

## **Life-Cycle Cost Analyses for Road Barriers – Example of a Swedish research**

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### **Abstract**

The initial cost for road barriers is a crucial factor affecting the selection of barrier type. Life-cycle costs for barriers are seldom considered when selecting barrier types. This fact could be due to limited information regarding maintenance costs which obstruct an adequate consideration of maintenance aspects during the road planning and design process. Another problem regarding calculating life-cycle costs, when selecting road barriers, is the limited information available regarding costs for injuries associated with barrier collisions.

This analysis presents a study aimed at implementing and evaluating an approach for analysing life-cycle costs for road barriers under consideration of repair, maintenance and injury aspects.

### **Abstract – long version**

The cost of a road construction over its service life is a function of design, quality of construction as well as maintenance strategies and operations. An optimal life-cycle cost for a road requires evaluations of the above mentioned components. Unfortunately, road designers often neglect a very important aspect, namely, the possibility to perform future maintenance activities. Focus is mainly directed towards other aspects such as investment costs, traffic safety, aesthetic appearance, regional development and environmental effects.

One of the problems identified in the above mentioned study as an obstacle for due consideration of maintenance aspects during road design was the absence of a model for calculating life-cycle costs for roads. Because of this lack of knowledge, the research project focused on implementing a new approach for calculating and analyzing life-cycle costs for roads with emphasis on the relationship between road design and road maintainability. Road barriers were chosen as an example. The ambition is to develop this approach to cover other road components at a later stage.

A study was conducted to quantify repair rates for barriers and associated repair costs as one of the major maintenance costs for road barriers. A method called “Case Study Research Method” was used to analyse the effect of several factors on barrier repairs costs, such as barrier type, road type, posted speed and seasonal effect. The analyses were based on documented data associated with 1625 repairs conducted in four different geographical regions in Sweden during 2006. A model for calculation of average repair costs per vehicle kilometres was created. Significant differences in the barrier repair costs were found between the studied barrier types.

In another study, the injuries associated with road barrier collisions and the corresponding influencing factors were analysed. The analyses in this study were based on documented data from actual barrier collisions between 2005 and 2008 in Sweden. The result was used to calculate the cost for injuries associated with barrier collisions as a part of the socio-economic cost for road barriers. The results showed significant differences in the number of injuries associated with collisions with different barrier types.

To calculate and analyse life-cycle costs for road barriers a new approach was developed based on a method called “Activity-based Life-cycle Costing”. By modelling uncertainties, the presented approach gives a possibility to identify and analyze factors crucial for optimizing life-cycle costs. The study showed a great potential to increase road maintenance efficiency through road design. It also showed that road components with low investment costs might not be the best choice when including maintenance and socio-economic aspects.