CENTER FOR TRANSPORTATION RESEARCH

PROJECT SUMMARY

Texas Department of Transportation

0-6692: Truck-Rail Intermodal Flows: A Corridor Toolkit

Background

Freight moves across a variety of routes, modes, and transfer points while meeting shipper-specified needs such as speed, security, reliability, safety and cost. Moreover, much of the system is dynamic, not static, thus complicating any analysis. Transportation planners at state departments of transportation (DOT) and metropolitan planning organizations (MPO) who need to understand freight flows can only capture a cross section of the dynamic system that now drives freight logistics. This situation stems from the difficulty in deriving good data that can allow planners to determine effective multimodal policies and strategic thinking of future highway investments. In addition, the mode choice models typically used by planners are also limited in scope, and need to be further developed to output accurate truck and rail operating parameters. Furthermore, current models for evaluating truck and rail movement are limited in their ability to be integrated into planning models because they are either proprietary software or built to be standalone applications. To address these limitations, the Texas Department of Transportation sponsored this study to investigate the possibility of developing an integrated truck-rail toolkit to evaluate freight movement along its extensive state network of multimodal corridors. The toolkit is designed to enable adequate truck and rail operating cost comparisons, which are useful in strengthening corridor analysis—an important component of the MAP-21 legislation.

What the Researchers Did

The study team built a truck-rail intermodal toolkit (TRIT) using state and federal secondary data and models with assistance from trucking and rail companies and users of the model at TxDOT. TRIT was developed to help planners equally compare truck and rail freight movements for specific corridors and to give insight into some of the associated variables needed when dealing with each mode. The rail component of the model (CT-Rail) is designed to help planners and policy makers understand rail corridor operations and examine the opportunities and challenges for modal shifts from truck to rail. CT-Rail uses a mechanistic approach that adequately captures the effects of cargo weight, running speeds, network capacity, and route characteristics—key factors that are essential in any logistical analysis. The truck component of TRIT, CT-Vcost, developed from an earlier TxDOT study, allows planners to simulate truck movements over a specified corridor given factors such as truck speed, equipment depreciation, financing, insurance, maintenance costs, fuel cost, driver costs, road use fees (e.g., tolls), and other fixed costs—factors that influence truck operating costs and delivery time.

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Comparative variables used in both models include incorporating roadway and track characteristic (elevations and grades), travel speeds, changes in fuel prices, maintenance cost, labor cost, and tonnage. The truck corridor model also accounts for toll rates and vehicle insurance costs whiles drayage cost is included only in the rail corridor model. Outputs from both models include fuel consumption and cost, travel time, and payload cost per ton-mile. TRIT was then tested on a key segment of the TxDOT freight highway system to determine costs differentials and social benefits. A route data acquisition model was also developed to facilitate the acquisition of road and rail track profiles and grades using publicly available data sources.

What They Found

TRIT enables planners—at both the DOT and MPO levels—to accurately evaluate proposals that constitute opportunities for short haul rail service, which is designed to take trucks off the highway. The non-linearity of speed-volume flows shows that modest levels of freight moving from a highway to a rail corridor would substantially benefit the remaining highway users. It would also contribute to decreasing air pollution and pavement consumption. Current mode choice and other planning models do not capture the effects of weight, speed, engine power, grade changes, and curvature—key elements of any mechanistic approach—on operating cost and delivery times. This study was designed to address and correct these deficiencies by integrating truck and rail mechanistic models in the form of a calibrated toolkit that planners can use to accurately determine costs and social benefits. Successful and continued use of TRIT is dependent on the availability of recent and updatable data. The current design of TRIT enables users to calibrate the model based on available information, with default values included as a fallback option. Future enhancements of the model can provide the opportunity for integration into current and existing freight planning models and databases.

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