

**A CASE BASED APPROACH TO BENCHMARK THE
ENERGY AND WATER CONSUMPTION OF
SUPERMARKETS IN SRI LANKA**

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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ABSTRACT

Buildings are responsible for about 40% of global energy consumption, 42% of global CO₂ emissions and about 30% of global fresh water consumption. Therefore, the importance of energy and water consumption benchmarking in buildings has become a major objective for governments and relevant authorities. Since energy and water consumption patterns depend upon various factors such as climate conditions, personal habits, hygiene practices and economic factors, it is most suitable to develop local benchmarks for countries/regions instead of using global benchmarks to compare the performance of the buildings. The main intention of this research is to analyse the major research gaps in energy and water benchmarking in Sri Lankan buildings, and to develop water and energy benchmarks to bridge those gaps. Energy consumption benchmarks in Sri Lankan context are available for commercial sector, hospitality industry, apparel industry and tea processing industry, which are established by Sri Lanka Sustainable Energy Authority (SLSEA). However, energy benchmarks are not available in local context for retail (supermarkets), educational, healthcare and residential building sectors. Moreover, it is identified that, water consumption benchmarking is a major research gap in Sri Lanka, as the water consumption benchmarks have been developed only for hospitality sector. The focus of this study is to establish the energy and water benchmarks for retail sector (supermarkets) in Sri Lanka.

During the study, electricity consumption data from 2008 to 2020, and water consumption data from 2018 to 2020 were collected from 101 supermarkets across the country. Annual electricity consumption, annual electricity cost and annual water consumption of these 101 supermarkets were analysed against the sales floor areas and total floor areas of the relevant supermarkets. According to the analysis, electricity consumption benchmarks for Sri Lankan supermarkets was estimated as 780 kWh/year/m² per sales floor area and 465 kWh/year/m² per total floor area. Moreover, the water consumption benchmarks was estimated for the Sri Lankan supermarkets as 247 L/year/ m² per sales floor area and 137 L/year/ m² per total floor area.

Keywords: Energy benchmarking, Water benchmarking, Energy consumption, Retail sector, Supermarket

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LIST OF ABBREVIATIONS

Abbreviation	Description
AHU	Air Handling Unit
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
BREEAM	Building Research Establishment Environmental Assessment Method
CCTV	Closed-Circuit Television
CIBSE	Chartered Institution of Building Services Engineers
CTC	Crush, Tear, Curl
ELV	Extra Low Voltage
EUI	Energy Use Intensity
FCU	Fan Coil Unit
GBCSL	Green Building Council Sri Lanka
HFO	Heavy Fuel Oil
HVAC	Heating, Ventilation and Air Conditioning
ICU	Intensive Care Unit
IHEI	International Hotels Environmental Initiative
LEED	Leadership in Energy and Environmental Design
LPG	Liquid Petroleum Gas
M&E	Mechanical & Electrical
MATV	Master Antenna Television
MVAC	Mechanical Ventilation and Air Conditioning
NWSDB	National Water Supply and Drainage Board
SFA	Sales Floor Area
SLSEA	Sri Lanka Sustainable Energy Authority
SLTDA	Sri Lanka Tourism Development Authority
SMV	Standard Minute Value
TFA	Total Floor Area
VRF	Variable Refrigerant Flow
WEI	Water Efficiency Index