

**SYSTEMS APPROACH TO DEVELOP HIGH
MOBILITY ROAD NETWORK PLAN FOR SRI LANKA**

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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 fulfillment 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 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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Date:.....

Prof. J. M. S. J. Bandara

ABSTRACT

A high mobility road network is crucial for Sri Lanka's economy, enabling efficient transportation of goods, services, and people. These roads facilitate domestic and international trade, support tourism, enhance regional connectivity, contribute to economic growth, promote rural development, industrial growth, and urban mobility, ensuring sustainable economic development and improving the quality of life for the people of Sri Lanka. However, the construction of the current road network was a result of natural and historical behavior. The construction of the expressways gave little thought to overall connection. Therefore, a methodical methodology of assigning priority for the network's future developments is urgently needed. The primary objective of this study is a systematic approach to a high-mobility road network at interdistrict level, including upgrades for current links.

To facilitate efficient connectivity, 25 District Capitals have been designated as primary nodes. It is assumed that other nodes within each district already possess adequate secondary-level road networks to connect to the primary nodes. These assumptions are the limitations of this study. In defining the original network, places with significant traffic attractions, intersections of the A-class roads and expressway interchanges were included as nodes. This approach aims to ensure seamless connectivity between essential locations and enable smooth traffic flow across the network. To address the particular difficulties and needs related to strategic choices, we limit our analysis to the inter-district level.

During analyzing stage, in order to find bottlenecks, critical nodes and links, minimum spanning trees and least distance paths were developed with respect to trip time and distance during the peak time. To find the optimum network, aspects like reducing the total network length, optimizing the average network speed, and achieving reasonable average speed levels were considered. In order to increase the country's overall mobility, a methodology was created to identify the links that require improvement and have a higher gravity level and slower average speed.

This study identified links with high demand and low service, particularly in Sri Lanka's central and west regions, with population density as a key factor. A combined system approach using minimum spanning tree, gravity level, and mobility level, was used to rank the links for improvement, mainly requiring roadway infrastructure improvements to address geographical issues. These findings provide valuable insights into the specific areas that need attention to improve the transportation system's efficiency and effectiveness. The next step can be conducting a detailed evaluation and creating a targeted improvement plan considering their unique needs, road conditions, and surrounding land use.

Keywords: High Mobility Road Network, Minimum Distance Path, Minimum Spanning Tree, Systems Approach

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