TN TDOT Department of Transportation

Research Summary

Improvement of Park-and-Ride Facilities and Services in Metropolitan Areas of Tennessee

Project Number:
RES 2020-15

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WHAT WAS THE RESEARCH NEED?

Strategically placed park-and-ride (P&R) facilities can encourage commuters to use public transit and non-motorized transportation modes, potentially mitigating traffic congestion, parking shortages in highly populated areas, and greenhouse gas emissions. When selecting sites for P&R facilities, it is important to assure that the facilities will be effectively utilized by commuters, avoiding oversubscription or underutilization after placement. In addition, transit is mostly used by commuters who walk to stations. Therefore, it is also important to understand pros and cons of transit-oriented developments (TODs), which are compact, mixed use developments near transit facilities and have generally high-quality walking environments.

WHAT WERE THE RESEARCH OBJECTIVES?

The research had two primary objectives:

1. Conduct literature review to identify the best practices in design and development of P&R facilities and TODs.
2. Determine the optimal locations and sizes of P&R facilities/TODs among a set of candidate locations to improve the network.

WHAT WAS THE RESEARCH APPROACH?

The research team used a 4-step approach to complete the research. First, a literature review on P&R facilities and

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TODs was conducted to establish a holistic framework to prescribe the placement of P&R facilities/TODs among a set of candidate locations to improve the network. Second, a framework was developed to integrate a demand model and an optimization model to study the optimal placement of P&R facilities. Third, a case study was performed for the City of Nashville with daily trip data from Davidson county and six of its surrounding counties. In the case study, 14 existing P&Rs and 11 candidate P&Rs were considered. Lastly, the potential use of TODs in the network was examined. Specifically, TODs and P&Rs were compared to determine whether replacing a P&R facility with a TOD would reduce the vehicle kilometer traveled (VKT).

WHAT WERE THE FINDINGS?

The research produced the following findings:

- State DOT based P&R development guidelines vary across states, suggesting the need for state-specific guidelines.
- Data availability (quantity and format) proved to be key to large-scale modeling and quality model calibration.
- The optimal set of candidate locations prescribed by the optimization model varied as a result of the choice of objective function, constraints, and model parameters.
- In the City of Nashville, given the available data, P&R facilities generally remained more favorable compared with TODs.

IMPLEMENTATION AT TDOT

The research team had various recommendations for TDOT, including:

- More P&R-based research should be conducted on bus-based P&Rs and in areas with less extensive transit services.
- Surveys focusing on P&R facilities and their alternatives should be conducted in the City of Nashville to get accurate and reliable demand model for P&Rs.
- To develop a more accurate and comprehensive demand model, a rich dataset including 'travel cost,' 'parking fare,' 'transit frequency,' and 'waiting time,' among others, should be collected.
- Appropriate candidate locations must be selected to be included in the optimization model.
- Feasible range of TOD characteristics must be clearly defined to enable a meaningful comparison between P&Rs and TODs and ensure actionable decisions regarding the placement of TODs in the network.

MORE INFORMATION

Find the final report here: https://www.tn.gov/content/dam/tn/tdot/long-range-planning/research/final-reports/res2020-final-reports/RES2020-15_Final_Report_Approved.pdf.

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