



0-6844: Putting a Price Tag on International Trade Use of State Infrastructure

Background

As a major gateway to the entire U.S. for international trade both through seaports and land ports of entry, Texas pays the bills for the construction and maintenance of the infrastructure required to move the freight which benefits other parts of the country. With the expansion of the Panama Canal and the land bridge from the Mexican port of Lazaro Cardenas to Texas, international trade through Texas ports of entry will likely continue to grow, and continue to impact the state's transportation infrastructure, especially highways. In this sense, the effective and efficient infrastructure management has been at the forefront of discussions. However, no local studies examine the current asset value of major freight corridors to move international trade in Texas; a methodological process to put "price tags" on international trade use of Texas' transportation infrastructure is needed.

What the Researchers Did

This project's objective was to propose a utility-based asset valuation methodological framework that can incorporate various aspects of transportation assets, and assign reasonable price tags to the Texas international trade highway corridors. Throughout this 24-month project, the research team successfully conducted following procedures:

- (1) Extensive literature review on existing transportation asset valuation techniques and practices,
- (2) Workshop with the Subject Matter Expert Working Group,
- (3) Identification of highway freight corridors in Texas (referred to as Texas Freight Roadway Network [FRN]),

- (4) Data collection and processing,
- (5) Development of highway construction/ maintenance costs estimation methodologies, and
- (6) Estimation of a price tag of the FRN by using the proposed utility-based asset valuation approach.

What They Found

Throughout the literature review on transportation asset valuation related studies and practices, the researchers have found two limitations in the valuation methods: (1) each method yields significantly different values for a given asset, and (2) most of the developed valuation methods are primarily based on historical cost information and current physical condition of infrastructure, giving no consideration to the functional characteristics and the level of utilization of the infrastructure. Based on the findings from the literature review, the research team then developed a novel utility-based transportation asset valuation methodological framework. The developed valuation approach adopted the utility theory in

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Project Completed:

12-31-2016

order to capture various factors that can affect transportation infrastructure.

The research team made an effort to identify major highway freight corridors in Texas by following systematic processes based on several criteria: gross domestic product (GDP), traffic volume, and geographical location. Then, the identified corridors—the FRN—were developed as a GIS map. The FRN GIS map was then integrated with various infrastructure management databases, such as Pavement Management Information System (PMIS) and Bridge Inventory, Inspection and Appraisal Program (BRINSAP). It revealed that about 82% of the bridges and 87% of the pavements on the FRN were maintained in good condition.

Based on the developed GIS map, the utility-based asset valuation process was conducted to assign price tags to the FRN in two phases: estimation of the base price tag and adjustment of the base price tag according to the FRN’s functionality and utilization. First, a thorough review on highway construction and maintenance costs information was conducted to determine the based price tag, which would be adjusted for various factors other than physical condition. A replacement cost estimation methodology was then developed based on the findings to estimate the base price tag. As the result, the total base price tag of the FRN was estimated at \$160 billion: approximately \$117 billion for the pavements and \$43 billion for the bridges on the FRN.

To adjust the base price tag for factors that could affect the infrastructure on the FRN, three key factors and eight performance measures were then prepared for inclusion in the utility-based asset valuation framework. The performance in different units could be successfully scaled and amalgamated together by using the utility functions developed in other studies. As the result, the total base price tag of the FRN was estimated at approximately \$160 billion, while the utility-adjusted price tag was \$366 billion (\$252 for the pavements and \$114 for the bridges), which indicated a 129% increase in its value.

What This Means

The difference between the base price tag and the utility-adjusted price tag indicates that a failure to include the functionality and the utilization aspects of transportation assets can result in distorting their true values, by underestimating or overestimating the asset values. Considering the important role of asset valuation in transportation asset management, putting comprehensive price tags to international used infrastructure will serve to enhance the linkage between TxDOT goals and performance, giving the agency the ability to reflect how they value their infrastructure in vital systems. These price tags will also allow the enhancement of public planning and decision-making processes regarding freight by providing more effective and efficient resource allocation and management strategies for achieving TxDOT’s organizational goals.

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Keyword: Research