SUSTAINABLE CRITERION SELECTION FRAMEWORK FOR GREEN CONSTRUCTION MATERIALS UTILIZED IN INDUSTRY APPLICATIONS

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Degree of Master of Philosophy

Department of Civil Engineering

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree of Master of Philosophy in Civil Engineering

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Abstract

Cement and concrete currently are two of the most consumed materials in the industry nowadays. Considering how infrastructure development has become an indispensable need for the humankind, the rate of infrastructure and building constructions are likely to rise at a high rate. Hence use of concrete as a staple material is also expected to rise exponentially resulting the present-day effects of concrete production to become ever more damaging. Currently, concrete production accounts for 8% of total CO_2 emissions globally. The chemical process of Portland cement production, using clinker, causes 80% of these concrete production emissions. As an effective solution, use of Supplementary Cementitious Materials (SCMs) as a partial replacement for clinker to produce blended cement has become a popular option among the cement manufacturers. However, the implementation and use of these materials has been difficult with lack of proper tools and decision-making techniques to measure the effectiveness. Additionally, consumers often prefer using the conventional material, rather than switching to a new product mainly due to lack of awareness and trust. As a first step to address the problem at hand and to identify the prevailing research gaps, a systematic review on decision making frameworks and a review of life cycle assessment approaches together with green construction related to concrete/cement applications will be conducted. Following the development of the methodology, a decision-making criterion with an overall approach consisting of factors related to performance, environmental, economic and social will be developed. The case studies presented in this study will assist stakeholders in choosing a sustainable concrete mix to be applied for general building foundation applications. Further, through conducting a general questionnaire survey, the study aims to contribute to knowledge by examining consumer preferences for cement brands and the factors that affect their choice of cement used in the current market in Sri Lanka.

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