

Identifying the Grade Separation Requirement for Railway Level Crossings in Sri Lankan Urban Context

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Abstract

Railway level crossings are a major consideration that road agencies often need to pay attention to in managing the issues related to safety, traffic, and land use in the road segment where it's located. Though grade separation is the ideal alternative since it completely separates the road and rail traffic, it carries a downside due to the high project cost and maintenance by making it impossible to grade separate all the level crossings. Allocation of funds for a single grade separating structure could restrict the funds available for other development projects. With the increasing number of road users and the higher demand for the railway, increased congestion is more than certain in the absence of proper improvements to the network. have been proposed in many countries how to identify and prioritize potential level crossings for grade separations which leads to effectively utilizing the funds allocated. A knowledge gap was identified in the Sri Lankan context, where the lack of a guiding framework leads to ad hoc decision-making and inefficient allocation of funds. The study aims at developing a criterion that can be used to identify the grade separation requirement in Sri Lankan urban context. The literature review, it was identified that accident cost under safety impact, delay and vehicle operating cost under the economic impact, Average Daily Traffic (ADT) under traffic impact, project cost under financial constraints and emission cost under the environmental impact are the key parameters that have been used in many studies. Limiting ADT was identified as the threshold value for grade separation decisions in an urban context, and an economic analysis was then carried out to check the suitability of the identified limiting criterion for the local urban context. Existing flyovers were selected representing four-lane and two-lane grade separations. Survey data was collected from the Transportation Engineering Division, the University of Moratuwa and the daily train schedule was taken from the Sri Lankan Railways to incorporate the train frequency and gate closures of delay at the level. Crossings were done with VISSIM microsimulation software for different ADT levels. Travel time, vehicle operating, and emission costs due to grade separating the level crossing were considered as the economic benefits, but the savings from accident costs were not considered due to lack of data availability. Benefits were compared with the project cost and the maintenance cost of the grade separation. Project Benefit-Cost Ratio was then calculated for the previously considered ADT levels, and a sensitivity analysis was carried out considering different cases of changing benefits and costs to assess the economic strength of the selected criterion. On the above results, a limiting ADT value to identify the four-lane and two-lane grade separation requirements are proposed. In future studies, it is recommended to obtain more comprehensive results by incorporating train speeds, the number of rail tracks and savings from accident costs.

Keywords: *Level Crossing, Grade Separation, Economic Evaluation, Economic Benefits*

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