

**FINDING AADT THRESHOLDS FOR UPGRADING  
LOW VOLUME ROADS IN SRI LANKA  
(USING HDM-4 MODEL)**

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of Engineering

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University of Moratuwa

Sri Lanka

February 2012

## 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.

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## Abstract

The Highway Development and Management Tool (HDM-4) is a powerful system for the analysis of road management and investment alternatives and it is used to prepare road investment programmes and to analyse road network strategies.

In this study, the HDM-4 tool is used to find the AADT thresholds based on traffic, subgrade and climate for upgrading low volume roads to maximize economic benefits in Sri Lanka.

Several road sections were defined based on different possible traffic, subgrade and climatic conditions for Gravel, Penetration Macadam (PM), Surface Dressed (SD), Portland Cement Concrete (PCC) and Asphaltic Concrete (AC) pavement types. Altogether more than 120 sections were modelled in HDM-4. Level-1 calibration was done in HDM-4 to harmonize with the Sri Lankan condition. Using HDM-4 strategy analysis, different rehabilitation and improvement alternatives were analysed. Maintaining existing pavement considered as the base case. Analysis was done for a 20-year period and optimized for maximum NPV.

The outcomes of the analysis EIRR was compared in tabular and graphical forms in order to identify the AADT thresholds for traffic, subgrade and climate for upgrading each pavement type. This shows that traffic volume and growth rate are significantly affected and whereas the effect of climate and of subgrade condition are negligible.

Upgrading threshold of low volume road can be decided based on traffic volume in AADT with a fair assessment of the number of heavy vehicles, traffic growth rate and climate condition. According to the study, AADT ranges were defined to get maximum economic benefit for different pavement types of low volume roads in Sri Lanka.

Furthermore it can be concluded that low volume roads (AADT less than 1000) in Sri Lanka can use Gravel, PM or SD pavement type with proper maintenance and it is more economical than upgrading to AC or PCC.

**Keywords:** HDM-4, Low volume roads, Pavement upgrading, Road maintenance

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## ABBREVIATIONS

Abbreviation	Description
AADT	Annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt concrete
CBR	California bearing ratio
EIRR	Economical internal rate of return
ESA	Equivalent standard axle
GC	Well graded gravel-sands with small clay content
GF	Gravel-sands mixture with excess of fines
Gr	Gravel
GR	Growth rate
HDM-4	Highway development and management
HV	Heavy vehicle
IRI	International roughness index
NPV	Net present value
PCC	Portland cement concrete
PM	Penetration macadam
RDA	Road development authority
SD	Surface dressing
SF	Sands with excess fines
SN	Structural number
VOC	Vehicle operating cost
vpd	Vehicles per day



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