

Predictive analysis on the influence of green certifications for rent performance in Kuala Lumpur

Analisis Ramalan Pengaruh Pensijilan Hijau terhadap Prestasi Sewa di Kuala Lumpur

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ABSTRACT - Green building has been widely promoted globally as a pathway to sustainability, aligning with the United Nations Sustainable Development Goal (SDG) 11 on sustainable cities and communities as well as Malaysia's commitment to achieving a low-carbon nation under the National Green Technology Policy. Certified buildings, such as those recognized under the Green Building Index (GBI) and Leadership in Energy and Environmental Design (LEED), typically integrate energy-efficient systems, sustainable materials, and environmentally friendly designs, which are often assumed to justify higher rental values. The objective of this study is to test the rent performance among office buildings in Kuala Lumpur with different certification status, while accounting for other building attributes such as size and location. Transaction data were collected from the Valuation and Property Services Department (VPSD) covering the period 2023–2025. Machine learning predictive analytics was employed to test the R^2 among three categories of office buildings: non-green buildings, GBI-certified buildings, and LEED-certified buildings. The findings reveal a relatively higher Coefficient of determination R^2 for LEED suggests that internationally recognized certifications are beginning to be reflected in rent. Overall, the predictive results demonstrate that rental performance in Kuala Lumpur office market is primarily driven by conventional physical attributes, particularly sizes and locations, which consistently achieved the highest R^2 values across all machine learning algorithms. The significance of this study lies in its contribution to the understanding of the evolving dynamics of green-certified office buildings in Malaysia, where the market has yet to consistently recognize certification as a premium value driver. By highlighting the gap between global sustainability aspirations and local market realities, this study provides important insights for investors, developers, and policymakers in shaping strategies that support Malaysia's transition towards a greener and more sustainable built environment in line with both national and global agendas.

INTRODUCTION

Kuala Lumpur is one of the commercial centres in Malaysia that has become a centre of attention for large companies and corporate organisations to occupy the top-grade office buildings. As demand for premium offices increase, investors and stakeholders are shifting towards green-certified buildings to attract quality tenants by offering lower operating costs, healthier work environments, and stronger Environmental, Social and Governance (ESG) credentials (Doan et al., 2023).

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Green-certified building has been widely promoted globally as a pathway to sustainability, aligning with the United Nations Sustainable Development Goal (SDG) 11 on sustainable cities and communities as well as Malaysia's commitment to achieving a low-carbon nation under the National Green Technology Policy. For instance, the Green Building Index (GBI) is one of the efforts designed to promote sustainability, buildings awarded with the GBI certifications were proved to be environmentally friendly goods based on their assessments (Kong et al., 2021). Green-certified buildings often achieve higher rental rates as their sustainable features enhance operational efficiency and tenant satisfaction (MacNaughton et al., 2017). Studies in US, Europe, and other areas, from 2003 to 2021, has substantiated an 85% green premium in the US, 81% in Europe, and 75% in other regions (Hemantha Jayakody & Vaz, 2023). In Netherland, the BREEAM-NL certification positively affects the office market, in consideration of locational and building attributes, the rent premium varying between 5.1%-12.6% in the market (van Overbeek et al., 2024). When compared to conventional buildings, a substantial number of valuers in the prior study concurred that green features result in greater rent and lower vacancy rates (Jasimin & Mohd, 2015).

Indeed, the real estate rent market were influenced based on existing correlations through multitude of variables, and some are beyond our control. Although green-certified buildings are often promoted as offering multiple benefits, ongoing debate persists among industrial key players whether building with certification command higher rent compared to the non-certified counterparts (Kong et al., 2021). Several studies in the past have argued that green certification is not yet a major driver of market performance in Malaysia, as current market seen as infancy and immature (Abdullah et al., 2018; Mohd et al., 2024). Furthermore, the limited availability of data on green building rental transactions has further constrained empirical investigation. To address this gap, this study tests the rent performance among office buildings in Kuala Lumpur with different certification status, while accounting for other building attributes such as size and location. By leveraging predictive models, this study aims to examine the relative contribution of green building certification status to predict office rental performance in Kuala Lumpur, providing a data-driven perspective on rental differentials in the market.

LITERATURE

Overview of office market

Kuala Lumpur is the main commercial hub, with a substantial number of Grade A office concentrated in the Central Business District (CBD) such as Kuala Lumpur City Centre (KLCC), Bukit Bintang, and Chow Kit. According to annual Property Market Report (PMR) released by the National Property Information Centre (NAPIC) 2024, the office rental market has seen an increase in rental rates, especially for buildings with flexible layouts and green certification. At the Central Region of Kuala Lumpur, office rentals at Menara Prestige, Campbell Complex, and The Horizon Bangsar South experienced modest rent growth of over 6.0% indicating a positive growth. Demand within Kuala Lumpur CBD areas are largely driven by multinational corporations (MNCs), financial institutions, technology companies, and Government Linked Companies (GLC).

Key attributes affecting green office rent

Office rental market is shaped by multitude of factors includes physical, locational, and market-driven factors (Safian & Nawawi, 2013; Thuraiya Mohd et al., 2022; Wan Rodi et al., 2019). The most prominent factors were physical and locational since it fundamentally shapes both the utility and desirability of a building. Physical characteristics such as building age, sizes and sustainability features directly affect operational costs, functionality and preferences of tenants (Adnan et al., 2012; Robinson et al., 2017). While property with superior qualities physically, often commands a higher rents and experience lower vacancy due to their ability to meet the expectations of tenants. Office rent is highly dependent on locations where access to public transport, distance to CBD and labor market is accessible (Bera & Kangalli Uyar, 2019). Location theory explains how labour market proximity affects office rent. Previous studies using CBD distance as a proxy for labour market closeness have had significant outcomes (Ho et al., 2005; Ojok, 2018).

In the context of office market in Malaysia, certifications reflect the use of resources that can bring out competitive advantage. Office building certifications existed due to the governmental policies as an indicator to support environmental policies such as green practice and building that possess a high-

speed communication technology that support operations of business (multimedia) (Jun Hwa & Imm Ng, 2015). These has led to the development of two (2) types of certifications today namely the Green certification and MSc status (Kong et al., 2021). The certification has become key indicators for tenants who seek to utilise office spaces for specific purposes (Adnan et al., 2012; Jang et al., 2018; Safian & Nawawi, 2013). The idea to utilise such certifications were based on the demand, where rent changes affected from tenant willingness to pay more for such these benefits. These key attributes such as locational, physical and certifications are the key attributes affecting green office rent. To summarise, the attributes is shown in Figure 1.

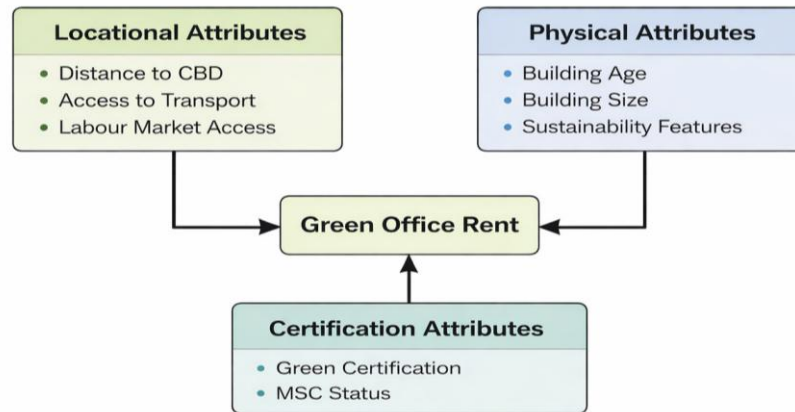


Figure 1. Key attributes affecting office rent

Green building rating tools (GBRTs)

Green building rating tools (GBRTs) are essential instruments for assessing the sustainability performance of construction projects, aiming to mitigate environmental, economic, and social impacts. These tools, such as LEED, BREEAM, GRIHA, and others, evaluate buildings based on various criteria, including energy efficiency, water use, and indoor environmental quality, throughout the building's life cycle from design to demolition (Chin Yee Ha et al., 2023; Hussein et al., 2016). It provides a framework for integrating sustainable development into construction processes, setting priorities, and guiding decision-making (Leskinen et al., 2020). Despite their widespread use, these tools face challenges such as balancing the three pillars of sustainability (environmental, social, and economic), addressing regional variations, and incorporating life cycle assessments. Studies have shown that while environmental criteria often dominate, there is a growing emphasis on social and economic factors (Kalsum & Isa, 2019; Plebankiewicz et al., 2019). Additionally, the effectiveness of these tools in capturing the full environmental impact of buildings, including operational and embodied energy, remains a topic of ongoing research.

Malaysia has adopted various green building rating tools from other countries to promote sustainable construction practices within its own context. One of the most notable tools is the Green Building Index (GBI), which was developed in Malaysia but draws inspiration from international systems like LEED from the United States and BREEAM from the United Kingdom (Chin Yee Ha et al., 2023; Hussein et al., 2016; Wong et al., 2021). The GBI assesses buildings based on criteria such as energy efficiency, water usage, indoor environmental quality, and sustainable site development, aligning with global best practices while addressing local environmental conditions and cultural considerations (Lau et al., 2023; Mohd Adnan et al., 2022). By integrating these international frameworks, Malaysia aims to enhance its own green building initiatives, promote sustainable urban development, and contribute to global sustainability goals while addressing its unique environmental challenges. Table 1 shows the established GBRT.

Table 1. Established GBRT

Green rating tools	Abbreviations	Region	Countries
Leadership in Energy and Environmental Design, introduced by USGBC (United States Green Building Council) in 1998	LEED	United states	USA
WELL Building Standard (USA), introduced by International WELL Building Institute (IWBI) in the United States	WELL	United states	USA
Sustainable Sites Initiatives. Introduced by American Society of Landscape Architects (ASLA)	SITES	United states	USA
Living Building Challenge, introduced by the International Living Future Institute (ILFI) 2006	ILFI	United states	USA
Building Research Establishment Environmental Assessment Method introduced in 1990	BREEAM	EUROPE	UK
Leadership in Energy and Environmental Design 1998	LEED	EUROPE	CANADA
Deutsche Gesellschaft fur Nachhaltiges Bauen igh Environmental Quality, introduced in early 1990s	DGNB	EUROPE	FRANCE
Green Star System	Green star	EUROPE	GERMANY
Green Star System launched in 2007	Green star	ASIA PACIFIC	AUSTRALIA
Comprehensive Assessment System for Building Environmental Efficiency, introduced in 2001	CASBEE	ASIA PACIFIC	NEW ZEALAND
Building Environmental Assessment Method	BEAM	ASIA PACIFIC	JAPAN
Building and Construction Authority	BCA	ASIA PACIFIC	HONG KONG
Green Standards for Energy and Environmental Design	G-SEED	ASIA PACIFIC	SINGAPORE
Green Building Index	GBI	ASIA PACIFIC	KOREA
Green Rating for Integrated Habitat Assessment. Introduced by the Energy and Resources Institute (TERI)	GRIHA	ASIA PACIFIC	MALAYSIA
Green Building Rating System - Sri Lanka, introduced by Sri Lanka Green Building Council (SLGBC)	GBRS		INDIA
Excellence in Design for Greater Efficiencies, introduced by the International Finance Corporation (IFC)	EDGE	INTERNATIONAL	SRI LANKA

Source: (Kong et al., 2021)

Assessment criteria for green rating tools

Green rating tools are organised frameworks to evaluate and certify the environmental performance and sustainability. The assessment criteria serve as a thorough checklist of sustainability considerations to guide developers, designers, and building owners in implementing environmental practices. These criteria were designed to assess building potential in minimising the environmental footprint while enhancing health, comfort, and productivity of occupants. In essence, the assessment criteria act as performance benchmarks across the entire building life cycle from planning and design through construction and operation. Each tools contains specific indicators or sub-criteria, and points are awarded based on the extent to which the building meets or exceeds these requirements. Similarly, international tools like Leadership in Energy and Environmental Design (LEED) and Building Research Establishment Environmental Assessment Method (BREEAM) use comparable sets of criteria tailored to their respective contexts. Table 2 summarises the core focus areas, assessment criteria and building type for certain green rating tools.

Table 2. Assessment criteria for green rating tools

Tools	Core focus	Assessment criteria	Building type
Green Building Index (GBI)	To promote sustainability in built environment and awareness of environmental issues Purposely developed for Malaysian-tropical climate, environmental and development, cultural and social needs	<ul style="list-style-type: none"> ● Energy efficiency ● Indoor environmental quality ● Sustainable site planning and management ● Materials and resources ● Water efficiency ● Innovation ● Integration of building systems ● Location and transportation 	<p>Residential: Linked houses, apartments, condominiums, townhouses, semi-detached and bungalows</p> <p>Non-residential: Commercial, Institutional, and Industrial</p>
LEED	Sustainable sites, water efficiency, materials and resources, energy and atmosphere, regional priority, and indoor environmental quality	<ul style="list-style-type: none"> ● Sustainable sites ● Water efficiency ● Energy and atmosphere ● Materials and resources ● Indoor environmental quality ● Innovation ● Regional priority ● Energy efficiency ● Water efficiency ● Environmental protection 	Broadly applied to all building types, including residential, commercial and industrial
BCA Green Mark	Evaluate a building for environmental impact and performance	<ul style="list-style-type: none"> ● Indoor environmental quality ● Other green features and innovations that may not be covered in the other sections ● Energy ● Water ● Health and wellbeing 	USA Residential and non-residential building
BREEAM	Energy, health and well-being, innovation, land use, materials, management, pollution, transport, waste and water	<ul style="list-style-type: none"> ● Pollution ● Transport ● Materials ● Waste ● Ecology ● Management 	Widely used in Europe and internationally for new construction, renovations and in-use buildings

Source: (Abdullah et al., 2015; Doan et al., 2023; Wu et al., 2017)

METHODS AND MATERIALS

Data

The area was chosen based on the availability of data. The data were acquired from Department of Valuation and Property Services that comprises four (4) mukims in Kuala Lumpur area namely mukim Petaling, Bandar Kuala Lumpur, Batu, Setapak and Kuala Lumpur as shown in Table 3.

Table 3. Focus area

State	District	Mukim
Kuala Lumpur	No district	Petaling Bandar Kuala Lumpur Setapak Kuala Lumpur

Source: (VPSD, 2025)

The rent transactions only cover these four (4) mukims subject to the availability of the green office building. Table 4. Office building transactions depict the summary of transactions based on the data.

Table 4. Office transactions (2022-2025)

Certifications	Number of transactions
Non-green	882
LEED	43
GBI	93

Source: (VPSD, 2025)

The number of transactions of office building based on the datasets is 1041, 902 transactions were non-green, 95 registered under the Green Building Index (GBI), and 44 certified with Leadership in Energy and Environmental Design (LEED) comprising transactions from 2022 until 2025. The limitation in transactions of green office is due to low transactions for green certified building. Most of certified green buildings were located within Bandar Kuala Lumpur areas. The analysis on the numbers of transactions for building with certifications is low, and only two (2) certifications available from the data. Certain buildings in Kuala Lumpur were discovered to possess other certification from other green rating tools such as BREEM and BCA Green Mark. However, prior to limitation in the numbers of transactions, the data was disregarded.

Machine learning algorithms

Machine learning method is implied to test the influenced of the attributes on rent. Using the same data source in the form of *descriptive*, datasets were tested based on the machine learning auto modelling and certain algorithms will be configured by the systems to gain the compatible algorithms with datasets in the manual processing. As a result, algorithms such as decision tree, random forest and support vector machine were selected by the systems as the compatible algorithms. Through the auto model, the optimal parameter setting was configured for each algorithm to produce best predictive value (rent) based on the optimal parameter settings configured. Table 5,6 and 7 shows the optimal parameter settings for each algorithm.

Table 5. Decision tree optimal parameters

Algorithm	Maximal depth	Error rate
Decision tree	2	35.0%
	4	17.0%
	7	11.3%
	10	11.6%
	15	10.7%
	25	11.5%

Table 6. Random forest optimal parameters

Algorithm	Number of trees	Maximal depth	Error rate
Random forest	20	2	42.6%
	60	2	42.5%
	100	2	42.2%
	140	2	42.9%
	20	4	33.7%
	60	4	34.2%
	100	4	32.7%
	140	4	34.5%
	20	7	26.0%
	60	7	26.3%
	100	7	27.9%
	140	7	27.1%

Table 7. Support vector machine optimal parameters

Algorithm	RBF	C	Error rate
Support vector machine	0.005	10	59.3%
	0.050	10	59.3%
	0.500	10	56.4%
	5	10	56.5%
	0.005	100	55.7%
	0.050	100	54.7%
	0.500	100	56.2%
	5	100	56.4%
	0.005	1000	48.5%
	0.050	1000	43.5%
	0.500	1000	53.8%
	5	1000	55.2%

The best settings with minimal error rate were used in designing manual machine learning algorithms as per highlighted in Table 5,6 and 7. To summarise, (decision tree 15 = maximal depth with 10.7% error rate), (random forest 20 = number of trees, 7 = maximal depth with 26% error rate) and (support vector machine 0.05 = RBF, C = 1000 with 43.5% error rate).

Predictive analytics

Predictive modelling allows the analysis to move beyond simple descriptive comparisons by statistically capturing the complex relationships between these variables and rent. Indication was made based on the correlation between (*attributes x rent*) by each algorithm. The correlation was viewed based on the performance metrics chosen, initially the R^2 (Coefficient of Determination). R^2 represents the variance in the dependent variable (*rent*) that explained by the independent variables (*location, sizes, certifications*).

A higher R^2 reflects a greater portion of the observed variations in rent can be attributed to the predictors in the model, implying better explanatory power.

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}}$$

- SS_{res} = residual sum of squares (unexplained variance)
- SS_{tot} = total sum of squares (total variance)

A model with high R^2 generally seen as more reliable and stable for decision making since it demonstrates the systematic patterns (not just random noise) are being captured. From this point, the attributes (*sizes, locations, certifications*), were analyse. A higher value means higher contributions to the predictive value which indicates. For example (*If certifications $R^2 >$ higher contributions, hence higher rent value*). The training and testing will be done through machine learning manual processing, with the inclusion of attributes used in this study, the optimal parameters settings based on auto modelling and the observation of R^2 (Coefficient of determination).

RESULTS AND DISCUSSION

Descriptive statistics

Table 8 summarises the results of descriptive statistics based on the green building datasets.

Table 8. Descriptive statistics

Groups	Count	Sum	Average	Variance
Non-green	882	21011.0333	154.4928919	25253.56069
GBI	93	12002.58073	129.0600079	63553.55474
LEED	43	6384.911595	148.4863162	51177.95008

The descriptive analysis indicated that a total of 272 buildings were examined, comprising 136 non-green, 93 Green Building Index (GBI)-certified, and 43 Leadership in Energy and Environmental Design (LEED)-certified buildings. The mean rental rate was highest among non-green buildings (M = 154.49), followed closely by LEED-certified buildings (M = 148.49), while GBI-certified buildings recorded the lowest mean rental rate (M = 129.06). Notably, rental rate variability differed across the groups, with GBI-certified buildings exhibiting the greatest variance (63,553.55), followed by LEED-certified buildings (51,177.95), and non-green buildings showing the least variability (25,253.56). These results suggest substantial differences in both the central tendency and dispersion of rental rates across the certification categories.

Results

The results presented in Table 9,10 and 11 shows the R^2 generated by decision tree, random forest and support vector machines.

Table 9. Decision tree

Algorithm	Attributes	R^2
Decision tree	Location	0.46
	Sizes	0.62
	Tenancy period	0.09
	Age	0.31
	GBI Certification	0.16
	LEED Certification	0.35

Table 10. Random forest

Algorithm	Attributes	R^2
Random forest	Location	0.53
	Sizes	0.69
	Tenancy period	0.04
	Age	0.13
	GBI Certification	0.09
	LEED Certification	0.17

Table 11. Support vector machine

Algorithm	Attributes	R^2
Support vector machine	Location	0.26
	Sizes	0.45
	Tenancy period	0.09
	Age	0.12
	GBI Certification	0.03
	LEED Certification	0.15

The analysis revealed that green certification variables exhibited comparatively lower predictive strength than physical attributes, yet they provided meaningful insights into rental differentials. Across the models, LEED certification consistently produced higher R^2 values (0.35 in the decision tree algorithm and 0.17 in the support vector machine algorithm) compared to GBI certification (0.16 and 0.09, respectively). These values indicate that while neither certification type explains a large proportion of the variance in rent, LEED buildings demonstrate a clearer rental signal than GBI buildings, suggesting a stronger market recognition or premium associated with LEED. This difference may be attributed to LEED's longer global presence and stronger branding as an international benchmark for green certifications. By contrast, the weaker R^2 values for GBI imply that GBI-certified buildings do not yet exert a substantial influence on rent levels, possibly reflecting limited market maturity, weaker tenant demand, or insufficient price differentiation in the current Malaysia office market. Notably, the absence of measurable R^2 values for certification variables in the random forest model may suggest that their effect is overshadowed when stronger predictors such as size and location are included simultaneously. Overall, these findings indicate that green certification status contributes only modestly to rent prediction, with LEED showing relatively stronger predictive relevance than GBI.

Discussions

The observed disparity in predictive strength between LEED and GBI certifications carries important implications for the commercial office market in Kuala Lumpur. The relatively higher Coefficient of determination R^2 for LEED suggests that internationally recognized certifications are beginning to be reflected in rental, albeit modestly, signalling an emerging preference among tenants for globally benchmarked sustainable buildings. In contrast, the consistently low R^2 values for GBI indicate that local green certifications have not yet translated into higher rent, possibly due to current market seen as infancy and immature, or a perception that GBI compliance adds limited additional value beyond standard building quality. For investors and developers, this finding implies that pursuing LEED certification may offer a more competitive positioning strategy in high-value office markets, while GBI certification alone is unlikely to produce immediate rent differentials. However, the overall low R^2 scores for both certification types also underscore that green status currently plays only a supplementary role in driving rental performance, which remains dominated by physical attributes such as size and location. This highlights the need for market education, policy incentives, and more extensive transactional data to strengthen the market recognition and economic return of locally certified green buildings. Overall, the predictive modelling results demonstrate that rental performance in Kuala Lumpur's office market is primarily driven by conventional physical attributes, particularly size and location, which consistently achieved the highest Coefficient of determination (R^2) values across all algorithms. These findings confirm that fundamental spatial and structural characteristics remain the dominant determinants of rental variability.

Limitation

The analysis on the numbers of transactions for building with certifications is low, prior to the low transactions volume of rent for green-certified office building and based on the data acquired from VaPSD only two (2) certifications available were considered valid. Certain buildings in Kuala Lumpur were discovered to possess other certification from other green rating tools such as BREEM and BCA Green Mark. However, prior to limitation in the numbers of transactions, the data was disregarded. Plus, the market focus area of this study might be unfit to compare mukim bandar kuala lumpur which located at city centre while Setapak considered to be a suburban market. This study needs to address this limitation can be solve in future by considering a different market such as Klang valley which is an urban conurbation rather than Kuala Lumpur. While Klang Valley covers part of areas in Selangor (Subang jaya, Petaling jaya and Klang) which possess a reliable number of green-related buildings.

CONCLUSIONS

The significance of this study lies in its contribution to the understanding of the evolving dynamics of green-certified office buildings in Malaysia, where the market has yet to consistently recognize certification as a value driver. By highlighting the gap between global sustainability aspirations and local market realities, this study provides important insights for investors, developers, and policymakers in shaping strategies that support Malaysia's transition towards a greener and more sustainable built environment in line with both national and global agendas.

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CONFLICT OF INTEREST

"The authors declare no conflicts of interest" should be included if there is no conflict of interest.

AUTHORS' CONTRIBUTION

Author 1.: Paper Write-up, Conceptualization, Methodology, Software. **Author 2.:** Supervision

AVAILABILITY OF DATA AND MATERIALS

Data is openly available in a public repository, with a permanent identifier

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI was used in the writing of the manuscript.

ETHIC STATEMENTS

'Not applicable'

REFERENCES

- Abdullah, L., Mohd, T., Pin, S. F. C., & Ahmad, N. (2018). Green building valuation: From a valuers' perspective. *AIP Conference Proceedings*, 2020. <https://doi.org/10.1063/1.5062690>
- Bera, A. K., & Kangalli Uyar, S. G. (2019). Local and global determinants of office rents in Istanbul: The mixed geographically weighted regression approach. *Journal of European Real Estate Research*, 12(2), 227–249. <https://doi.org/10.1108/JERER-12-2018-0052>
- Chin Yee, H., Ismail, R., & Terh Jing, K. (2020). The barriers of implementing green building in Penang construction industry. *Progress in Energy and Environment*, 12, 1–10.
- Doan, D. T., Tran, H. Van, Aigwi, I. E., Naismith, N., Ghaffarianhoseini, A., & Ghaffarianhoseini, A. (2023). Green building rating systems: A critical comparison between LOTUS, LEED, and Green Mark. *Environmental Research Communications*, 5(7). <https://doi.org/10.1088/2515-7620/ace613>
- Hemantha Jayakody, T. A. C., & Vaz, A. (2023). Impact of green building certification on the rent of commercial properties: A review. *Journal of Informatics and Web Engineering*, 2(2), 8–28. <https://doi.org/10.33093/jiwe.2023.2.2.2>
- Hussein, S. M., Algburi, S. M., & Faieza, A. A. (2016). Review of Green Building Index in Malaysia: Existing work and challenges. *International Journal of Applied Engineering Research*.
- Jasimin, T. H., & Mohd Ali, H. (2015). Valuation of green commercial office building: A preliminary study of Malaysian valuers' insight. *International Journal of Humanities and Social Sciences*, 9(8), 1156–1161.
- Kalsum, N., & Isa, M. (2019). Town planners' involvement in the planning and design process of green building projects in Malaysia. *Pertanika Journal of Social Sciences & Humanities*, 27(2), 977–985.
- Kong, T., Hong, K., Shamsudin, Z., Mohsen, M., & Jalil Omar, A. (2021). Key attributes affecting the rental value of green commercial office buildings in Kuala Lumpur, Malaysia. *Research in Management of Technology and Business*, 1(1), 1383–1396. <https://doi.org/10.30880/rmtb.2021.02.01.099>
- Lau, Y. Y., Talukdar, G., Widyasamratri, H., Wang, J., & El-shaammari, M. (2023). Utilization of green materials and technology for sustainable construction in Malaysia. *Tropical Environment, Biology, and Technology*, 1(1), 47–66. <https://doi.org/10.53623/tebt.v1i1.238>
- MacNaughton, P., Satish, U., Laurent, J. G. C., Flanigan, S., Vallarino, J., Coull, B., Spengler, J. D., & Allen, J. G. (2017). The impact of working in a green certified building on cognitive function and health. *Building and Environment*, 114, 178–186. <https://doi.org/10.1016/j.buildenv.2016.11.041>
- Mohd Adnan, Y., Mohd Arif, N. A., & Razali, M. N. (2022). Exploring green office building choices by corporate tenants in Malaysia. *Sustainability (Switzerland)*, 14(21). <https://doi.org/10.3390/su142114509>
- Mohd Safian, E. E., & Nawawi, A. H. (2018). The characteristics of purpose-built office: Occupants' perception. *Journal of Asian Behavioural Studies*, 3(8), 159–170. <https://doi.org/10.21834/jabs.v3i8.289>
- Mohd, T., Jamil, S., & Masrom, S. (2020). Machine learning building price prediction with green building determinant. *IAES International Journal of Artificial Intelligence*, 9(3), 379–386. <https://doi.org/10.11591/IJAI.V9.I3.PP379-386>
- Plebankiewicz, E., Juszczak, M., & Kozik, R. (2019). Trends, costs, and benefits of green certification of office buildings: A Polish perspective. *Sustainability (Switzerland)*, 11(8). <https://doi.org/10.3390/su11082359>
- Safian, E. E. M., & Nawawi, A. H. (2013). Occupier's perceptions on building and locational characteristics of purpose-built office. *Procedia – Social and Behavioral Sciences*, 101, 575–584. <https://doi.org/10.1016/J.SBSPRO.2013.07.230>
- Thuraiya Mohd, Muhamad Harussani, & Suraya Masrom. (2022). The relationship between office rent determinants and rental values based on automated machine learning. 11th International Real Estate Research Symposium (IRERS).
- van Overbeek, R., Ishaak, F., Geurts, E., & Remøy, H. (2024). The added value of environmental certification in the Dutch office market. *Journal of European Real Estate Research*, 17(1), 70–86. <https://doi.org/10.1108/JERER-04-2023-0010>
- Wong, S. Y., Low, W. W., Wong, K. S., & Tai, Y. H. (2021). Barriers for green building implementation in Malaysian construction industry. *IOP Conference Series: Materials Science and Engineering*, 1101(1), 012029. <https://doi.org/10.1088/1757-899x/1101/1/012029>