

# JOINT TRANSPORTATION RESEARCH PROGRAM

**Principal Investigators:** Samuel Labi, Purdue University, labi@purdue.edu, 765.464.5926

Kumares C. Sinha, Purdue University, sinha@purdue.edu, 765-464.2211

**Program Office:** jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

**Sponsor:** Indiana Department of Transportation, 765.463.1521

SPR-3502

2013

## Costs and Revenues Associated With Overweight Trucks in Indiana

### Introduction

In order to protect the investments made in highway pavements and bridge infrastructure, the Indiana Department of Transportation regulates trucking operations using legislation and federal-recommended policies. Under certain circumstances, special permits are granted to truck operators to allow excess over the specified operational weight restrictions. As the steward of the public highway infrastructure in Indiana, INDOT has a special duty to ensure that operating policies are not unduly restrictive as to discourage economic development but also realistic enough to prevent premature and accelerated highway deterioration. With the changing patterns of commercial vehicle movements over the years, there is a need to continually review the costs and revenues associated with overweight trucks, in terms of their pavement and bridge damage costs and permit fees. This study addressed the vital issue of pavement and bridge damage cost estimation and analyzed these costs in terms of the adequacy of permit revenues for highway pavements and bridges. Analytical frameworks were developed for estimating the marginal damage cost on the basis of practical and realistic strategies for pavement and bridge maintenance over their life cycles or remaining lives. The study began with an extensive review of the literature on the subject, thus facilitating identification of the gaps in the existing practice and research. The framework, involves development of asset families, establishment of realistic schedules for reconstruction, rehabilitation, and maintenance, and projections of traffic volumes. Using the developed framework, the marginal cost of damage was estimated for each asset family and age group. Furthermore, the sensitivity of marginal asset damage cost with respect to key policy and analysis variables was explored. Finally, the study examined cost and operational issues associated with the enforcement of overweight truck policies.

### Findings

The literature review showed that very few studies in the past, had adopted a truly comprehensive approach for asset damage cost estimation on the basis of practical and realistic maintenance, rehabilitation and reconstruction practices. Key gaps in existing research include the use of data from limited sources that do not adequately capture loading patterns across the different functional classes, the impractical assumption of perpetual application of only a single type of overlay applied at fixed intervals, inadequate use of actual data on asset treatment cost and performance and traffic volumes, failure to distinguish between strength-driven and capacity-driven expenditure, lack of an analysis time frame of sufficient length to accommodate realistic long-term expenditures, traffic, and performance trends, and use of inappropriate road-use measures. In developing a framework that addresses these gaps, this study showed that the damage cost of



*Measuring the costs and benefits of overweight trucking operations is vital for overweight policy formulation and evaluation.*

highway assets due to overweight trucks is influenced significantly by the asset type and age, among other factors.

For pavement assets, the overall pavement damage cost estimates were found to range from \$0.006 per ES-AL-mile on Interstate highways to \$0.218 per ESAL-mile on non-national highways. The study also showed that non-consideration of reconstruction or maintenance cost can result in underestimation of the actual pavement damage cost by as much as 79% and 83%, respectively. The analysis also showed that the unrealistic approach of considering only rehabilitation treatments applied at fixed intervals in asset life cycle, can lead to as much as 86% underestimation of the actual pavement damage cost. The results suggest that the pavement damage cost estimates are highly sensitive to the pavement life cycle length, interest rate, rest period, and the costs and service lives of rehabilitation treatments.

For bridge assets (classified by their superstructure material types), the incremental methodology was found to be suitable for the damage cost estimation. This methodology yields a damage cost to each vehicle class on the basis of the axle configurations and usage frequency (vehicle-miles travelled) in that vehicle class. The bridge damage cost was estimated for two permit fee options and three user-charging scenarios. An important result of the study was the confirmation of the fact that bridge damage cost is a function not only of gross vehicle weight but also of axle spacing and axle loads. Also, it was shown that adopting a permit structure on the basis of gross vehicle weight only will result in the situation where certain vehicle classes underpay by as much as 92% of their actual damage contribution.

Finally, the study identified a number of locations that could be considered for establishing new weigh stations and improving the staffing. The study also made recommendations for enhancing the efficiency of monitoring and inspecting the operating weights of commercial vehicles in the state.

## Implementation

---

This study can be used by a number of offices, program areas, and units at INDOT to assess the consequences of truck weight policies on the longevity of assets within their jurisdiction. These include the Indiana Toll Road, Offices of Freight Mobility, Economic Opportunity, and the Indiana Department of Revenue. These offices have a stake in knowing the potential impact of any changes on vehicle license fees and overweight truck permits on the revenue generated from each of these fee structures, and the impact of pavement damage in response to overweight policy changes.

In summary, implementing the study product can assist the state of Indiana in updating and streamlining its overweight vehicle permitting process. The state will be in a better position to monitor the impacts of the use of its highways by overweight vehicles, make its permit fee structures more equitable, and ultimately, strike a balance between the need to preserve its investments in highway infrastructure and the need to help make the state more competitive economically.

## Recommended Citation

---

Ahmed, A., B. R. D. K. Agbelie, S. Lavrenz, M. Keefer, S. Labi, and K. C. Sinha. *Costs and Revenues Associated With Overweight Trucks in Indiana*. Publication FHWA/IN/JTRP-2013/01. Joint Transportation Research Program, Indiana Department of Transportation and Purdue University, West Lafayette, Indiana, 2013. doi: 10.5703/1288284314987.

View the full text of this technical report here:  
<http://dx.doi.org/10.5703/1288284314987>

Published reports of the Joint Transportation Research Program are available at <http://docs.lib.purdue.edu/jtrp/>.

