JPPIPA 11(8) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Green Building Concept in Building Gas Station Based on BREEAM With Nzeb Method For Increasing Cost Performance

Abdul Charis[1*], Mawardi Amin[1], Agus Suroso[1]

[1] Civil Engineering Department, University Mercu Buana, Jl. Meruya Selatan No. 1 Kembangan, Jakarta Barat , Jakarta, Indonesia.

Received: February 26, 2025
Revised: July 03, 2025
Accepted: August 25, 2025
Published: August 31, 2025

Corresponding Author:
Abdul Charis
abdul_charis@ymail.com

DOI: 10.29303/jppipa.v11i8.10751

Abstract: In this case, the rapid development of gas station construction is a significant threat to life and global growth, with greenhouse gas (GHG) emissions functioning as one of the main catalysts. Indonesia is urged to immediately embrace green concepts in the progress of building construction efforts, including gas station buildings. This is the mission of the Sustainable Development Goals 2030, which states that by 2030, new building concepts will be 100%. Researchers conducted a study to answer questions about the problem, namely the BREEAM-based green concept with the nZEB method. Based on this research, the green building concept will experience an increase in cost ranging from 4.66% to 22.56% with BREEAM assessment compared to conventional design. Implementing BREEAM using the nZEB method reduced cost from 3.03% to 10.72%. The results of this research revealed ten factors that influence the cost performance of the BREEAM-based Green Building Gas Station Building project with nZEB, namely: reduction of energy use and carbon emissions, indoor air quality, waterproof performance, monitoring water use, heating for each comfort space, energy-efficient transport systems, transport assessment and travel planning, water leak detection, water-saving equipment, and sustainable transport measures. This research also found the implementation of BREEAM using the nZEB method.

Keywords: BREAAM Assessment; CraveZERO; Gas Station; Green Building; nZEB

Introduction

Gas stations are increasingly needed for the rapid growth of vehicles in urban areas as the number of cars increases (Allahabady et al., 2022; Lestari et al., 2023). The need for gas stations will also increase (Alchamdani, 2019; Li et al., 2021). This condition places gas stations as an opportunity for new business. Gas stations are sensitive facilities that contain flammable substances, causing pollution consequences at gas stations and their surroundings (Husin, Priyawan, et al., 2023). In this case, the rapid development of gas station construction is a significant threat to life and global growth due to gas emissions. Greenhouses function as one of the main catalysts (Barri et al., 2024). As a result, Indonesia is moderately experiencing a transition to a green economy that emphasizes low-carbon development that is inclusive and equitable to maintain economic growth. To facilitate this transition, Indonesia has pledged to reduce emissions by 29% by 2030 under business-as-usual circumstances, which could increase to 41% through collaboration with the international community. The government has started a series of strategic actions in various vital sectors to address climate change, including Forestry and Other Land Uses (FOLU), energy, agriculture, waste management, and

How to Cite:
Charis, A., Amin, M., & Suroso, A. (2025). Development of Green Building Concept in Building Gas Station Based on BREEAM With Nzeb Method For Increasing Cost Performance. *Jurnal Penelitian Pendidikan IPA*, *11*(8), 246–253. https://doi.org/10.29303/jppipa.v11i8.10751

Industrial Process and Product Uses (IPPU). Currently, the initiative's primary focus is the government in the forestry and land use domain, especially in Forestry and Other Land Uses (FOLU) and the energy sector (Husin, Prawina, et al., 2023; Imron et al., 2021).

Indonesia is positioned as the 164th country among 180 countries in the Environmental Performance Index (EPI) for 2024, reaching a performance score of 28.20 from 77.90. EPI is a valuable tool that compares, analyses and explains various environmental impact categories. Therefore, Indonesia is urged to immediately embrace the Green concept in progress building construction efforts, including office space. Sector development Architecture, Engineering, and Construction (AEC) often come under scrutiny due to adverse environmental effects, such as pollution and energy waste (Azhar et al., 2024; Imron et al., 2021; Sukmawati et al., 2024).

World Emissions Clock (WEC) is a project developed by the World Data Lab in partnership with Vienna University and the International Institute for Applied Systems Analysis (IIASA). It has launched capable state-of-the-art digital instruments that analyse global greenhouse gas emissions in real-time in great detail. This tool can also display overall CO_2 emissions worldwide and provide details of emission sources for each country, including countries that are the main contributors to CO_2 emissions (Imron et al., 2021).

The International Energy Agency states that increasing energy efficiency in buildings, industrial operations, and transportation systems has the potential to reduce about a third of worldwide energy consumption by 2050, which helps mitigate greenhouse gas emissions on a global scale (Kurniawan et al., 2023). In energy and energy efficiency, renewables are generally associated with sustainable energy policies and are the main focus of the sustainable energy hierarchy. Integrating green building concepts into architectural structures is a significant step toward increasing energy efficiency (Ardiansyah et al., 2023).

This research aims to analyse the integration of sustainable development practices to increase energy efficiency in gas station buildings. This analysis will consider several important factors, including Energy Efficiency and Conservation (EEC), Water Conservation (WAC), and Material Resource and Cycle (MRC), all of which are important for ensuring that gas stations meet the requirements for green building certification. During the September 25, 2015 Summit, UN member states officially ratified 17 Sustainable Development Goals (SDGs) to tackle social, economic, and environmental challenges cohesively until 2030 (Golubtsov et al., 2024; Iswidyantara et al., 2023).

Hence, within the scope of this study, the utilisation of the CRAVEzero (Cost Reduction and Market Acceleration for Viable Nearly) approach is essential for achieving a Green Building with enhanced cost efficiency in Gas Station constructions. CRAVEzero serves as a strategy aimed at minimizing/maximizing expenses related to green building construction, thereby enhancing cost-effectiveness (Magrini et al., 2022).

Method

During the research process, a careful examination of the research methodology, including the materials, tools, and steps taken, is necessary. This includes the entire research process from inception to data presentation, including the challenges faced and appropriate solutions (Sutikno et al., 2022).

The research process requires research development starting from its initiation, which leads to developing a hypothesis that aims to address the statement problems by implementing scientific research (Husin, Prawina, et al., 2023). This process uses stages or sequences adapted to the research framework as a flow diagram. The flow diagram is designed based on the research formulation and objectives set for achievement, considering the project feasibility assessment. The initiation of this research involves formulating the problem derived from the problem statement to identify research topics supported by a library inquiry (Husin & Priyawan, 2023).

Library investigations involve exploring and reviewing journals' international or national issues related to the research topic. This check aims to ascertain whether there are research gaps and whether the current research replicates previous studies (Rantauni et al., 2022; Takundwa et al., 2017). To obtain Green Building Implementation in nZEB (Nearly Zero Energy Building), based gas station buildings to create a research structuring instrument in the form of variables formulated as questions. Collected data was then subjected to analysis to obtain initial findings. Next, efforts were conducted to consider and research reviews based on this preliminary data for conclusions (Husin et al., 2022). This research begins by identifying the problem in the housing locality to determine the problem and shape it in harmony with the research subjects, thereby turning them into supporting data to help the objectives case (Zhang et al., 2022). After this, efforts are made to collect information aimed at voting tools that will be used to establish hypotheses and determine the focus of the research (Yuliatti et al., 2022). Then secondary information is obtained consisting of information on the construction cost estimate of development projects, operational and maintenance costs, information on materials or building materials

used, green Building regulations, and other data that can be used as a reference in analysing the implementation of cost method integration with nZEB (Nearly Zero Energy Building) (Wu et al., 2022).

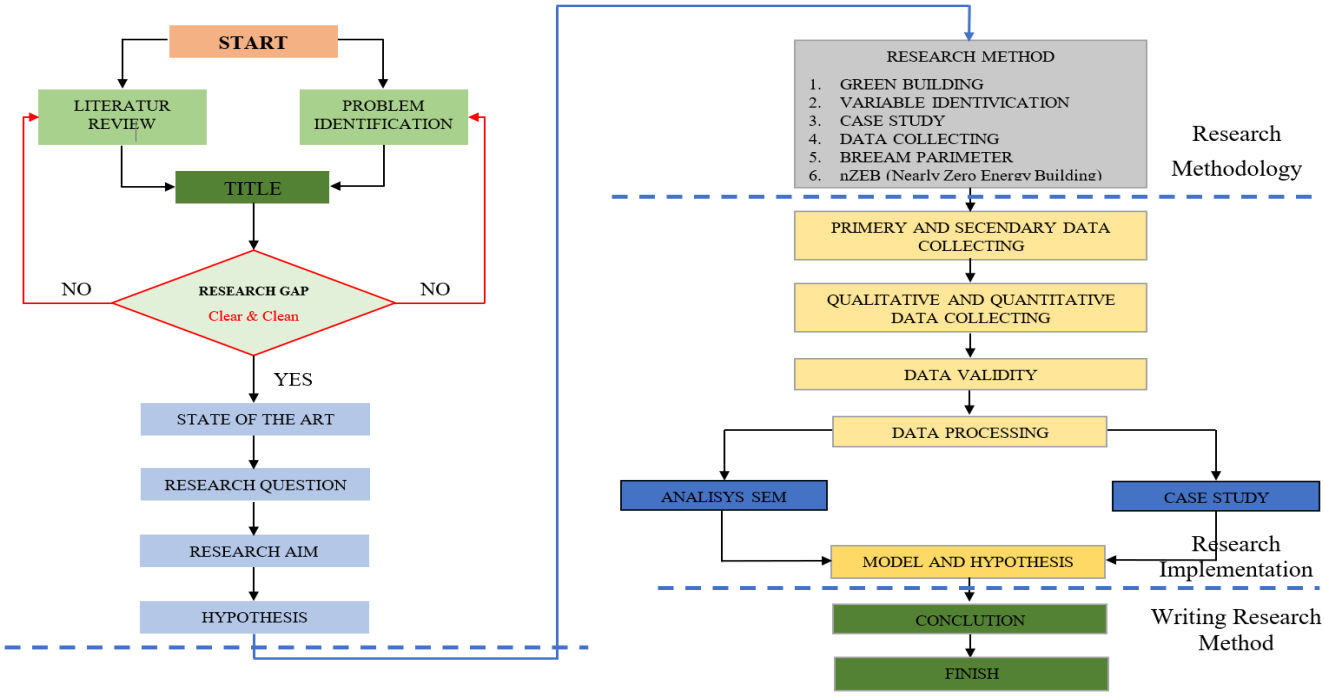

Figure 1. Research framework

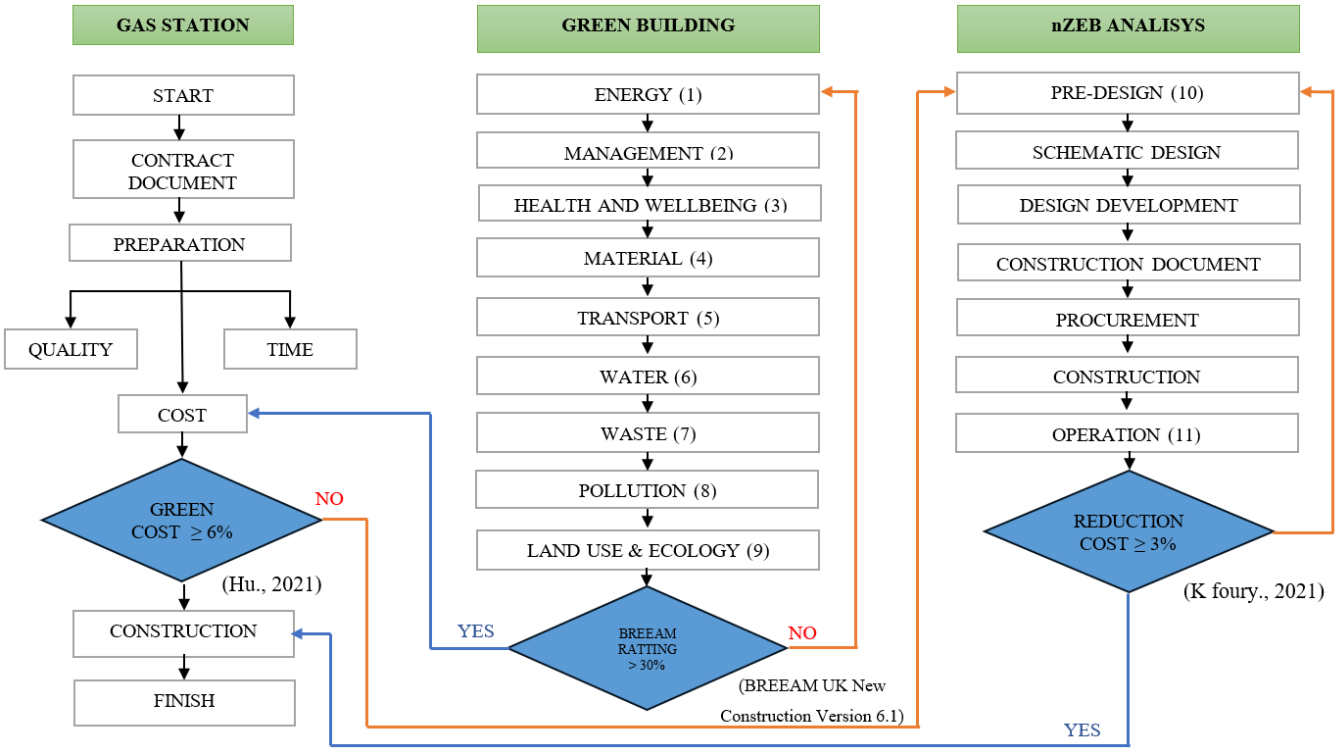

Figure 2. Research Implementation of BREEAM and nZEB concept on building gas station

Result and Discussion

Data examination will involve using Structural Equation Modeling (SEM) via SMART PLS (Partial et al.) 3.0 software. Next, the interview will be carried out to deepen understanding. Through this software, the primary factors and the applicable subfactors influencing cost-effectiveness are the focal points of this

research. SMART PLS is a simulation tool currently popular in some scientific research to analyse data (Singh et al., 2024).

Data Processing

The first step in data analysis is through SEM-PLS (Structural Equation Modeling – Partial Least Squares), which involves collecting data from distributed questionnaires to respondents (Nguyen et al., 2024).

In each dependent variable (variable Y) and independent variable (variable X), the parameters used serve as a reference point in evaluating each variable. This investigation's dependent variable (variable Y) is Cost Performance. Meanwhile, the independent variable (Variable X) includes the Station Construction Project Public Fuel Filling (X1), Green Building Concept (X2), and the Methods used is nZEB (Nearly Zero Energy Building) (X3).

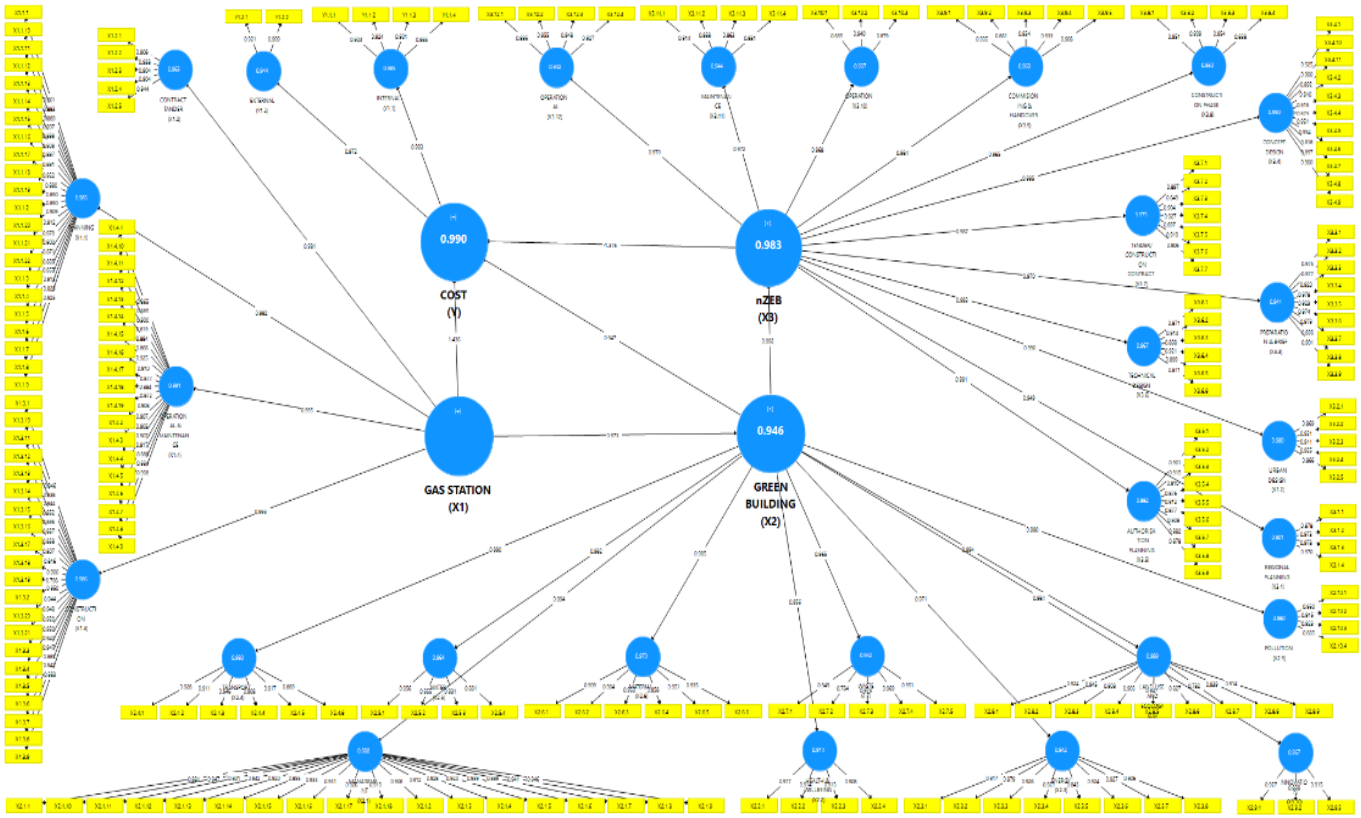

Figure 3. SEM t-value and part coefficient diagram results

Based on the analysis carried out on 211 factors, it was found that ten factors have the most significant influence in determining whether a green building can be made to get certification from the Building Research Estabilism Environmental Assessment Method (BREEAM) where the most influential factors are listed in order of the biggest. Where the most influential factor is energy-saving measures, this can be described.

Table 1. Outer Loading T Statistics Analysis Results

Sub Factor	original sample value	Mean	T-Statistic (p<0.05)	R Square
Reduction of energy use and carbon emissions	0.978	0.978	167.067	0.990
Indoor air quality	0.975	0.975	129.414	
Acoustic performance	0.973	0.973	155.118	
Water monitoring	0.966	0.966	115.370	
Thermal comfort	0.965	0.964	103.974	
Energy-efficient transportation system	9.962	0.962	132.783	
Transport assessment and travel plan	0.962	0.961	139.580	
Water leak detection	0.961	0.961	144.230	
Water efficient equipment	0.960	0.960	120.220	
Sustainable transport measures	0.959	0.960	134.568	

Case Study

In this discussion, researchers will describe the process of implementing green construction at the gas station using the nZEB framework (Nearly Zero Energy Building). Data and information from research results are organised into several subsections (Jalilzadehazhari et al., 2021). The data analysis segment of the project describes the data project as a case study, providing detailed insight into the job description, volume work, unit price, and material specifications. Previously, researchers did green building assessments using BREEAM (Building Research Establishment Environmental Assessment Method), and then, from the assessment results, they received a rating predicate according to their respective classifications. Researchers will then carry out the results of the cost estimation to reduce costs by using nZEB (nearly zero energy building) for performance optimisation costs and, according to literature from previous research, potentially revealing the difference in cost efficiency is more than equal to 3% (Karolina et al., 2021). The green building concept will experience an increase in cost ranging from 4.66% to 22.56% with BREEAM assessment compared to conventional design.

BREEAM Assessments

From the results, the based assessment is then implemented into additional work items to achieve the green building predicate from implementation results. There will be additional costs, which we often call green costs.

Table 2. BREEAM Rating Benchmarks.

BREEAM Rating	% Score
Outstanding	≥ 85%
Excellent	≥ 70%
Very Good	≥ 55%
Good	≥ 45%
Pass	≥ 30%
Unclassified	≥ 30%

Table 3. Green Building Achievement Target Assessments with BREEAM

ITEM	Green Building Criteria With BREEAM Parameters					
	Unclassified	Pass	Good	Very Good	Excellent	Outstanding
Standard Criteria	< 30 %	≥ 30 %	≥ 45 %	≥ 55 %	≥ 70 %	≥ 85 %
Target Achievement	28.19 %	35.51 %	53.01 %	64.26 %	70.01 %	87.58 %
Total Credits Score						152 Credits
Target Achievement Credits Score	37 Credits	63 Credits	83 Credits	96 Credits	108 Credits	121 Credits

Table 4. Fulfillment of Building Requirements towards Green Building

Green Building Development Plan	Unclassified	Pass	Good	Very Good	Excellent	Outstanding
Air ventilation	-	-	-	√	√	√
Soundproofing to the entire room	√	√	√	√	√	√
Solar Photo Voltaic	-	-	-	√	√	√
Shelters public EV charging	-	√	√	-	-	√
Public transport stops	-	-	√	√	√	√
Retention tanks	√	√	√	-	√	√
Integrated waste disposal sites	-	-	√	-	-	√
Bioreaction WWTP	√	√	√	-	√	√

Table 5. Fulfillment of Building Requirements towards Green Building

BREAAM Rating	Additional/ Green Cost (IDR)	Total Cost (IDR)
Unclassified	-	14,960,928,000
Pass	674,215,000	15,138,456,000
Good	1,048,721,000	15,512,962,000
Very Good	2,365,216,000	16,829,457.000
Excellent	2,826,363,000	17,290,604,000
Outstanding	3,263,431,000	17,727,672,000

Modelling With CraveZERO - Cost Reduction and Market Acceleration for Viable nZEB

We are modeling with CraveZERO—Cost Reduction and Market Acceleration for Viable Nearly Zero Energy Building (nZEB). The main goal is to identify and eliminate additional nZEB costs associated with processes, technology, and building operations, as well as promote innovative business models and cost-effectiveness by considering all stakeholders in a building's life cycle.

The CRAVEzero project's results have been summarised on a pinboard, which can be considered the project's backbone. This enables a design approach and constructs for new nZEBs to be modified based on the tools and solutions developed. A brief overview of the pinboard's main features is necessary to understand better a prototypical implementation carried out by the project partners.

Upon completion of an evaluation utilising the BREEAM Parameters, the subsequent phase entails the development of a visual depiction for every element

encompassed in the assessment through the utilisation of CRAVEzero Revenue to optimise the allocation of resources towards environmentally friendly expenditures and enhancements in the realm of sustainable construction. The endeavour of formulating these depictions is undertaken by in-house researchers who have meticulously gathered information about the development of the filling station project at the public burning gas station. The creation of such representations is predicated upon analysing data acquired and scrutinised during prior evaluations.

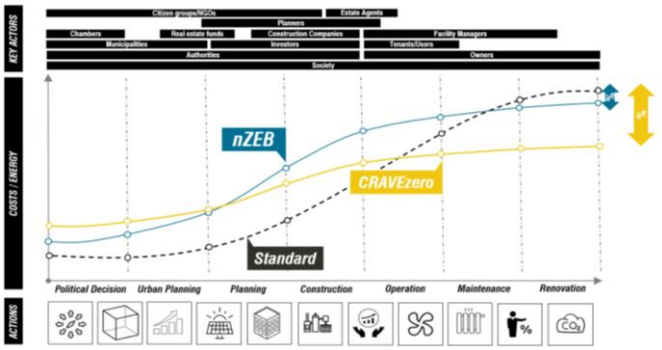

Figure. 4. CRAVEzero approach for cost reduction in the nZEB life cycle

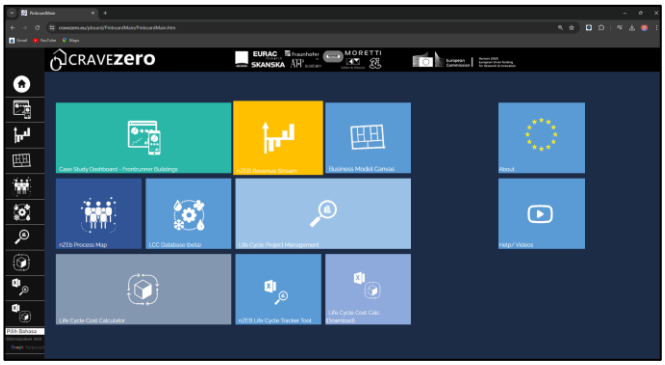

Figure. 5. CRAVEzero web tools

The implementation of BREEAM using the nZEB method resulted in a PASS rating predicate getting cost efficiency, namely 10.74%, for a good rating predicate 7.31%, for a very good rating predicate 3.60%, for an excellent rating predicate 3.09%, and the outstanding rating predicate 3.03% of the additional initial costs due to green building adjustments to the building gas station.

Table 6. Recapitulations of nZEB Implementation

BREAAM Rating	Green Cost	Cost Reduction nZEB
Unclassified	-	-
Pass	4.66 %	3.88%
Good	7.25 %	5.78%
Very Good	16.34%	13.19%
Excellent	19.54%	13.19%
Outstanding	22.56%	21.88%

Conclusion

The results of this research showed that there were ten factors. The most influential are Reduction of energy use and carbon emissions (reduction energy use and carbon emissions), Indoor air quality (indoor air quality), Acoustic performance (soundproof performance), Water monitoring (monitoring water use), Thermal comfort (heating for the comfort of each room), Energy efficient transportation systems (energy-efficient transportation systems), Transport assessment and travel plan (transportation assessment and travel plans), Water leak detection (water leak detection), Water efficient equipment (water saving equipment) and Sustainable transport measures (sustainable transport measures). Implementing nZEB (Nearly Zero Energy Building) in a new green building by constructing a public fuel filling station (SPBU) has proven effective in improving cost performance. The implementation of BREEAM with nZEB (Nearly Zero Energy Building) can provide green cost efficiency in filling station buildings General Fuel (SPBU), namely for the pass rating predicate from the initial green cost amounting to IDR 674,215,000,- to IDR 601,797,842,- a cost efficiency of 10.47%, on an excellent rating predicate from an initial green cost of IDR 1,048,721,000, to IDR 972,085,367,- a cost efficiency of 7.31%, for the rating predicate very good from the initial green cost of IDR 2,365,216,000,- to IDR 2,280,143,417, cost efficiency of 3.60% for the excellent rating predicate of green costs with an initial IDR 2,826,363,000,- to IDR 2,739,005,409,- there is cost efficiency amounting to 3.09%, and for the outstanding rating predicate from the initial green cost of IDR 3,263,431,000,- to IDR 3,164,472,603,- there is a cost efficiency of 3.03%.

Acknowledgments
The author would like to thank the Master of Civil Engineering, Mercu Buana University, Jakarta, Indonesia, for providing sufficient space to assist in this research.

Author Contributions
Conceptualization, A.C; M.A and A.S.; methodology, A.C; M.A and A.S; software, A.C; M.A and A.S; validation A.C; M.A and A.S; formal analysis, A.C; M.A and A.S; investigation, A.C; M.A and A.S; resources A.C; M.A and A.S.; data curation, A.C; M.A and A.S.; writing—original draft preparation, A.C; M.A and A.S.; writing—review and editing, A.C; M.A and A.S.; visualization, A.C; M.A and A.S.; supervision, A.C; M.A and A.S.; project administration, A.C; M.A and A.S.; funding acquisition, A.C; M.A and A.S. All authors have read and agreed to the published version of the manuscript.

Funding
This research received no external funding.

Conflicts of Interest
No conflict of interest.

References

Alchamdani. (2019). NO2 and SO2 Exposure to Gas Station Workers Health Risk in Kendari City. *Jurnal Kesehatan Lingkungan*, *11*(4). https://doi.org/10.20473/jkl.v11i4.2019.319-330

Allahabady, A., Yousefi, Z., Tahamtan, R. A. M., & Sharif, Z. P. (2022). Measurement of BTEX (benzene, toluene, ethylbenzene and xylene) concentration at gas stations. *Environmental Health Engineering and Management*, *9*(1), 23–31. https://doi.org/10.34172/EHEM.2022.04

Ardiansyah, M. K., & Husein, A. E. (2023). Analisis Faktor yang berpengaruh dalam Penerapan Green Retrofitting Industri Beton di Indonesia untuk Meningkatkan Kinerja Biaya. *Jurnal Aplikasi Teknik Sipil*, *21*(1), 2023. Retrieved from https://iptek.its.ac.id/index.php/jats/article/download/14590/7456

Azhar, R., Javed, M. A., Nasar-U-minallah, M., Machado, S., & Jabbar, M. (2024). Urban Transformation in Lahore: Three Decades of Land Cover Changes, Green Space Decline, and Sustainable Development Challenges. *Geography, Environment, Sustainability*, *17*(2), 6–17. https://doi.org/10.24057/2071-9388-2024-3204

Barri, A. B., & Budiandru. (2024). Application of the Green Building Concept (BGH) in High-Rise Office Buildings Based on Hybrid Dynamics to Improve Cost Performance. *International Journal of Science and Society*, *6*(1), 273–291. https://doi.org/10.54783/ijsoc.v6i1.1010

Golubtsov, V. A., Vanteeva, Y. V., & Cherkashina, A. A. (2024). a Regional-Scale Estimate of the Soil Organic Carbon Isotopic Composition (Δ13C) and Its Environmental Drivers: Case Study of the Baikal Region. *Geography, Environment, Sustainability*, *17*(2), 63–93. https://doi.org/10.24057/2071-9388-2024-3091

Husin, A. E., & Budianto, E. A. (2022). Influential factors in the application of the Lean Six Sigma and time-cost trade-off method in the construction of the ammunition warehouse. *Sinergi*, *26*(1), 81. https://doi.org/10.22441/sinergi.2022.1.011

Husin, A. E., Prawina, R. S., Priyawan, P., Pangestu, R., Kussumardianadewi, B. D., Sinaga, L., & Kristiyanto, K. (2023). Optimizing Time Performance in implementing Green Retrofitting on High-Rise Residential by using System Dynamics and M-PERT. *Civil Engineering Journal*, *9*(12), 3060–3074. https://doi.org/10.28991/CEJ-2023-09-12-07

Husin, A. E., & Priyawan, P. (2023). Implementation the Last Indonesian Minister Regulation of 2022 uses SEM-PLS and Blockchain-BIM to Green Cost Efficiency. *Journal of Sustainable Architecture and Civil Engineering*, *33*(2), 96–112. https://doi.org/10.5755/j01.sace.33.2.34229

Husin, A. E., Priyawan, P., Kussumardianadewi, B. D., Pangestu, R., Prawina, R. S., Kristiyanto, K., & Arif, E. J. (2023). Renewable Energy Approach with Indonesian Regulation Guide Uses Blockchain-BIM to Green Cost Performance. *Civil Engineering Journal (Iran)*, *9*(10), 2486–2502. https://doi.org/10.28991/CEJ-2023-09-10-09

Imron, A. I., & Husin, A. E. (2021). Peningkatan Kinerja Biaya Berbasis Value Engineering Pada Proyek Green Hospital. *Jurnal Aplikasi Teknik Sipil*, *19*(3), 323. https://doi.org/10.12962/j2579-891X.v19i3.9144

Iswidyantara, A. M., & Husin, A. E. (2023). Key success factors analysis for improving cost performance of green retrofit infrastructure on the jetty project. *Sinergi (Indonesia)*, *27*(1), 89–100. https://doi.org/10.22441/sinergi.2023.1.011

Jalilzadehazhari, E., Vadiee, A., & Johansson, J. (2021). Subsidies required for installing renewable energy supply systems considering variations in future climate conditions. *Journal of Building Engineering*, *35*. https://doi.org/10.1016/j.jobe.2020.101999

Karolina, T., Husin, A. E., & Susetyo, B. (2021). Analysis of Key Success Factors on the Improvement Façade Performance of High-Rise Hotels Based on Green Building and Value Engineering Using the RII Method. *International Journal of Research and Review*, *8*(February), 569–577. https://doi.org/10.52403/ijrr.20210271

Kurniawan, I., & Husin, A. E. (2023). Analisis Faktor – Faktor yang Berpengaruh dalam Implementasi Konsep Green Untuk Peningkatan Kinerja Biaya menggunakan Structural Equation Modelling-Partial Least Square (SEM-PLS). *Teknik*, *44*(1), 57–69. https://doi.org/10.14710/teknik.v44i1.49522

Lestari, F., Modjo, R., Wibowo, A., & Sunindijo, R. Y. (2023). Influence of Safety Climate on Safety Performance in Gas Stations in Indonesia. *Safety*, *9*(3). https://doi.org/10.3390/safety9030044

Li, F., & Pan, Y. (2021). Research on influencing factors of service interactive experience of digital gas station—the case from China. *Journal of Theoretical and Applied Electronic Commerce Research*, *16*(6). https://doi.org/10.3390/jtaer16060120

Magrini, A., Marenco, L., & Bodrato, A. (2022). Energy smart management and performance monitoring of a NZEB: Analysis of an application. *Energy Reports*, *8*, 8896–8906. https://doi.org/10.1016/j.egyr.2022.07.010

Nguyen, M. T., Pham, N. T., & Nguyen, Q. T. (2024). High-quality human resources in sustainable socio-economic development in Vietnam. *Heritage and Sustainable Development*, *6*(2), 529–544. https://doi.org/10.37868/hsd.v6i2.688

Rantauni, D. A., & Sukmawati, E. (2022). Correlation of Knowledge and Compliance of Implementing 5m Health Protocols in the Post-Covid-19 Pandemic Period. *Science Midwifery*, *10*(4), 3192–3196. https://doi.org/10.35335/midwifery.v10i4.789

Singh, S., Kaur, R., & Dana, L. P. (2024). Partial least squares structural equation modeling. *Women Entrepreneurs*, 109–123. https://doi.org/10.1201/9781032725581-7

Sukmawati, E., & Imanah, N. D. N. (2024). Motivation for Pregnant Women to Get Covid-19 Vaccination. *Jurnal Bidan Cerdas*, *6*(4). https://doi.org/10.33860/jbc.v6i4.3978

Sutikno, S., Husin, A. E., & Yuliati, M. M. E. (2022). Using PLS-SEM to analyze the criteria for the optimum cost of green MICE projects in Indonesia based on value engineering and lifecycle cost analysis. *Archives of Civil Engineering*, *68*(4), 555–570. https://doi.org/10.24425/ace.2022.143054

Takundwa, R., Jowett, S., McLeod, H., & Peñaloza-Ramos, M. C. (2017). The Effects of Environmental Factors on the Efficiency of Clinical Commissioning Groups in England: A Data Envelopment Analysis. *Journal of Medical Systems*, *41*(6). https://doi.org/10.1007/s10916-017-0740-5

Wu, L., Lu, W., Zhao, R., Xu, J., Li, X., & Xue, F. (2022). Using Blockchain to Improve Information Sharing Accuracy in the Onsite Assembly of Modular Construction. *Journal of Management in Engineering*, *38*(3). https://doi.org/10.1061/(asce)me.1943-5479.0001029

Yuliatti, M. M. E., Husin, A. E., & Sutikno. (2022). Improved Performance of Toll Road Projects Based on System Dynamics Integrated Life Cycle Cost Analysis Green Retrofitting. *Civil Engineering and Architecture*, *10*(6), 2713–2730. https://doi.org/10.13189/cea.2022.100635

Zhang, C., Shi, L., Tian, T., Zhou, Z., Peng, X., Shen, Y., Li, Y., & Ou, J. (2022). Associations Between Academic Stress and Depressive Symptoms Mediated by Anxiety Symptoms and Hopelessness Among Chinese College Students. *Psychology Research and Behavior Management*, *15*, 547–556. https://doi.org/10.2147/PRBM.S353778