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**ASSESSING THE IMPACT OF WASTE LDPE AND
SASOBIT ADDITIVES ON THE TECHNO-ECONOMIC
PERFORMANCE OF WARM MIX ASPHALT IN SRI
LANKA**

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MEng/PG Diploma in Manufacturing Systems Engineering

Department of Mechanical Engineering

University of Moratuwa

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Thesis/Dissertation submitted in partial fulfilment of the requirements for the degree
Master of Engineering in Manufacturing Systems Engineering

Department of Mechanical Engineering

University of Moratuwa

Sri Lanka

August 2025

DECLARATION

I declare that this is my own work, and this Dissertation 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. I retain the right to use this content in whole or part in future works (such as articles or books).

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The above candidate has carried out research for the MEng in Manufacturing Systems Engineering Dissertation under our supervision. We confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Dr. L.U. Subasinghe

Signature of the Supervisor:

Date:

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ABSTRACTS

This research focuses on the use of waste LDPE (waste shopping bags) as an additive in asphalt mixtures for road construction in Sri Lanka. With the country's limited infrastructure, the accumulation of waste plastic remains a significant environmental challenge. Consequently, this research aims to address environmental concerns while enhancing road performance through the incorporation of waste LDPE in Warm Mix Asphalt (WMA) technology. The related study investigates the mechanical properties, durability, and energy efficiency of waste LDPE-modified asphalt that includes Sasobit as an additive.

Various laboratory experiments were carried out using different compositions of LDPE (2%, 4%, 6%, and 8% by weight of bitumen) along with Sasobit (3% and 5% by weight of bitumen). Results showed that 6% LDPE combined with 3% Sasobit generated the most enhanced performance for stability, flexibility, and environmental stress, like cracking and rutting, compared to the conventional asphalt mixture. Besides, the produced LDPE modified asphalt exhibited excellent workability with lower bitumen heating temperatures, which can save considerable energy consumption in producing LDPE modified asphalt.

The cost analysis confirmed that mixing both LDPE and Sasobit into the asphalt mixtures were more beneficial from an economic perspective, due to the reduction in cost of material and energy consumption. Moreover, the incorporates LDPE waste also helps cope with the plastic pollution, and it gives sustainable solution for plastic problems with other waste management and infrastructure development.

In conclusion, this research signifies that LDPE-modified asphalt mixtures can be employed as a sustainable alternative for Sri Lankan Road construction, serving the dual purpose of improving road quality and ameliorating plastic waste. Additional investigations are required to assess the long-term durability of these mixtures and to consider the incorporation of other types of plastic waste in the asphalt.

Keywords: LDPE waste, warm mix asphalt, sustainability, bitumen, road construction.

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LIST OF ABBREVIATIONS

AASHTO	- American Association of State Highway and Transportation Officials
AIV	- Aggregate Impact Value
ASTM	- American Society for Testing and Materials
CMA	- Cold Mix Asphalt
FI	- Flakiness Index
HDPE	- High Density Polyethylene
HMA	- Hot Mix Asphalt
ICTAD	- Institute of Construction Training and Development
LA AV	- Los Angeles Abrasion Value
LCA	- Life Cycle Assessment
LDPE	- Low-Density Polyethylene
OBC	- Optimum Bitumen Content
PET	- Polyethylene Terephthalate
PMA	- Polymer Modified Asphalt
PS	- Polystyrene
PVC	- Polyvinyl Chloride
RDA	- Road Development Authority
SG	- Specific Gravity
UK	- United Kingdom
USA	- United States of America
V _a	- Air Voids
VMA	- Voids in Mineral Aggregates
WMA	- Warm Mix Asphalt