	25	6.3
	45 - 54	7	1.8
	55 - 64	1	0.3
	65 and above	3	0.8
Educational Level	SPM	78	19.5
	Foundation/ STPM/ A- Level/ Diploma	53	13.3
	Bachelor's Degree	251	62.7
	Master's degree	15	3.8
	Doctor of Philosophy	3	0.8
Employment Status	Full-Time Employment	168	42.0
	Part-Time Employment	50	12.5
	Self-employed	55	13.8
	Unemployed	127	31.8
Household Income	Less than RM2,500	196	49.0
	RM2,501 - RM3,170	52	13.0
	RM3,171 - RM3,970	67	16.8
	RM3,971 - RM4,850	24	6.0
	RM4,851 - RM5,880	21	5.3
	RM5,881 - RM7,100	18	4.5
	RM7,101 - RM8,700	15	3.8
	RM8,701 - RM10,970	5	1.3
	RM10,971 - RM15,040	0	0.0
	More than RM15,041	2	0.5
Residential Property	Yes	87	21.8
Owning	No	313	78.3
Residential Property	Yes	388	97.0
Price Affected by Infrastructural	No	12	3.0
Development			
Residential Property	Yes	228	57.0
Purchasing	No	172	43.0

Table 2: Content Analysis – The Key Comments of the Respondents

Residential Property Price in Greater Kuala Lumpur	Infrastructural Development in Greater Kuala Lumpur
▪ Extremely high and expensive ▪ Overpriced for small spaces ▪ Quite high for certain areas if nearby infrastructural and center zone ▪ Getting more expensive in recent years until it is not affordable to an employee ▪ Will increase again after the completion of the MRT line and post-economic recovery ▪ Valuable and worth for it as its surrounding infrastructures and facilities provided ▪ Affordable and in an expected price range	▪ Convenient and satisfied ▪ Developing and significantly improving ▪ Advanced and relatively well-established compared to other states ▪ Poor density management due to high population and insufficient infrastructure ▪ Traffic jams on the highway, especially during peak hours ▪ It can be more user-friendly ▪ Public transportation is less reachable and last-mile connectivity is non-existent in the public transport network ▪ Lack of public transport stations and less frequency of LRT ▪ Always under maintenance and having poor maintenance ▪ Water shortage is always happening ▪ Quite enough retailers, but refurbishment is needed for some old shopping malls

4.2 Relative Importance Index (RII) Analysis of Residents' Perceived Adequacy of Infrastructural Development in Greater Kuala Lumpur

Table 3 and Figure 1 show the ranking of the adequacy of infrastructural development in Greater Kuala Lumpur perceived by the residents according to RII value. The retailer has obtained the highest RII of 0.8880 in the quantitative survey. This score means the adequacy of Greater Kuala Lumpur retailers is highly sufficient and significant based on the respondents' perceptions. From the questionnaire, the respondents have revealed that the retailers in Greater Kuala Lumpur are enough, but refurbishment is needed for some old shopping malls or retailers.

The water and sanitation infrastructure possesses the lowest RII, which is 0.6030. Ahmed et al. (2014) pointed out that Selangor has increasingly frequent dry spells and water crises. The water demand is rising with population increase, urbanization, industrialization, and irrigation. From the questionnaire, the respondents have also complained that the water shortage is always happening in Greater Kuala Lumpur. The respondents also commented that the water supply system in such areas should be enhanced and managed well.

Table 3: Relative Importance Index by Ranking for Adequacy of Infrastructural Development in Greater Kuala Lumpur

Variables	Relative Importance Index (RII)	Remarks	Rank
Retailers	0.8880	High	1
Health Facilities	0.8215	High	2
Educational Infrastructure	0.8135	High	3

Variables	Relative Importance Index (RII)	Remarks	Rank
Recreational Facilities	0.8095	High	4
Airports	0.7775	High Medium	5
Roadways and Highways	0.7575	High Medium	6
Telecommunications	0.7440	High Medium	7
Railways	0.6140	High Medium	8
Water and Sanitation	0.6030	High Medium	9

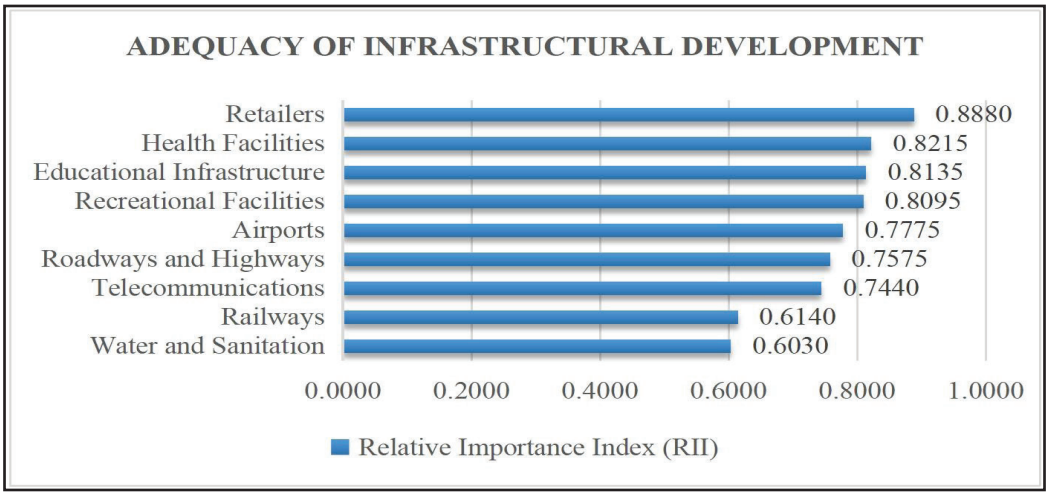

Figure 1: Relative Importance Index by Ranking for Adequacy of Infrastructural Development in Greater Kuala Lumpur

4.3 Spearman Correlation Analysis of Residents' Perceived Property Price Fairness Concerning the Infrastructural Development in Greater Kuala Lumpur

Table 4 shows the relationship between the adequacy of infrastructural development and residents' perceived property price fairness in Greater Kuala Lumpur. Water and sanitation recorded the highest correlation coefficient, 0.788, which means there is a strong positive correlation between the adequacy of water and sanitation and the residents' perceived property price fairness in Greater Kuala Lumpur. The positive correlation shows that as the adequacy of water and sanitation is lower, the other variable, residential property price fairness, will tend to be lower.

Table 4: Relationship between Adequacy of Infrastructural Development and Residents' Perceived Property Price Fairness in Greater Kuala Lumpur

Adequacy of Infrastructural Development	Residential Property Price Fairness			Rank
	Correlation Coefficient	Sig. (2-tailed)	Remark	
Water and Sanitation	0.788	<0.001	Strong Positive	1
Telecommunications	0.647	<0.001	Strong Positive	2
Railways	0.631	<0.001	Strong Positive	3
Educational Infrastructure	0.584	<0.001	Moderate Positive	4
Airports	0.544	<0.001	Moderate Positive	5
Roadways and Highways	0.536	<0.001	Moderate Positive	6
Recreational Facilities	0.516	<0.001	Moderate Positive	7
Health Facilities	0.508	<0.001	Moderate Positive	8
Retailers	0.458	<0.001	Moderate Positive	9

The respondents consider the residential property prices in Greater Kuala Lumpur unreasonable due to insufficient water and sanitation infrastructure. Purchasing houses with established water connections is a potential way for households that cannot afford the cost of establishing a new connection to gain access to the water network. Therefore, it is reasonable to expect that connecting a residential property to the piped water network will increase its property value (Choumert et al., 2014).

In contrast, retailers recorded the lowest correlation coefficient, 0.458, which means it has the weakest positive correlation between the adequacy of retailers and residents' perceived property price fairness in Greater Kuala Lumpur. In this case, the positive correlation shows that as the adequacy of retailers is higher, the other variable, residential property price fairness, will tend to be higher.

Meanwhile, the respondents consider residential property prices reasonable relative to the sufficiency of retailers in Greater Kuala Lumpur. However, the lowest correlation coefficient means that the respondents are less concerned about the adequacy of retailers towards the fairness of residential property prices in Greater Kuala Lumpur, resulting in the weakest correlation between the variables. Despite the advantages of being close to retailers, Hurtubia et al. (2010) revealed that a high concentration of retailers may discourage households from buying a specific location due to overcrowding and noise pollution.

5. CONCLUSION

The development of infrastructures in Malaysia now seems to be a part of the features of the housing industry. Throughout the research, evidence indicated that the adequacy of infrastructural development was one of the factors contributing to the increase in residential property prices. The value added could be explained by the satisfied and adequate infrastructures in the study area.

According to the research findings, there is a positive significant correlation between residents' perceived property price fairness and the adequacy of infrastructural development in Greater Kuala Lumpur. Residents considering the infrastructural development in Greater Kuala Lumpur adequate tend to view property prices as more reasonable. They are probably aware of the value that well-developed infrastructure brings to the area regarding improved accessibility, connectivity and overall quality of life.

To address these concerns and enhance residents' perceptions of property price fairness, continued efforts from local authorities and developers are needed. These efforts include transparent communication regarding infrastructural development initiatives, their impacts on the community, and how they contribute to residential property prices. Lastly, incorporating public feedback and integrating residents in decision-making can also build a sense of ownership and inclusivity to raise property price fairness in the community.

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COMPREHENSIVE REVIEW OF CORPORATE REAL ESTATE MANAGEMENT (CREM) AND THE GROWING IMPORTANCE OF SUSTAINABILITY

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ABSTRACT

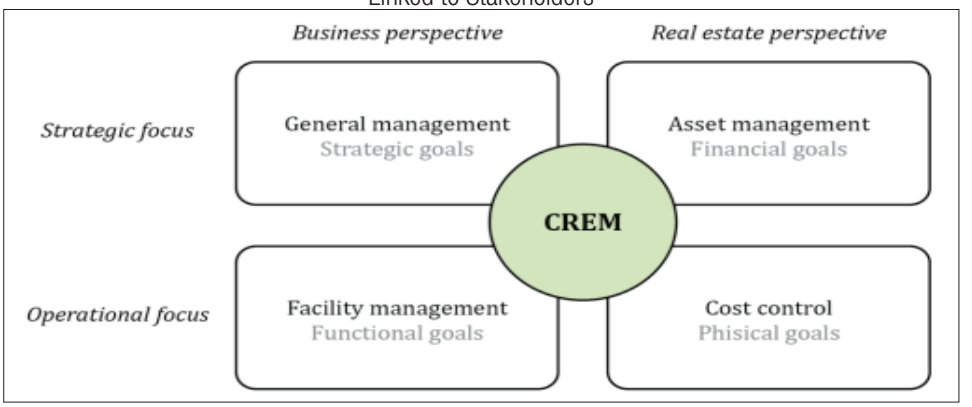
This article emphasises the necessity of integrating sustainability into Corporate Real Estate Management (CREM) practices and the significant benefits it can provide to organisations, stakeholders and the community. This research promotes sustainable CREM techniques as a strategic necessity since the built environment contributes to global issues including climate change and resource depletion. Sustainability integration in CREM is essential for environmental protection and responsible resource management, according to Garmston et al. (2020). The research seeks to explain how CREM sustainability practises can support global sustainability goals by promoting energy efficiency, carbon reduction and environmental conservation. Sustainability in CREM benefits stakeholders including employees, investors and the community, according to the research. Ambrey et al. (2018) found that sustainable companies attract and retain talent better, improving employee happiness and productivity. The report also examines how sustainable CREM might improve community ties through social and ethical issues. Report goals and objectives include Raising Awareness: inform CREM experts, organisations, and stakeholders about built environment sustainability, guidance: provide practical advice on implementing sustainability into CREM practises, including green building certifications and sustainable design, strategize, emphasise the economic and social benefits for organisations to overcome sustainability integration issues in CREM. The article intends to help CREM professionals adopt sustainable practices that connect with global environmental goals and contribute to organisational performance and community well-being.

Keywords: *Sustainability, green technology, corporate real estate management*

1. INTRODUCTION

Corporate Real Estate Management (CREM) is crucial for organizations, encompassing strategic planning, acquisition, utilization, and optimization of real estate assets. There's a notable shift towards sustainability, driven by global environmental concerns (Smith et al., 2019). CREM's importance for corporate success is recognized globally (Haynes, 2012; Shiem-Shin et al., 2014). Joroff et al. (1993) proposed five stages: taskmaster, controller, dealmaker, entrepreneur, and business strategist. To reach the strategic level, managers must progress through these stages. Krumm, Dewulf, and de Jonge (2000) and Appel-Meulenbroek (2014) support this model.CRE managers need technical, analytical, and strategic skills to become business strategists (Krumm, Dewulf, & de Jonge, 2000; Appel-Meulenbroek, 2014). de Jonge's (1996) model identifies four elements: general management, facility management, asset management, and project management, which align with stakeholder goals (Den Heijer, 2011).

Figure 1: Amalgamation of the CRE Management Model (de Jonge, 1996) and CRE Domains Linked to Stakeholders



Source: Den Heijer, 2011

The realization of the environmental impact of real estate operations is underscored by the study conducted by Greenberg and Levy (2020), which found that the carbon footprint of commercial buildings is a major concern. This concern has prompted a re-evaluation of traditional CREM practices, leading to an urgent need for the integration of sustainability elements into the management of corporate real estate portfolios. Several trends and developments have underscored the importance of sustainability in CREM. The shift towards sustainable building certifications, such as LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method), reflects a broader industry movement towards environmentally responsible practices (Jones, 2021). Moreover, regulatory pressures and stakeholder expectations are increasingly influencing organizations to adopt sustainable CREM practices (Smith & Johnson, 2018). Challenges, such as the rising costs of non-renewable resources and the volatility of energy prices (Eichholtz et al., 2022), further emphasize the necessity for CREM to integrate sustainability. The financial implications of sustainable practices, as demonstrated by research from Chan et al. (2017), indicate that sustainable buildings can yield long-term cost savings and enhance overall portfolio performance. In the evolving landscape of CREM, where global concerns about sustainability, coupled with industry trends and challenges, have necessitated a strategic focus on integrating sustainability elements into CREM practices.

2. LITERATURE REVIEW

2.1 Sustainability Integration in Asset Management

The concept of sustainability is nascent. In 1972, the scientific community introduced sustainability to global politics with the report 'the limits to growth'. Establishing the link between economic growth and environmental sustainability became a political priority. The 1973 global oil crisis highlighted the dependence on fossil fuels, leading to increased focus on energy conservation (IISD, 2011). After the World Commission of Environment and Development released the report 'Our Common Future' in 1987, it gained global attention. This research provided pioneering insights into social, economic, and environmental factors, connecting economic growth, environmental challenges, and wealth disparities on a large scale (VROM, 2010). The most commonly used definition of sustainable development is found in the United Nations 1987 report, *"Development which meets the needs of current generations without compromising the ability of future generations to meet their own needs."* Sustainability involves meeting present human requirements without harming mankind, nature or welfare. We may apply five general protection principles for sustainable development to real estate.

i. Preservation of the natural environment;
ii. Protection of natural resources;
iii. Protection of human health and well-being;
iv. Promotion of social values and public goods;
v. Protection of capital and material goods.

Using social, economic and environmental implications, Elkington (1995) created the triple bottom line theory (TBL) with the three P's: people, planet and profit. People relate to social dimensions in a region, including health, safety, education, social capital and quality of life. Planet refers to the environment, including water quality, energy consumption, natural resources, waste and land use. Profit relates to economic factors such as income, expenditures, taxes, business climate, employment and revenue. According to Slaper and Hall (2011), sustainability is becoming a priority for businesses, non-profits and governments. The TBL can be used as an accounting framework for organizations to monitor sustainability, including social and environmental components in addition to financial indicators.

2.2 Corporate Real Estate Sustainability Management

Real estate and sustainability are interconnected, with growing understanding of their importance (Eichholtz, Kok & Quigley, 2013). Sustainable measures for the built environment, which accounts for 40% of global energy use, are becoming increasingly important (Taylor, 2013; Eichholtz et al., 2013). According to NOS (2015), the built environment accounts for 36% of national CO2 emissions in the Netherlands. While sustainable real estate is crucial, there is less theory on implementing it as a strategy (Jensen et al., 2014). Gibler and Lindholm (2011) introduced sustainability as a new real estate approach in CRE portfolios only recently. Haynes (2012) established 10 components of CREM, including planet, position, purpose, procurement, place, paradigm, processes, people, performance, and productivity, based on real estate alignment theory covered in chapter 2. For optimal alignment of the CRE strategy with the organizational strategy, all elements must be aligned. Haynes (2012) was among the

first to identify planet as a CREM. *"Building for current generations without hindering future generations' ability to meet their own needs."*

The CRE portfolio should connect with environmental and CSR challenges, according to the author. According to Shen et al. (2012, in Haynes, 2012), future trends in CRE sustainability include:

i. Increased energy use and carbon footprint transparency;
ii. CRE as an energy source and consumer;
iii. Reliable and renewable energy, potable water, and waste distribution;
iv. Efficiency monitoring and control technology;
v. CRE as a sustainability awareness tool.

Research by Kuijstermans (2012) highlights benefits such as reduced exploitation costs, extended depreciation periods, higher rental levels, future-proof design, increased letability, reduced vacancy risk, higher residual value, higher productivity, improved employee health, reduced absence due to illness, increased employee satisfaction, and a greener approach. The CRE strategy support sustainability theory, addressed in chapter 2, suggests that a conscious sustainable real estate strategy impacts the performance of other real estate strategies. Implementing a sustainable real estate plan is called corporate real estate sustainability management (CRESM). UNEP (2014, p19) defines CRESM as: *"Integrated management of economic, environmental, and social aspects across an organization's property activities and investment decisions. This includes strategies, methods, and institutions that promote corporate governance and sustainable company and product development."*

Masalskyte et al. (2014) discovered that CRESM can benefit all three elements of the TBL. A summary of the benefits is shown in Table 1.

Table 1: Possible Benefits of CRESM

Environmental benefits	Social benefits	Economic benefits
Efficient use of resources	Healthy and comfortable working environment	Increase real estate market value
Lower life cycle impacts	Employee engagement	Cost reduction
Sustainable workplaces	Employee satisfaction	
Other issues related to physical building features	Employee productivity	

Source: Masalskyte et al., 2014

According to UNEP (2014), operational property management information essential for CRE sustainability decision-making includes performance and physical property characteristics. Performance attributes can be measured during operation. Physical property parameters, including technical and functional quality, are identified during project planning. The TBL divides performance characteristics into three groups, as shown in Table 2.

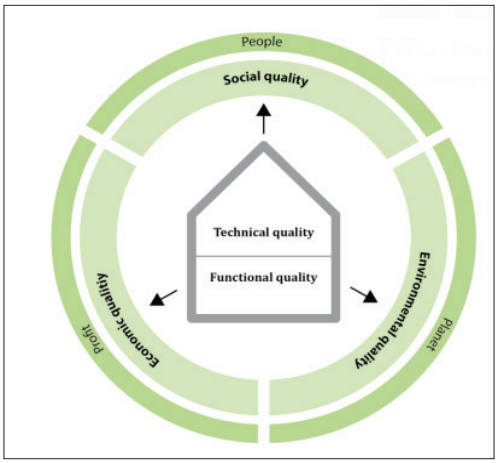


Table 2: Categories of Real Estate Sustainability Performance Characteristics

Social quality	Environmental quality	Economic quality
Aesthetic quality	Energy performance	Life cycle costs
Urban design quality	Resource depletion	
Cultural value	GHG-emissions & GWP	
Health and wellbeing	Impacts on environment	
Indoor air quality	Land use change	
Comfort	Water consumption	
User safety	Wastewater	
User participation and control	Waste (construction and use)	
Accessibility		

Source: UNEP, 2014

2.2.1 Petronas: A Leader in CREM in Malaysia

Established in 1974, Petronas (Petroliam Nasional Berhad) is the state-owned oil and gas corporation of Malaysia. Petronas is an all-inclusive energy firm that does everything from producing and exploring for oil upstream to processing and distributing its refined products downstream. Among the world's leading energy companies, Petronas has a presence in over 50 nations. Office complexes, manufacturing sites, and residential properties are all part of the vast real estate portfolio managed by the firm. In order to maximise asset utilisation, guarantee sustainability, and support the company's strategic objectives, a strong strategy to Corporate Real Estate Management (CREM) is required for this broad portfolio (Petronas, 2023).

Practices (1) Efficient Use of Space

As part of its CREM plan, Petronas aims to maximise the use of available space. In order to find ways to optimise space, the corporation is always looking at its real estate assets. To meet the needs of a changing workforce while keeping costs down, many

companies are adopting more flexible work arrangements, such as hot-desking, open floor plans, and flexible workplaces (Petronas Annual Report, 2022).

Practices (2) Controlling Energy Use

An integral part of Petronas' CREM processes is energy management. In order to keep tabs on and manage energy usage throughout all of its locations, the business has put money on cutting-edge energy management systems. Use of HVAC (heating, ventilation, and air conditioning) systems that are less energy intensive is part of this. Significant energy savings and a decrease in greenhouse gas emissions have resulted from the installation of these technologies (Petronas Sustainability Report, 2022).

Practices (3) Efforts to Promote Sustainability

The CREM practices of Petronas demonstrate the company's dedication to sustainability. The Petronas Towers, the corporate headquarters, are a landmark in ecological architecture and contemporary CREM. The towers have received global acclaim for their eco-friendliness thanks to its cutting-edge building management systems, water collection from rain, and energy-saving features (LEED Gold Certification, 2019). The Petronas Towers aren't the only properties in the company's real estate portfolio that have adopted green construction practices. Sustainable construction practices include things like reducing trash and increasing biodiversity in and around their buildings (Petronas, 2023).

Practices (4) Technology for smart buildings

As a means to better manage its property holdings, Petronas employs smart building technologies. Internet of Things (IoT) sensors, data analytics, and automated building systems are some of the technologies that can optimise a building's performance and make occupants' lives easier. Petronas is able to increase the efficiency of its real estate assets, save operational expenses, and proactively manage maintenance thanks to smart technologies (Petronas, 2023).

In summary, space optimisation, energy management, sustainability, and smart technology are all part of Petronas's CREM plan, which is both thorough and innovative. The dedication to these principles by the corporation helps achieve its larger goals while also improving the efficiency and sustainability of its real estate assets.

2.3 Factors Influencing the Promotion Of Sustainable Practices In Real Estate

Sustainability implementation in real estate portfolios is driven by stakeholders and their drivers (Hoendervanger, van der Voordt & Wijnja, 2012). Falkenbach, Lindholm, and Schleich (2010) identify three built environment sustainability drivers.

i. External drivers
ii. Corporate drivers
iii. Property-level drivers

External influences include top-down market factors like building sustainability certificates, but only environmental legislation is necessary. Examples of international legislation include the Kyoto Protocol and the UN Principles of Responsible Investment. Most national levels have legislation affecting stakeholder groups, including carbon emissions, energy efficiency, water usage, and waste management. Additionally, external influences may include subsidies for green construction and better financing arrangements. Growing sustainability knowledge in business and community may lead to corporate image benefits. Limited empirical research suggests that sustainability leads to improved rental levels, lower property expenses, reduced hazards, and higher property values at the property level (Falkenbach et al., 2010). The built environment has many stakeholders (Hoendervanger et al., 2012). Due to the financial and long-term nature of real estate in finance, health and well-being, image, culture, spatial planning, and the environment, stakeholders have distinct roles and interests with significant stakes. A large number of stakeholders with diverse interests exist. According to Hoendervanger et al. (2012), stakeholders can be categorized into three categories.

i. User growth
ii. Corporate stakeholders
iii. External parties

Building users include all structural and incidental users of a building and its facilities. Employees, subtenants, and clients are structural users. Incidental users include customers who buy goods or services. Company stakeholders include financiers, including owners, shareholders, and banks as financial providers. External stakeholders include non-financial or operational parties who want to influence the real estate, such as local residents, municipalities, and others who may experience inconvenience due to the property.

2.4 Sustainability Reporting

Transparency in disclosing business sustainability practices has increased due to the growing relevance of sustainability, responsibility, reputation improvement, and external effects from stakeholders. Various methods can assess sustainability in the built environment. New solutions address transparency and sustainability in real estate. Jansen (2015) compared popular techniques and rating standards for evaluating sustainable real estate performance, as shown in Table 3. While each technique has unique criteria and weights, they all prioritize energy, materials, and health. Water receives less emphasis, and aspects like trash and sustainable sites are assessed in only one technique, similar to stakeholder involvement.

Table 3: Comparison of Measurement Tools

Criteria (%)	BREEAM	LEED	GRESB	Green Star	GPR Building	Energy Star
Management	12	8	31	10		
Transport	8	25		10		
Energy	19	25	44	20	20	100
Water	6	5	44	12	20	
Materials	12,5	19	44	10	20	
Pollution	10	11	44	5	20	

Criteria (%)	BREEAM	LEED	GRESB	Green Star	GPR Building	Energy Star
Land use and ecology	10	5		8		
Waste	7,5					
Sustainable sites		16				
Health and wellbeing	15	13	26	10	20	
Stakeholder engagement			26			

Source: Jansen, 2015

Three prominent sustainability assessment methodologies are widely used in the construction and real estate industries. The first, BREEAM, evaluates projects across eight categories including management, transport, energy, water, materials, pollution, land use and environment, sustainable sites, and health & wellbeing. It assesses new, existing, and area development projects. The second method, LEED, focuses on five sustainable performance categories: sustainable sites, energy and atmosphere, water efficiency, indoor environmental quality, and materials & resources. It applies to new building, operations and development projects.

Lastly, GRESB assesses properties in seven categories: management, policy, disclosure, risks, opportunities, environmental monitoring, performance indicators, building certifications, stakeholder participation, and new construction/ renovations. BREEAM and LEED are commonly used to evaluate property-level sustainability, while GRESB assesses portfolio-level sustainability. For CRE managers, BREEAM and LEED are recommended for individual assets, while GRESB is ideal for investors to gauge the overall sustainability of their portfolio. This research focuses on CREM, so only BREEAM and LEED categories are explored to identify sustainability indicators. Combining different methods might be the best approach for assessing sustainability in practical situations. Table 4 summarizes key categories and sub-categories from two commonly used sustainability assessment methods, categorized by real estate sustainability performance criteria. Three sustainability performance variables for commercial real estate (CRE)-management, sustainable locations, and innovation-were excluded from consideration due to their misalignment with the sustainability areas outlined in CRE Sustainability Management (CRESM) theory. The management variable was deemed inappropriate as it represents an ongoing process rather than a specific CRE sustainability choice. Sustainable locations primarily relate to real estate and area development, which fall outside the scope of this research. Additionally, the term “innovation” is too broad to be considered a distinct variable as it encompasses all sustainability-related developments.

Table 4: Overview of sustainability variables and sub-variables

Area	CRE Performance variable	CRE Performance sub-variable
Social	Health and Wellbeing	Visual comfort
		Indoor air quality
		Safe containment in laboratories
		Thermal comfort
		Acoustic performance

Area	CRE Performance variable	CRE Performance sub-variable
		Safety and security
		Low-emitting materials
		Controllability of systems
	Transport	Public transport accessibility
		Alternative transportation
		Proximity to amenities
		Cyclist facilities
		Maximum car parking capacity
		Travel plan
Environmental	Energy	Reduction of energy use and carbon emissions
		Energy monitoring
		External lighting
		Low carbon design
		Energy efficient cold storage
		Energy efficient transportation systems
		Energy efficient laboratory systems
		Energy efficient equipment
		Drying space
		On-site renewable energy
		Green power
	Water	Water consumption
		Water monitoring
		Leak detection
		Water efficient equipment
		Innovative wastewater technologies
		Construction waste management
		Recycled aggregates
		Operational waste
		Speculative floor and ceiling finishes
		Adaptation to climate change
		Functional adaptability
	Land use and Ecology	Site selection
		Ecological value of site and protection features
		Minimizing impact on existing site ecology
		Enhancing site ecology
		Long term impact on biodiversity
	Pollution	Impact of refrigerants
		NOx emissions
		Surface water run off

Area	CRE Performance variable	CRE Performance sub-variable
		Light Pollution Reduction
		Noise attenuation
Environmental & Economical	Materials	Life cycle impacts
		Hard landscaping and boundary protection
		Responsible sourcing of materials
		Insulation
		Designing for durability and resilience
		Material Efficiency

Source: BREEAM, 2015; LEED, 2015; and UNEP, 2014

3. KEY CHALLENGES IN CORPORATE REAL ESTATE MANAGEMENT (CREM)

3.1 Environmental Challenges in Corporate Real Estate Management (CREM)

Environmental challenges significantly influence Corporate Real Estate Management (CREM) strategies and practices, particularly regarding energy consumption and carbon emissions. Sustainable energy practices, such as using renewable sources and energy-efficient technologies, are crucial for reducing buildings' environmental impact. Waste management is also a key concern, with CREM professionals focusing on reducing, recycling, and responsibly disposing of corporate facility waste to meet sustainability goals. Spangenberg et al. (2014) highlight the importance of aligning corporate practices with sustainability goals, particularly in energy consumption and waste management. By implementing environmentally conscious strategies, corporations can contribute to broader sustainability objectives and enhance their reputation as socially responsible entities. Reducing the carbon footprint in corporate real estate involves adopting green building practices. Academic research, like that by Johnson and Lundholm (2019) on the financial aspects of incorporating green features into real estate portfolios, offers insights into the economic implications of such strategies. These challenges emphasize the need for CREM professionals to develop comprehensive environmental strategies that extend beyond compliance to build sustainable and resilient real estate portfolios.

3.2 Economic Challenges in Corporate Real Estate Management (CREM)

Corporate Real Estate Management faces economic challenges in balancing cost optimization with maintaining quality workplace environments. Organizations must navigate market volatility and uncertainties impacting property values and rental prices. Financial modeling is crucial for assessing the feasibility, profitability, and risk of real estate investments. It aids in decision-making regarding acquisitions, disposals, and portfolio management, aligning with the organization's financial goals (Johnson & Lundholm, 2019).

3.3 Social Challenges in Corporate Real Estate Management (CREM)

Corporate Real Estate Management (CREM) faces significant social challenges concerning employee well-being, satisfaction, and flexible working arrangements. Meeting the demand for flexibility requires CREM professionals to redesign office layouts and incorporate technology for seamless communication (Becker & Steele, 1995). Another challenge is optimizing workspace design for productivity and collaboration while balancing the benefits of open offices with concerns about distractions (Becker & Steele, 1995; Wyatt & Murray, 2013). Addressing diversity and inclusion in workplace design and location choices is also critical. CREM strategies must accommodate diverse demographics, workstyles, and accessibility requirements to foster inclusivity and equity (Spangenberg et al., 2014).

4. RECOMMENDATIONS AND STRATEGIES

According to Roulac (2001), corporate real estate strategies are quite unusual. Corporate strategic management and the researchers' tendency to downplay the importance of real estate assets in company organisations are to blame for this weak link. Consequently, CREM was not given any importance. On the other hand, some CRE scholars have distinguished CRE from corporate business challenges and focus on real estate issues alone. For instance, Roulac (2001) aims to overcome this obstacle by highlighting how CRE strategies can help corporate organisations gain a competitive edge. According to Roulac (2001), a company's competitive advantages can be enhanced through superior CRE strategies that create and retain customers, attract and retain outstanding people, contribute to business processes, promote enterprise values and cultures, encourage innovation and learning, enhance core competency, and increase shareholder wealth. Listed below are practical suggestions, along with instructions and examples of good practice.

4.1 Conduct a Sustainability Audit

Step-by-Step Guidance:

1. Assess Current Practices: Evaluate the current state of your real estate assets, including energy usage, water consumption, waste management, and indoor environmental quality (Kats, 2010).
2. Identify Areas for Improvement: Pinpoint areas where sustainability can be enhanced, such as energy efficiency, renewable energy integration, and waste reduction (US EPA, 2023).
3. Set Baseline Metrics: Establish baseline metrics to measure progress over time. This includes tracking energy consumption, carbon emissions, water usage, and waste generation.

Best Practices:

- Engage third-party experts to conduct comprehensive sustainability audits.
- Use industry standards such as LEED or BREEAM for benchmarking (BREEAM, 2023).

4.2 Develop a Sustainability Strategy

Step-by-Step Guidance:

1. Define Objectives: Set clear and achievable sustainability goals aligned with the organization's overall mission and values (Elkington, 1997).
2. Create an Action Plan: Develop a detailed action plan outlining specific initiatives, timelines, and responsible parties.
3. Allocate Resources: Ensure adequate resources, including budget, personnel, and technology, are allocated to implement the strategy.

Best Practices:

- Incorporate stakeholder input to ensure the strategy meets the needs of employees, investors, and customers.
- Align sustainability goals with broader corporate objectives to ensure cohesive integration (Morris & Boyd, 2012).

4.3 Implement Energy Efficiency Measures

Step-by-Step Guidance:

1. Upgrade Lighting Systems: Replace traditional lighting with energy-efficient LEDs and install motion sensors to reduce unnecessary usage (Pérez-Lombard, Ortiz, & Pout, 2008).
2. Optimize HVAC Systems: Implement advanced HVAC systems with programmable thermostats and regular maintenance schedules to ensure optimal performance.
3. Conduct Energy Audits**:** Regularly perform energy audits to identify and address inefficiencies.

Best Practices:

- Utilize energy management software to monitor and optimize energy usage in real-time.
- Engage employees in energy-saving initiatives to foster a culture of sustainability (Janda, 2011).

4.4 Integrate Renewable Energy

Step-by-Step Guidance:

1. Assess Feasibility**:** Evaluate the feasibility of integrating renewable energy sources, such as solar or wind, into your real estate portfolio (REN21, 2022).
2. Install Renewable Systems**:** Implement renewable energy systems where feasible, starting with pilot projects to demonstrate viability.
3. Monitor and Adjust**:** Continuously monitor the performance of renewable energy systems and make adjustments as needed to maximize efficiency.

Best Practices:

- Take advantage of government incentives and grants for renewable energy installations.

- Partner with renewable energy providers to secure reliable and sustainable energy sources (IRENA, 2023).

4.5 Implement Sustainable Building Practices

Step-by-Step Guidance:

1. Use Sustainable Materials: Select sustainable and locally-sourced building materials for new constructions and renovations (Wilson et al., 2015).
2. Incorporate Green Building Design: Design buildings with features such as green roofs, rainwater harvesting systems, and natural ventilation.
3. Achieve Green Certifications: Aim for certifications such as LEED, BREEAM, or Green Star for all new and existing buildings.

Best Practices:

- Conduct life-cycle assessments to understand the environmental impact of building materials and designs.
- Engage architects and engineers with experience in sustainable building practices (Kibert, 2012).

4.6 Enhance Waste Management

Step-by-Step Guidance:

1. Implement Recycling Programs: Establish comprehensive recycling programs for paper, plastics, metals, and e-waste (UNEP, 2022).
2. Reduce Single-Use Plastics: Eliminate or significantly reduce the use of single-use plastics within the organization.
3. Promote Composting: Introduce composting programs for organic waste in cafeterias and common areas.

Best Practices:

- Educate employees on the importance of waste reduction and proper recycling practices.
- Partner with local recycling and waste management companies to ensure efficient and effective waste disposal (Wilson et al., 2015).

5. CONCLUSION

This article addressed the management of corporate real estate sustainability, with a particular focus on the potential impact of physical and non-physical building attributes on the sustainability performance of such properties. Although sustainability performance can be assessed during the operational phase of a building, determining its full potential requires the establishment of all physical real estate attributes. The sustainability performance of corporate real estate is influenced by these physical real estate attributes, which encompass economic, technical, social, environmental, and functional qualities. In addition to physical, building-related factors, non-physical factors including tenant, occupant, and corporate conduct impact the sustainability performance of corporate real estate. However, it is possible that tangible real estate attributes could exert a more significant influence on the sustainability performance of the property and are considerably more susceptible to modification by the corporate real estate manager. Therefore, for the corporate real estate manager to effectively integrate sustainability principles into the real estate portfolio, operational decisions pertaining to the attributes of physical properties must be in accordance with the corporate real estate sustainability strategy, as outlined in the corporate sustainability strategy statement.

The necessity for sustainability in real estate is established by a multitude of stakeholders and their respective motivators, each of whom operates according to their own distinct roles and interests. External stakeholders, facility users, and corporate stakeholders comprise the stakeholders in corporate real estate. There are also three distinct categories of drivers that have the potential to inspire stakeholders: external, corporate, and property-level drivers. A number of commonly employed rating criteria for evaluating the sustainability performance of real estate have been identified, in addition to variables pertaining to the sustainability of corporate real estate. BREEAM and LEED are the rating systems that are most commonly implemented. Incorporating corporate real estate sustainability management theory into the process of subtracting the various categories from each standard rating results in the identification of eight sustainability variables and their corresponding sub-variables. In conjunction with the influence of tangible real estate attributes on sustainability performance, these rating criteria offer direction for integrating sustainability into the portfolio of corporate real estate.

The Corporate Real Estate Management (CREM) domain is shifting significantly with a heightened focus on sustainability. Businesses are increasingly aware of their environmental and social impact, driving the integration of sustainable practices into CREM. This extends beyond physical real estate to encompass socially and environmentally responsible business strategies. Sustainability is not just a trend but a crucial aspect of ethical business operations. Organizations adopting sustainable principles not only benefit the environment but also establish themselves as industry leaders. Anticipated developments include advancements in sustainable technologies, increased collaboration between environmental organizations and businesses, and deeper integration of sustainability into CREM operations. Given global efforts to address climate change, CREM's role in promoting sustainability will continue to grow.

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UNRAVELLING SUPERSTITION'S INFLUENCE ON HOME PURCHASE DECISIONS: A STUDY IN THE KLANG VALLEY

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ABSTRACT

This research delves into the enduring influence of superstitions on potential homebuyers' decision-making processes in the Klang Valley region. Despite societal modernization, superstitions remain deeply ingrained and continue to shape people's beliefs and behaviours, particularly when it comes to significant life events such as buying a home. While previous studies have primarily focused on Chinese religious beliefs regarding property, this research aims to explore the broader impact of superstitions on the home purchase decision and the level of belief in superstitions among potential homebuyers in the Klang Valley. Adopting a quantitative research approach, the study collected survey data from potential homebuyers in the region and designed the questionnaire to capture their beliefs, perceptions, and the impact of superstitions on real estate decisions. The findings reveal that superstitions indeed have a significant influence on the home purchase decisions of potential buyers, with participants exhibiting various superstitious beliefs related to numerology, street characteristics, and psychological impacts on properties. These beliefs notably affect their preferences for properties associated with specific address numbers, locations, and historical significance. The study utilizes a questionnaire survey and the Relative Importance Index (RII) as the primary method of analysis. The study's implications contribute to academia and the real estate industry, enabling developers and estate agents to better understand the needs and preferences of potential homebuyers in the Klang Valley, leading to more tailored marketing and development strategies. Moreover, the research sheds light on the intricate interplay between superstition and decision-making processes, emphasizing the need for further exploration in diverse contexts and regions. Overall, this study underscores the significant role of superstition in the home purchase decision-making process, highlighting the importance of recognizing cultural beliefs and their impact on individual choices for a more informed approach to real estate marketing and development.

Keywords: *Superstitions, homebuyers, decision-making, Klang Valley, real estate*

1. INTRODUCTION

The concept of home holds a profound significance in human lives, offering a space of comfort and authenticity. Making a property purchase is a complex process involving significant financial decisions. Superstitions, deeply embedded in various cultures, continue to play a pivotal role in shaping people's beliefs and behaviours, even in modern societies. This research aims to explore the impact of superstitions on potential homebuyers' decision-making processes in the Klang Valley region, Malaysia. While previous studies have primarily focused on chinese religious beliefs related to real estate, this study seeks to investigate a broader range of superstitions affecting the home purchase decision and the level of belief among potential homebuyers.

According to previous research, superstitions are believed to positively influence decision-making efficiency and satisfaction. In the context of real estate, numerology plays a significant role in influencing choices. For instance, numbers like 6 and 8 are considered lucky, while 4 is deemed unlucky. Address numbers ending in '8' are known to sell at a premium, while those ending in '4' receive a discount. Additionally, the presence of previous suicide incidents or psychologically impacted houses tends to create negative perceptions and influence potential buyers' decisions.

Malaysian society, with its diverse ethnicities and cultures, retains a range of superstitions, particularly beliefs surrounding unnatural deaths and haunted properties. As a result, residential properties constructed near waste ponds, crossroads, or T-junctions might be avoided by superstitious buyers. Understanding these superstitious beliefs and their influence is essential for the real estate industry, including developers and estate agents. By comprehending potential homebuyers' levels of belief in superstitions and their preferences, industry players can tailor their marketing strategies and designs to cater to this specific market segment effectively.

This research aims to shed light on the complex interplay between superstitions and home purchase decisions in the Klang Valley. By gaining insights into the beliefs and behaviours of superstitious potential homebuyers, real estate industry players can adapt their approach to accommodate these unique preferences and foster a better understanding of superstition beliefs about houses. The findings of this study will be valuable in guiding the real estate industry to create more informed and tailored solutions to meet the needs of superstitious homebuyers.

1.1 Concept of Superstition Belief

The concept of superstition belief involves the belief in entities like Gods and Ghosts that do not exist in the real world, often characterized by blind belief and worship (Khan et al, 2024). It has been described as "false beliefs" leading to illogical economic decision-making (Fortin et al., 2014). Omobola (2013) defines superstition belief as an influence that lacks rational support. Superstitions can be broadly categorized into religious, cultural, and personal beliefs. Previous studies by Chou and Chang (2012) highlighted two notions defining superstitions: superstition numbers and superstition ghosts, both of which are associated with superstitious beliefs. In Malaysia, Alias et al. (2014) found that superstitions are still prevalent among various ethnic groups, and passed down through generations within families, which often makes the idea of a haunted house unsettling for many. Chinese superstitions commonly revolve around homophones, where unrelated topics are conveyed through the same syllable, leading to several beliefs based on these connections. The significance of "lucky numbers" is evident in Asian real estate markets, with people spending substantial sums for phone

numbers or license plates containing the number '8' due to their association with luck and prosperity (Shum et al., 2013). These beliefs extend to non-Asian nations with sizable Asian immigrant populations (Fortin et al (2024).

2. LITERATURE REVIEW

The following literature review offers a comprehensive overview of the factors that influence home purchase decisions, with a particular focus on superstitious beliefs among potential homebuyers. Said et al (2018) suggest that homebuyers evaluate relevant variables and comprehend their reasons for purchasing residential properties before making a selection. Consumer purchase behaviour, as studied by Stankevich (2017), involves seeking, choosing, and using goods and services based on needs, wants, and influencing circumstances. Understanding consumer behaviour can enhance marketing efforts in competitive markets.

The millennial generation's home purchase preferences are influenced by various factors, including location, accessibility, affordability, physical characteristics, amenities, design, developer repute, and land ownership (Majid et al, 2012; 2017; Said et al, 2016; 2017). Demographic factors, such as age, marital status, employment, and income level, also influence home purchase decisions (Majid et al., 2012). Additionally, cultural customs and viewpoints play a role in purchasing decisions (San, 2016). Working individuals prefer living close to their workplace to minimize the commuting time (Jun & Jones, 2011; Majid et al, 2021).

Psychological factors, like Feng Shui and superstitions, impact home purchase decisions. Feng Shui affects consumers' attitudes and subjective norms, leading to happiness with their residential properties (Wu et al., 2012; Said et al, 2018). Some homebuyers consider Feng Shui even if they do not believe in it, as it can influence resale prices (Fortin et al., 2014). Superstitions, like avoiding houses with certain numbers or living near cemeteries, can significantly influence purchase behaviour (Bozaci, 2020; Geh, 2015). Surprisingly, even technologically adept millennials consider Feng Shui in their purchase decisions (Heriyati et al., 2021).

Location factors, such as accessibility to amenities and transportation terminals, are crucial for homebuyers (Zrobek et al., 2015; Chia et al., 2016; Majid et al, 2020; 2021). Financial factors, including property prices, inflation protection, income level, and mortgage availability, also influence purchase decisions (Eze & Lim, 2013; Kenn et al., 2021). Environmental factors, like living in a tranquil and pollution-free area, are essential considerations for many homebuyers (Chia et al., 2016).

Potential homebuyers, particularly Generation Z and Millenials, have unique preferences due to their exposure to technology and social media (Hoxha & Zeqiraj, 2019; Larkin et al., 2018). They value authenticity, adaptability, and practicality in their real estate choices.

Superstitious beliefs impact property value and marketability. Numerology plays a significant role, with certain numbers considered lucky or unlucky (Lin et al., 2012; Mei-Hui et al., 2019). Street characteristics, such as being below street level or located at cross and T-junctions, are also influenced by superstitions (Fong, 2007; Hassan et al., 2021).

Psychologically impacted houses, associated with negative events like deaths, can affect property marketability (Alias et al., 2014; Chang & Lin, 2015). Superstitions also impact property prices, with homes ending in "8" selling for more and those ending in "4" selling for less (Fortin et al., 2014; Humphreys et al., 2019).

Owners and estate agents may face challenges selling psychologically impacted properties, as potential tenants may back out upon learning of the property's history (Alias et al., 2014). Revealing such information can also lead to legal issues.

In summary, this literature review provides an overview of various factors influencing home purchase decisions and the significant impact of superstitions on potential homebuyers' choices. The upcoming research methodology will delve into the level of belief and the impact of superstitions on home purchase decisions from the perspective of potential homebuyers.

3. METHODOLOGY

The research approach used in this study is quantitative, employing a questionnaire survey to collect data on the impact of superstitions on the home purchase decisions of potential homebuyers in the Klang Valley. Out of the initial 111 respondents who participated in the questionnaire survey, 95 responses were deemed valid for this research. These 95 respondents met the criteria of having plans to buy a house in the next five years and considering superstition beliefs during the home purchase decision-making process.

3.1 Research Design

The primary aim of this research is to explore the influence of superstitions on potential homebuyers' decision-making when purchasing a home. The research objectives are to understand the meaning of superstition beliefs among potential homebuyers during the home purchase process, determine the impacts of superstitions on their decision-making, and explore their level of belief in superstitions when making a home purchase. The research follows a systematic methodology, starting with problem identification and a literature review. The data collected from the questionnaire survey were analyzed using descriptive analysis and the Relative Importance Index (RII) to interpret the findings. The Relative Importance Index (RII) is a statistical method used to rank and prioritize variables based on their relative importance. It is widely employed in fields like project management, construction, education, and social sciences to assess the significance of various factors derived from survey or questionnaire responses.RII can effectively rank different variables based on their relative importance, providing a clear hierarchy of factors. However, RII only gives a relative ranking, not an absolute measure of importance. It shows which factors are more important compared to others, but not by how much.

3.2 Data Collection

Quantitative data were used to analyze the impact of superstitions on potential homebuyers' home purchase decisions. The primary data were collected through a structured questionnaire survey.

3.3 Questionnaire Survey

The questionnaire survey consists of six sections: A, B, C, D, E, and F. Section A gathers respondents' demographic profiles, providing general information about the research sample. Section B assesses the relevance of respondents by determining if they intend to buy a home within the next five years, ensuring only relevant responses are considered. Section

C examines the superstition beliefs of respondents, even if they do not consider themselves superstitious individuals.

Section D focuses on the factors influencing the respondents' home purchase decisions, allowing them to rate the most significant factor. Section E explores the level of superstition belief among potential homebuyers when making a home purchase decision, allowing respondents to rate their beliefs. Section F investigates the impact of superstitions on the home purchase decision from the perspective of potential homebuyers, with respondents rating their opinions on various impacts of superstition beliefs on property.

Overall, the research methodology employs a quantitative approach with a structured questionnaire survey to explore the influence of superstitions on potential homebuyers' home purchase decisions in the Klang Valley. Klang Valley was chosen due to its rapid urbanization, marked by a surge in new housing projects that are proliferating more rapidly than in other regions of Malaysia.

4. DATA ANALYSIS

The process of data analysis in this research involves several stages to derive valuable insights for decision-making:

4.1 Descriptive Analysis:

Descriptive analysis was used to condense and simplify the collected data. In this study, it was employed to analyze the respondent's demographic profile and relevance. For the primary variable in Section E, which includes numerology, street characteristics of the property, and psychologically impacted house, means were grouped under the primary variable for comparison. The mean scores were categorized into "strongly disagree, disagree, neutral, agree, and strongly agree" as shown in Table 1.

Table 1: Level of Importance: Likert Scale Assessment

Likert Scale on Level of Importance	
1	Not important at all
2	Low importance
3	Moderate Important
4	Important
5	Very Important

4.2 Relative Importance Index (RII):

The RII was used based on the study by Jowwad and Gupta (2019) to calculate the relative relevance of each variable under each category of factors. The RII helps compare the level of relevance for each variable. It is calculated using the formula, taking into account the weight of each variable and the number of respondents. The RII values are inversely correlated with the impact or frequency of occurrence of the variables.

$$\mathbf{RII} = \frac{\sum \boldsymbol{W}}{\boldsymbol{A} \times \boldsymbol{N}} (\mathbf{0} \leq \boldsymbol{RII} \leq \mathbf{1})$$

Where;

RII	=	Sum of weights (W1 + W2 + W3 + W4……+ Wn) / A x N
W	=	weights given to each attribute (i.e. 1 to 5 where '1' is very low important and '5' is very highly important.
A	=	highest weight (i.e., 5 in this case)
N	=	total number of respondents

4.3 Data Presentation:

This stage involves presenting the analyzed data in a clear and comprehensible manner, utilizing tables and graphs for effective communication. Tables offer a concise summary of the gathered information, facilitating easier understanding for readers and researchers. Graphs, such as pie charts, visually depict patterns and trends in the data, allowing the audience to quickly grasp the presented information.

The data analysis process encompasses several key steps: selecting a research approach and technique (quantitative), creating a questionnaire (Google Form), selecting samples (simple random sampling method), analyzing data using descriptive analysis and the Relative Importance Index (RII), and presenting findings through tables and various types of graphs. These robust data analysis techniques are crucial for the effectiveness of the research report, as they provide valuable insights into the examined issue.

5. RESULTS

5.1 Respondents' Profile

This section of the questionnaire collects the respondents' general demographic information, encompassing gender, age, ethnicity, level of education, and occupation.

In Figure 1, the distribution of gender among the valid respondents (95 in total) is presented. Among these respondents, 44 (46.32%) identify as male, and 51 (53.68%) identify as female.

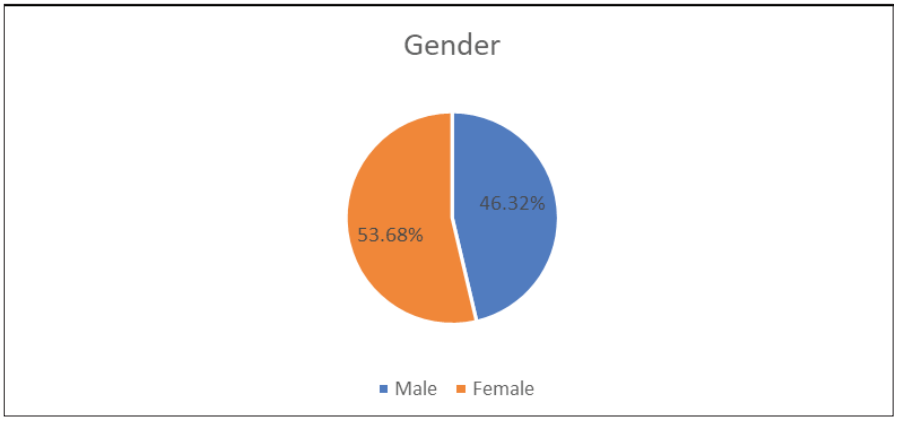

Figure 1: Gender

Figure 2 illustrates the age distribution of the respondents in the survey, targeting individuals who are at least 18 years old and legally eligible to purchase residential properties. Among the total of 95 respondents, 9 (9.47%) fall within the age range of 18 to 20, followed by 49 (51.58%) respondents between 21 and 25 years old, 29 (30.53%) between 26 and 30 years old, and only 8 (8.42%) respondents aged 31 and above. Consequently, the predominant age range among the participants is between 21 and 25 years.

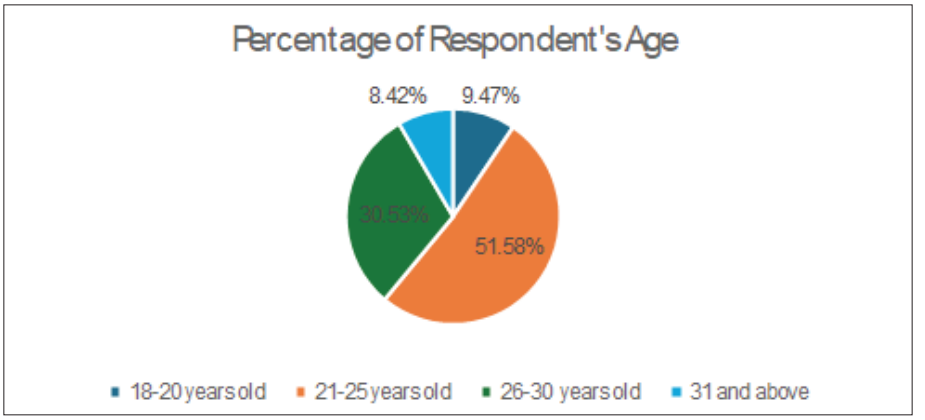

Figure 2: Percentage of Respondent's Age

The distribution of respondents' race is depicted in Figure 3. Among the total of 95 valid respondents, 22 (23.16%) identify as Malay, 67 (70.53%) identify as Chinese, and 6 (6.32%) identify as Indian. As a result, the Chinese ethnicity constitutes the majority among the participants in this survey.

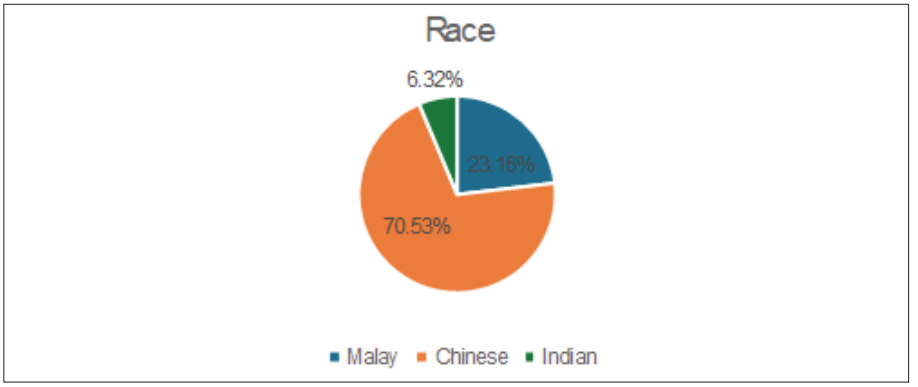

Figure 3: Percentage of Respondent's Race

Figure 4 displays the distribution of respondents' monthly income ranges. The largest proportion of respondents, 28 (29.47%), falls within the income range of less than RM2,500 per month, followed by 25 (26.32%) respondents earning between RM3,170 and RM3,969 monthly. Additionally, 18 (18.95%) respondents earn between RM2,500 and RM3,169 per month, 13 (13.68%) respondents earn between RM3,970 and RM4,849 monthly, 6 (6.32%) respondents earn between RM4,850 and RM5,879 monthly, and 4 (4.21%) respondents earn between RM5,880 and RM 7,099 per month. Furthermore, there is only 1 (1.05%) respondent who earns between RM7,110 and RM8,699 monthly. Notably, no respondents fall into the income categories of RM8,700 to RM10,959, RM10,960 to RM15,039, and RM15,040 and above on a monthly basis.

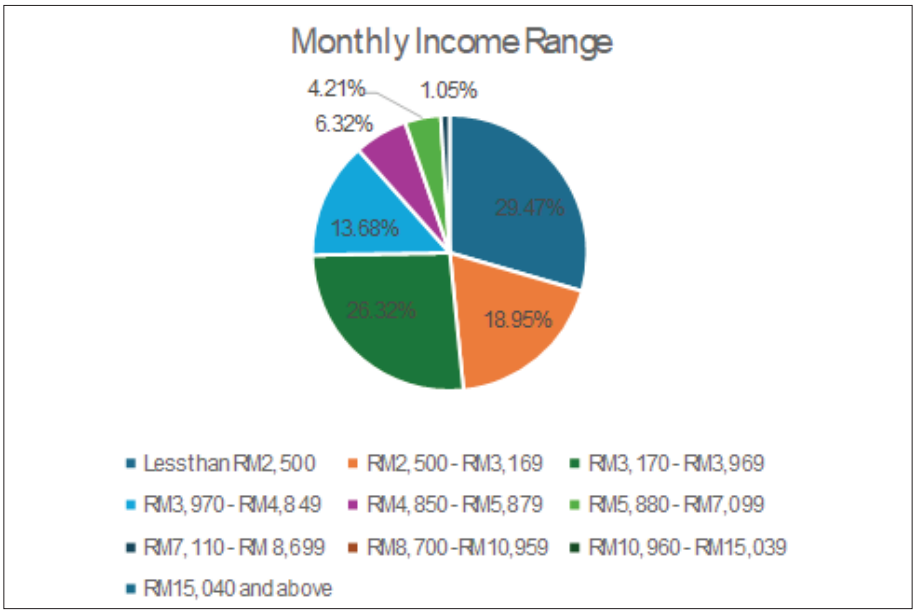

Figure 4: Percentage Distribution of Respondents' Monthly Income Range

5.2 Influential Factors in the Respondents' Home Purchase Decision

This section of the questionnaire aims to gauge potential homebuyers' perceptions of the factors influencing their home purchase decisions. It utilizes the Likert Scale, measuring the level of importance assigned by respondents to various factors, including demographic, psychological, location, financial, and environmental aspects. The respondents' perceptions regarding these factors will provide valuable insights into their decision-making processes when purchasing a home.

The results of the analysis are given in Table 2. The primary factor influencing the respondent's home purchase decision is the location, which ranked first. The convenience of accessing highways, hospitals, educational institutions, shopping malls, and other amenities appears to be crucial to most potential homebuyers. Consequently, location factors hold significant sway over their home purchase choices.

Psychological factors secured the second rank, with many Chinese potential homebuyers indicating that such factors play a pivotal role in their decision-making process, especially those with strong superstition beliefs.

Financial factors obtained the third position, as potential homebuyers consider overnight policy rates, income levels, stamp duty fees, and related aspects when making their home purchase decisions. Additionally, fluctuations in overnight policy rates by Bank Negara Malaysia may impact property loans.

Demographic factors occupied the fourth rank, with gender, age, occupation, and other demographic characteristics appearing to have less influence on the respondent's home purchase decisions, as per their opinions.

Environmental factors obtained the lowest rank, with most potential homebuyers deeming landscape features to be of lesser importance when compared to location. The preference for a property in a good location seems to override considerations for environmental aspects.

Table 2: Factors Influencing the Respondent's Home Purchase Decision: Relative Importance Index (RII)

Factors	Relative Important Index (RII)	Ranking
Demographic Factor	0.80000	4
Psychological Factor	0.84651	2
Location Factor	0.92326	1
Financial Factor	0.81163	3
Environmental Factor	0.69535	5

5.3 Perspective of Potential Homebuyers: Level of Superstition Belief in Home Purchase Decisions

The potential homebuyers' level of belief in superstitions when making a home purchase decision was assessed using the Likert Scale. The respondents' perception was based on various factors, including the type of numerology (address or floor numbers '8', '6', and '4'), street characteristics (facing the road directly, facing the T-junction, and located lower than the main road), and the psychological impact of the property (such as being associated with murder cases, suicide cases, proximity to graves, or waste ponds).

To assess the potential homebuyer's level of belief in superstitions when making a home purchase decision, the opinions regarding the sub-factors of each main factor are summarized in the table. The sub-factors are colour-coded to provide a clear guideline for grouping them under their respective main factors as given in Table 3.

Table 3: Colour-coded of Sub-factors

	Numerology
	Street Characteristic
	Psychologically Impacted House

Table 4 presents the order of agreement regarding the level of belief in superstitions when making a home purchase decision from the potential homebuyer's perspective. The respondents' top three essential sub-factors are properties facing the road directly and T-junction, properties associated with murder cases, and properties located lower than the main road or near graves. Among these, the street characteristic of a property holds the highest agreement among respondents, likely due to concerns related to safety, health and financial uncertainties associated with this factor.

On the other hand, the last three sub-factors agreed upon by respondents include properties with floor numbers "6" and "4," as well as properties with address number "4." This indicates that numerology is the least influential factor when potential homebuyers make their home purchase decisions. The respondents' perspective suggests that address and floor numbers can be changed, and their impact may not be substantial even if the numbers remain unchanged. Interestingly, a study by Mei-Hui et al. (2019) proposes the replacement of address and floor numbers, especially those linked to the number 4, with alternatives like using an alphabet, such as "3A."

Table 4: Level of Superstition Belief in Home Purchase Decisions: Order of Agreement from Potential Homebuyers' Perspective

Rank	Sub-factors
1	I will not buy the property that faces the road directly.
2	I will not buy the property that faces the T-junction.
2	I will not buy a property that has a murder case.
3	I will not buy a property that is lower than the main road.
3	I will not buy the property near the grave.

Rank	Sub-factors
4	I will not buy a property that has a suicide case.
5	I will not buy the property near the waste pond.
6	I will buy the property attached with address number “8”.
7	I will buy the property attached with floor number “8”.
8	I will buy the property attached with address number “6”.
9	I will buy the property attached with floor number “6”.
10	I will not buy the property attached with floor number “4”.
11	I will not buy the property attached with address number “4”.

5.4 Perception of the Impact of Superstition Belief on Property

This section of the questionnaire utilizes the Likert Scale to gauge potential homebuyers' perceptions regarding the level of impact of superstition belief on a property. The respondents' perceptions are based on the following statements:

1. “I would buy a property attached to the address number ‘8’ even if it is sold at a higher price.”
2. “I would not buy a property attached to the address number ‘4’ even if it is sold at a price lower than the market price.”
3. “I would buy a property attached to the floor number ‘8’ even if it is sold at a higher price.”
4. “I would not buy a property attached to the floor number ‘4’ even if it is sold at a price lower than the market price.”
5. “I would consider legal action against the owner or estate agent if I discover any unfavourable history associated with the property.”
6. “I would consult a numerologist or other spiritual practitioner regarding a property's address or unit number before making a purchase.”

The Likert Scale was employed to capture respondents' agreement or disagreement with these statements, providing valuable insights into their perceptions of the impact of superstition belief on properties.

Table 5 presents the relative importance index of the impact of superstition belief on properties. The foremost factor is the potential homebuyers' eagerness to purchase a property attached to the address number “8,” even at a higher price. This inclination is rooted in their belief that living in such property will bring them good luck, justifying their willingness to pay a premium.

In the second position, respondents show a strong inclination to take legal action against property owners or estate agents if they discover any undisclosed truths about the property's history. Transparency and access to comprehensive historical information are deemed crucial by potential homebuyers, as supported by findings from Alias et al. (2014).

Ranking third, respondents express a notable reluctance to buy properties associated with the address number “4,” even at prices lower than the market value. The number “4” carries negative connotations related to “death” in pronouns, significantly impacting their decision-making process.

Beyond the top three factors, there are additional sub-factors with varying degrees of influence. These include the willingness to purchase a property attached to floor number "8" even at a higher price, the tendency to seek advice from numerologists or spiritual practitioners before making a purchase, and the refusal to buy properties attached to floor number "4" even at discounted prices. These sub-factors have a comparatively lower impact on potential homebuyers' decisions when considering property purchases.

Table 5: Impact of Superstition Belief on Property: Relative Importance Index

Impact of Superstition Belief on Property….?	Relative Important Index (RII)	Ranking
I will buy the property attached with the address number "8" even if sells at a higher price.	0.90000	1
I will not buy a property attached with the address number "4" even if sells at a lower price than the market price.	0.88140	3
I will buy the property attached with the floor number "8" even if sells at a higher price.	0.80698	4
I will not buy a property attached to floor number "4" even if sells at a price that is lower than the market price.	0.77209	6
I will sue the owner or estate agent if they discover the truth about the history of the property.	0.89070	2
I will consult a numerologist or other spiritual practitioner regarding a property's address or unit number before purchasing the property.	0.79302	5

2. DISCUSSION

6.1 Superstition belief

Superstition belief refers to beliefs that lack rational justification and are often based on illogical or distant historical associations. Among potential homebuyers, three types of superstition beliefs influence their home purchase decisions: numerology, street characteristics of properties, and psychologically impacted houses. Numerology involves considerations of property address numbers "8," "6," "4," as well as property floor numbers "8," "6," "4." Street characteristics include properties facing the road directly, facing the T-junction, and those located lower than the main road. Additionally, psychologically impacted houses comprise properties associated with murder cases, suicide cases, proximity to graves, and waste ponds. These various superstition beliefs can significantly impact potential homebuyers' decisions when making a home purchase, potentially influencing the perceived value of the property in question.

6.2 Impacts of superstition on the home purchase decision-making

The findings indicate that a significant number of respondents agreed with the impacts of superstition on their home purchase decisions, as assessed in the questionnaire survey. This demonstrates that potential homebuyers in the Klang Valley region still hold superstition

beliefs regarding properties when making purchasing decisions. Moreover, all the tested impacts on the home purchase decision were deemed influential to potential homebuyers. Analyzing the results through the Relative Importance Index (RII), the top-ranked factor is the willingness of respondents to buy a property attached to the address number "8," even if it is sold at a higher price. This belief stems from potential homebuyers' perception that living in such a property will bring them good luck, justifying their readiness to pay a premium. Ranked second, potential homebuyers express their inclination to take legal action against property owners or estate agents if they discover any hidden truths about the property's history. This highlights their strong desire for transparency and the right to know the complete history of the property.

Furthermore, potential homebuyers hold a neutral stance on consulting a numerologist or other spiritual practitioner regarding a property's address or unit number before making a purchase. They also prefer not to buy properties attached to floor number "4," even if they are offered at prices lower than the market price. This attitude may stem from the perception that consulting numerologists or spiritual practitioners is costly and unnecessary. Instead, they may choose to replace the address number with an alphabet, such as "3A."

Moreover, the research highlights that most Chinese potential homebuyers retain strong superstition beliefs concerning properties, particularly favouring properties attached to the address number "8."

Overall, these findings underscore the enduring impact of superstition beliefs on potential homebuyers' home purchase decisions, with specific emphasis on certain property attributes and cultural preferences.

6.3 Level of belief in superstitions

Regarding the level of belief in superstitions when making a home purchase decision from potential homebuyers' perspectives, this research question was addressed through descriptive analysis. The relative importance index and mean comparison were utilized to rearrange the sub-factors order of importance and explore the relationship between demographic profiles and superstition beliefs when making home purchase decisions.

Overall, the findings reveal that most potential homebuyers strongly agree with the influence of superstition beliefs on the property's street characteristics, particularly properties that face the road directly and properties associated with murder cases, which ranked as the first and second priority, respectively. Potential homebuyers perceive that street characteristics can impact safety, health, and financial aspects in ways that are challenging to predict. Additionally, superstition beliefs surrounding numerology and psychologically impacted houses also hold sway over potential homebuyers' home purchase decisions. While these superstition beliefs are acknowledged only by some potential homebuyers, they still play a significant role in their decision-making processes.

In summary, the research highlights the prevalence and impact of superstition beliefs on potential homebuyers' home purchase decisions, particularly regarding street characteristics, numerology, and psychologically impacted houses. These beliefs, even when acknowledged by only some respondents, influence their considerations during the home-buying process.

3. CONCLUSIONS

This research sheds light on the influence of superstition beliefs on potential homebuyers in the Klang Valley region during their home purchase decisions. The findings demonstrate that superstition belief significantly affects the decision-making process of potential homebuyers, thus making it an important factor for developers and real estate agents to consider.

The study reveals that the level of belief in superstitions is notably strong among potential homebuyers in the Klang Valley when it comes to making their property purchase decisions. Street characteristics, such as properties associated with murder cases, emerge as highly influential factors impacting their perceptions of safety, health, and financial implications related to a property. Moreover, superstition beliefs surrounding numerology and psychologically impacted houses also play significant roles in shaping potential homebuyers' preferences and decisions.

As a consequence of these findings, it is imperative for developers and real estate agents to take these superstition beliefs into serious consideration when developing and marketing properties in the Klang Valley region. Ignoring or neglecting the influence of superstitions may lead to adverse consequences, such as depreciation in property values, increased overhang on properties, and potential challenges in selling properties. By recognizing and addressing these superstition-related concerns, developers and real estate agents can optimize their strategies to attract potential homebuyers and create a more favourable market response both for the primary and secondary markets.

In light of the study's results, it is recommended that developers and real estate agents conduct further market research to gain deeper insights into the specific superstition beliefs prevalent among potential homebuyers in various demographic segments. This understanding can facilitate the development of targeted marketing campaigns and property offerings that resonate with the preferences and concerns of potential buyers. By incorporating these considerations, the negative impact of superstition beliefs on the property market can be mitigated, leading to enhanced property sales and overall market stability.

In conclusion, the research highlights the importance of acknowledging and accommodating superstition beliefs in the real estate industry. It emphasizes that by recognizing the significance of superstitions in potential homebuyers' decision-making processes, developers and real estate agents can position themselves strategically to succeed in the property market of the Klang Valley and create positive outcomes for both buyers and sellers.

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