

**A STUDY OF APPLICATION OF PHOTOVOLTAIC
SOLAR SYSTEM IN DETACHED INDIVIDUAL
RESIDENTIAL BUILDINGS IN SRI LANKA**

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Degree of Master of Science

Department of Building Economics

University of Moratuwa

Sri Lanka

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Thesis is submitted in partial fulfillment of the requirements for the degree
Master of Science in Project Management

Department of Building Economics

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DECLARATION

“I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Name of the supervisor: Dr. Thanuja Ramachandra

Signature of the supervisor: *UOM Verified Signature*

Date: 24.09.2022

ABSTRACT

Energy, its demand and supply has become one of the defining factors in the economy of many countries. Sri Lanka (SL) is not an exception where the current demand for the energy is exceptionally intense and the country is seeking for renewable sources for a more sustainable energy supply. In present status quo, Sri Lankan energy mix significantly depends on fossil fuel leading to environmental pollution due to carbon emissions. Research on non-renewable energy sources is rather a necessity than a luxury. As a result of that, many new energy sources are introduced to the world. Most importantly, Sri Lanka as a third-world country, cost-effective sustainable solutions for energy generation are essential in reaching a sustainable goal. The residential building sector accounts for the largest energy consumer when considering the whole life cycle of the buildings. Briefly, solar photovoltaic (Solar PV) is the most cost effective, environmentally friendly solution for energy generation in residential buildings, but the lack of knowledge and misconceptions kept people away from using solar PV. The contribution of construction project managers in introducing novel energy sources and finding solutions is of paramount importance. On this note, this research aims to assess the application of photovoltaic solar system in detached individual residential buildings. The research apprehends mix method with including a market survey with questionnaires and two case studies with interviews. The responses for the questionnaire survey were analyzed using the Relative Important Index. Manual content analysis was carried out to analyze the case study data. The two case studies represent two households with solar PV and the building owners responded to the interview survey. This research study compared the effects of energy consumption due to implementation of PV Solar vs conventional residential buildings, and identified strategies to enhance solar PV panel application in residential buildings in Sri Lanka. This research study initially conducted an extensive literature review followed by a market survey and case studies to conclude that the solar PV is beneficial for the detached individual residential buildings. Furthermore, the study confirmed that solar PV is a viable for the conventional energy generating sources in the residential sector.

Keywords -: Sustainable buildings, Solar PV, Residential buildings, Project management, Challenges

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LIST OF ABBREVIATIONS

Abbreviation	Description
AC	Alternating Current
ASHP	Air Source Heat Pump
BIPV	Building Integrated Photovoltaic
CO ₂	Carbon Dioxide
CSP	Concentrating Solar Power
DC	Direct Current
GHG	Greenhouse Gas
GHI	Global Horizontal Irradiation
GREEN SL	Green Sri Lanka Rating System
HVAC	Heating, Ventilation, and Air Conditioning
PV	Photovoltaic
SAH	Solar Air Heaters
TFSC	Thin-Film Solar Cell
TPV	Thin-Film Photovoltaic