

The Application of Life Cycle Cost Analysis Method for Green Retrofitting of Mosque Building to Improve Investment Performance

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Abstract This study aimed to conduct a comprehensive life cycle cost (LCC) analysis of green retrofitting in mosque building to assess the financial feasibility and performance. The analysis included risk assessment of three crucial stages, namely pre-construction, construction, and post-construction. A Likert scale was used for the validation process based on responses from 51 experts included in green building retrofitting projects. The results showed that the highest risk occurred during the construction phase, impacting investment performance. Sensitivity analysis showed the potential longevity of investment, with pre-construction risk affecting the Net Present Value (NPV) in the 18th year, and post-construction risk proving feasible by the 17th year. Furthermore, several benchmarks were introduced such as NPV, Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), and Break Even Point (BEP) for investment evaluation. The financial feasibility of green retrofitting items, including solar panels and energy-efficient utilities, was confirmed with an NPV of IDR 140,797,698, IRR of 10.26%, and BCR of 2.21, with feasibility realized in the 17th year. Risk visualization through a Tornado Chart emphasized the significance of each risk stage on NPV values. In conclusion, this study provided valuable insights for informed investment decisions in mosque building green items, emphasizing the importance of risk management for long-term sustainability. Moreover, the recommendation was made for broader case studies, including multiple certified green mosque for more accurate risk identification

Keywords Green Retrofit, Life Cycle Cost Analysis, Risk Assessment, Investment Feasibility, Sensitivity Analysis, Mosque Building