

Framework to Incorporate Safety Performance in Highway Asset Management System- Case Study on Provincial Roads

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Abstract

According to the functional and management obligations, the road network in Sri Lanka is classified into national, provincial, and local authority roadways. Provincial roads in Sri Lanka are considered class C and D, which serve as connections between urban and rural areas to ensure social and economic necessities. Even though a developing country, the majority of these roads are in poor condition, and safety concerns are in minimal condition. Lack of accurate accident data and road conditions are reported as major factors for poor road conditions and minimum safety concerns. This study proposes a methodology to determine a safety index to evaluate safety performance on provincial roads in Sri Lanka with the maintenance scheme using an optimization approach. A cumulative safety index (CSI) is computed with the fundamental elements such as exposure, probability, and consequences identified from the safety audit. The volume of motorists and non-motorist is used to calculate exposure. The probability component of risk is obtained by using the guidelines developed for each safety issue and by making an assessment of each road feature using the point scale, and the consequences factor is calculated with the posted speed at the safety issue. The Computed Cumulative Safety Index (CSI) is validated by using available crash data. All severity levels in the crash data, such as fetal, grievous, and non-grievous, are translated to a single scale termed Equivalent Property Damage Only (EPDO) to validate the results. Once the actual EPDO is calculated, multiple regression analysis tools are used to determine the relationship between the actual EPDO and a computed CSI composed of identified safety issues in the road segments. Actual EPDO and estimated EPDO were compared using Root Mean Square Error (RMSE). Safety treatments are implemented to identify safety issues at the given location. All of the safety treatments are unable to be implemented in the area due to a lack of funds. Low-risk safety treatments, high-risk safety treatments and combinations of low and high-risk treatments were categorized. A framework is proposed to include safety performance in the Highway Asset Management System, particularly in the optimization analysis, which comprises the objective of minimum average network CSI. The results from the study show that roads with safety concerns are prioritized in budget allocation with a feasible combination of safety treatments. This methodology provides a crucial and cost-effective analytical tool for the Highway Management System, which simplifies the process of including road safety performance in provincial road network management.

Keywords: *Provincial roads, Safety Index, Cumulative Safety Index, EPDO, Optimization*

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