USDOT Region V Regional University Transportation Center Final Report

NEXTRANS Project No 083PY04

Using Regional Freight Traffic Assignment Modeling to Quantify the Variability of Pavement Damage for Highway Cost Allocation and Revenue Analysis

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TECHNICAL SUMMARY

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Introduction

While indicative of a vibrant economy, large volumes of freight traffic have been associated with accelerated wear of pavements particularly. In seeking to adopt operational policies that reduce undue deterioration of their infrastructure, state highway agencies in the United States strive to quantify the damage caused by vehicle loads so that it is possible to update loading polices and to implement fee structures that are commensurate with the pavement damage.

An INDOT-commissioned research study, SPR 3502, provided a methodology to estimate the pavement damage costs. That study reported these costs on the basis of systemwide average levels of traffic loading. In reality, however, traffic loading and climatic severity at specific road segments can differ significantly from what their systemwide averages suggest. This Nextrans study therefore investigated the issue of pavement damage cost estimation from a purely disaggregate level in order to establish potentially more reliable estimates of pavement damage costs. It is envisaged that doing so would not only increase the efficiency and effectiveness but also would enhance equity in the highway cost allocation and revenue generation.

To address the issue at a disaggregate level, the study first established more reliable projections of highway freight traffic volumes at each individual pavement segment on the highway network using the results from a freight assignment and volume prediction tool. Next, for each road segment the expected axle loadings on the basis of the projected traffic volumes, were calculated and the expected pavement damage costs were determined from the expected level of truck volume (and thus, estimated loading). Further, the study quantified the deviation, for each pavement segment, of the damage cost using disaggregate and aggregate approaches.

Findings

To address the issue at a disaggregate level, the study first established more reliable projections of highway freight traffic volumes at each individual pavement segment on the highway network using the results from a freight assignment and volume prediction tool. Next, for each road segment, the expected axle loadings on the basis of the projected traffic volumes, were

calculated. Then the expected pavement damage costs were determined from the expected loadings. Further, the study quantified the deviation, for each pavement segment, of the damage cost using disaggregate and aggregate approaches.

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Recommendations

The research product can be used to estimate the cost of pavement damage for individual pavements section on a state highway network. This can be done using the expected axle loadings on the basis of the projected traffic volumes. The deviation of pavement damage costs at each pavement segment relative to the aggregate damage cost reported all pavements, can be quantified. Thus, the dangers of using aggregate estimates for pavement damage cost, can be demonstrated.

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