VIETNAM NATIONAL UNIVERSITY
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INFORMATION OF THE DISSERTATION

Dissertation's title: Developing a Model-Driven Decision Support System for Allocation Optimization of Sustainable Materials in High-rise Buildings towards Sustainable Development in Vietnam

Major: Construction Management

Major code: 62580302

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Objective of dissertation:

During development process, developing countries are speeding up urbanization with the construction of more and more infrastructure works, especially high-rise buildings. These constructions have a significant impact and continuously increase the pressure on the environment because they generate a large portion of carbon emissions and utilize a significant amount of resources and energy for the construction process. This has caused environmental problems such as climate change, depletion of natural resources, generation of wastes and changes in land conditions. In order to minimize the impact of buildings on their lifecycle, sustainable construction has emerged as a new construction philosophy, promoting the use of more environmentally friendly materials, implementing techniques technology to save resources and reduce waste consumption and improve the quality of the indoor environment..

Contribution of dissertation:

The success of sustainable construction depends on the quality and effectiveness of the sustainable systems used. If a building lacks these essential features, it will neither fulfill its environmental objectives nor generate an estimated benefit. Therefore, the market requires a general way to differentiate sustainable construction from traditional ones through the use of standards, transparent, objective and verifiable measures that the minimum sustainability requirements have been met.

To facilitate sustainable construction development, sustainable construction assessment criteria play a very important role in assessing the sustainability level of buildings. Currently,

there are many assessment systems on sustainable construction in the world with the main purpose of the above evaluation standards to avoid depleting energy resources, water, raw materials, and increase the use of renewable energy and contribute to preventing the degradation of habitat on earth. Therefore, the sustainability of the building, especially the sustainability of construction materials, is getting more and more attention and is reflected in the evaluation tools in the sustainable construction assessment standards.

Therefore, the research has carried out the survey process, collecting data from reality and using SPSS software to evaluate which factors are important to the decision to build a sustainable construction works, such as affecting the selection of sustainable building materials in construction works in Da Nang, Vietnam. The research results also ranked the criteria in order of importance to help analyze the results and make suggestions and recommendations conveniently. Based on the research results, the author has contributed a number of recommendations to improve the use of sustainable building materials as well as to promote the construction of sustainable works in Da Nang, Vietnam.

At the same time, the author has proposed a support model using the Generalized Gradient (GRG) method in the genetic algorithm (GA) supported in standard Microsoft Excel (Frontline Systems, 2020) for optimal implementation with many different constraints. After entering all the input data, the optimization module will build a model that meets the goals set by the investor. Specifically:

(1) The research has developed an optimal model for selecting the ratio of eco-friendly materials that achieve the minimum initial investment cost and total workdays, which are different from traditional design and might maximize the score of construction projects through the Lotus-based system at the beginning of construction projects. Furthermore, this research has built a platform that integrates eco-friendly material selection, allowing building owners and designers to optimize decision making through knowledge of the materials, construction strategy and Lotus-based sustainable construction certification system in Vietnam.

(2) At the same time, this research has developed an optimal model to assist decision-makers in choosing the building's energy-saving solutions during use to maximize the economic benefits of building owners with consideration of environmental factors. Among them, the study has determined that the energy efficiency of the building has been enhanced by installing solar panels on the building's façade with the following three constraints: (1) the amount of investment cost is required to optimize the building's facade, (2) economic benefit analysis to reduce LCC over the life cycle of the project, (3) energy analysis to maximize renewable energy was created.

Science advisors		**PhD Candidate**
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