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**ROAD ALIGNMENT OPTIMIZATION IN A HILLY
REGION OF SRI LANKA USING GIS TECHNIQUES.**

Galatumba Dissanayakage Vikum Chathuranga Dissanayaka

228004C

Degree of Master of Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

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Dissanayaka G.D.V.C

Date

The above candidate has carried out research for the master's Dissertation under my supervision.

Name of the supervisor: Mr.T.D.C Pushpakumara

09/04/2025

.....

.....

Mr T.D.C Pushpakumara

Date

ABSTRACT

This study focuses on road alignment optimization in a landslide-prone hilly region of Sri Lanka, specifically the Yatiyanthota and Yatiyanthota town areas. The research employs Geographic Information System (GIS) techniques to optimize the design of a proposed bypass road, considering economic, environmental, and societal factors. Traditionally, engineers have used manual drafting techniques to design road alignments, but this method has limitations, particularly in simultaneously analyzing multiple spatial factors. Therefore, GIS techniques, such as the Least Cost Path algorithm in ESRI's ArcGIS, were utilized to generate optimal alignment alternatives for the bypass road. The methodology incorporated digital elevation models, land use data, geological information, and hydrological features to create a comprehensive suitability analysis, with cost surfaces developed by assigning weighted values to each factor based on their relative importance to road construction feasibility and safety. Multiple scenarios were modeled to evaluate different prioritization schemes for environmental protection, construction cost minimization, and social impact reduction. The study compares and assesses these alternatives to bypass landslide-prone areas in Yatiyanthota while considering multiple factors simultaneously. Results indicate that the least-cost optimal alignment better coincides with engineering factors than with other assessment criteria. Additionally, the optimal alignment is shorter and has reduced cut/fill costs compared to the existing alignment. This research provides valuable insights into using GIS techniques to optimize road alignment design in hilly regions with complex geography and geology prone to landslides and earthquakes, with implications for road development projects in Sri Lanka and other similar regions.

Key words – Remote sensing, Geographic information system, Optimization techniques, least cost path analysis, Multi criteria decision making

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Dissanayaka G.D.V.C

Postgraduate

Department of Civil Engineering

University of Moratuwa

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LIST OF ABBREVIATIONS

RS	Remote sensing
GIS	Geographic information system
GPS	Global positioning system
GND	Grama Niladari Divisions
DSD	Divisional secretary divisions
AHP	Analytical hierarchy process
MCDM	Multi criteria decision making
TRN	Terrain ruggedness index
LULC	Land use Land cover
MSS	Multi-spectral sensor
NDVI	Normalized difference vegetation index
WGS	World Geodetic system
UTM	Universal transverse Mercator
USGS	United states geological survey