

**FRAMEWORK FOR SELECTING PAVEMENT TYPES  
FOR LOW VOLUME PROVINCIAL ROADS**

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

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Thesis submitted in partial fulfilment of the requirements for the degree  
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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 believe 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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.....

Date:

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The above candidate has carried out research for the Master's thesis under our supervision.

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Prof. J.M.S.J.Bandara

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Date:

Dr. H.R.Pasindu

## **ABSTRACT**

Low volume Roads are those that serve the daily social and economic needs of the locality. In developing countries, the main problem with low volume roads which are managed by local authorities is the lack of funding for maintenance and resources. The funds allocated to local authorities are largely insufficient to maintain low volume road network at good condition. Fund allocation can be optimized to achieve better overall network performance if the decision making can be supported by up to date information of the road network condition.

Road roughness information is very useful for road agencies because it can be used to assess the road condition and be used in decision making process for maintenance planning and programming. But existing measurement technologies to measure road roughness like profilometer are very expensive and difficult to use with the prevailing constraints in the local road agencies. The development of smartphones with 3-Axis accelerometer allows it to take acceleration measurements in  $m/s^2$  along each of x, y, z axes. In this research regression analysis was used to two find a relationship between roughness value (IRI) obtained from profilometer and resultant acceleration obtained from an android application called Androsensor. According to the results Resultant acceleration has a linear relationship with road roughness (IRI) and Engineers can use this relationship to estimate road surface condition based on accelerometer readings.

In developing countries planning decisions on maintenance and decisions on selecting pavement type are mostly taken based on feedback from local communities and subjective judgement made by the authority due to significant political and other interferences. Therefore it has been become the trend in the recent past in Sri Lanka to pave low volume roads in asphalt all over the country regardless of the traffic volume and the required condition of the road. Although asphalt roads has it's many advantages in the point of view of the road user, when analysing the effective cost comparisons of life cycle cost this may not be the most suitable method available for some roads considering the limited funds available. Therefore suitable framework should be developed as a primary step to providing the context and a methodology by which pavement options may be assessed and selected for low volume roads.

This research presents a methodology to select suitable pavement type for low volume roads in Sri Lanka. The main factors considered for framework are Traffic volume, Traffic composition, Land use, connectivity, terrain and weather.

**Key Words:** Low volume roads, Roughness, maintenance, pavement type

# **DEDICATION**

To

**My Loving Parents and Brothers.**

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## LIST OF ABBREVIATIONS

AADT	Average Annual Daily Traffic
ADB	Asian Development Bank
ADT	Average Daily Traffic
AHP	Analytic Hierarchy Process
BST	Bituminous Surface Treatment
CBP	Concrete Block Pavement
cIRI	Calculated International Roughness Index
CSD	Context Sensitive Design
DBST	Double Bituminous Surface Treatment
eIRI	Estimated International Roughness Index
ESA	Equivalent Standard Axles
HDM	Highway Development and Management
IMF	International Monetary Fund
IRI	International Roughness Index
LBU	Large Bus
LVR	Low Volume Roads
MG 1	Medium Truck
MG 2	Heavy Truck
NGO	Non- Governmental Organization
QCS	Quarter Car Simulation
PCI	Pavement Condition Index
PRDA	Provincial Road Development Authority
RDA	Road Development Authority

VIMS	Vehicle Intelligent Management System
Vpd	Vehicles per day

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