

**EVALUATION OF THE IMPACT OF ROAD  
ROUGHNESS ON ROAD USER COST IN HIGHWAY  
CONSTRUCTION WORK ZONES**

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Degree of Master of Science

Department of Civil Engineering

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Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of  
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## **DECLARATION OF THE CANDIDATE & SUPERVISOR**

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## **Abstract**

A highway work zone is present in every part of the world due to the complete essentiality of such work. Roads are designed to a certain lifetime and once the lifetime is reached, the road needs rehabilitation. New roads are being built every day in a country like Sri Lanka where the infrastructure is still largely under development. However, unlike most countries, we do not have a lifecycle monitoring system to determine the optimum rehabilitation period nor the economic cost of rehabilitation of an existing busy road. When referring few of the previous feasibility reports, they have only considered the economic benefit gained after the road is built, but not the loss encountered while the road is being rehabilitated. This study provides insight to the exact issue of incorporating economic losses in the feasibility studies in order to increase the cost benefit ratio as much as possible. The economic cost includes vehicle operating cost, emission cost, delay time cost, and accident costs. However, in this study, only VOC and Delay time cost are monetarized while emissions are quantified without monetarizing. The simulations are carried out using World Bank's HDM-4 version 2 software calibrated to Sri Lankan Context. Here, multiple work zones are evaluated for roughness, vehicle speed, and safety while one complete case study is performed on the most critical work zone. It was found that with the current working conditions, economic loss is around 70% of the project cost and could be considerably reduced by proper management of traffic, pavement condition, and implementing other measures.

**Keywords: Vehicle operating cost, Highway Construction, Road Maintenance, Economic Feasibility, Economic cost, Delay time cost, Emissions, HDM-4, Operating speed**

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## LIST OF ABBREVIATIONS

Abbreviation Description

VOC	Vehicle Operating Cos
VOT	Value of Time
WZRUC	Work Zone Road User Cost
IRI	International Roughness Index
RDA	Road Development Authority
NRSS	National Road Safety Secretariat
FHWA	Federal Highway Administration