EMBODIED ENERGY, EMBODIED CARBON AND COST ANALYSIS FOR THE ROOFING MATERIALS AVAILABLE IN SRI LANKA.

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ABSTRACT

World population is rising day by day. Due to the increment of population, the demand for all the needs including foods, clothes, shelter etc. are also being increased. Therefore, escalating the production of various sectors is a must to meet these needs of the growing population. Most importantly, the increment of population has urged for new developments including factories, houses, apartments and various other construction works to facilitate their needs. Therefore, construction industry has become one of the significant industries to any country in the world. Nevertheless, it reasons for the environmental pollution due to carbon related emissions and due to the usage of tons of nonrenewable energy sources for it's day to day activities. Therefore, the researchers all around the world are focusing to reduce these since human needs should be fulfilled while saving the environment for the future. As a result of that, lots of new things have been introduced to the construction industry. Nevertheless, almost all of them are costly. Most importantly, being a developing country, cost effective sustainable solutions are really essential for a country like SL in reaching towards a sustainable goal. Nevertheless, there are minimum number of researches (Energy and Carbon) which have been conducted for the SL context in terms life cycle perspective. Further, roof element has not yet been studied in terms of Embodied Energy and Embodied Carbon perspective.

Therefore, this research aimed to identify the importance of Embodied Energy and Embodied Carbon and to analyze the roofing materials available in SL in terms of Embodied Energy, Embodied Carbon and Cost (initial and maintenance). There, (1) To identify the significance of Embodied Energy and Embodied Carbon throughout the life cycle of construction (2) To analyze the roofing materials available in Sri Lanka, in referring of Embodied Energy (3) To analyze the roofing materials in terms of Embodied Carbon and Initial and Maintenance Cost, were implemented as objectives to achieve the aim of this research. Here, the first objective was completely fulfilled through literature review and expert interviews. Work studies and documentary reviews were adopted to fulfill the second and third objectives.

After collecting data and analyzing them, it was found that conventional clay tile is the best (least EE & EC material), asbestos sheet (second best), automated clay tile (third best) and concrete (highest EE & EC material) is the worst in terms of EE & EC. Further, asbestos sheet is having lowest initial and maintenance cost and conventional clay tile, automated clay tile and concrete are having initial and maintenance cost values increasing accordingly. Moreover, the researcher has introduced a procedure/work sheet to find out the best roof material in terms of Embodied Energy, Embodied Carbon and initial and maintenance cost. Eventually, the developed work sheet can be adopted to analyze the alternative / newly invented roofing materials to analyze them in accordance with the same parameters.

Key words -: *Embodied Energy, Embodied Carbon, Building life cycle, Roof, Life Cycle Assessment*

I dedicate this piece of work to my beloved parents and brother……..

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I.G.N Anuradha

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LIST OF ABRIVIATIONS

Abbreviation	Description
BOQ	Bill of Quantities
EC	Embodied Carbon
EE	Embodied Energy
GHG	Green House Gas
LCA	Life Cycle Assessment
OC	Operational Carbon