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RELIABILITY DATA AND ANALYSIS TOOLS (L02/L05/L07/L08/C11)

A tool suite to help transportation planners and engineers improve data monitoring and analysis to achieve more consistent, predictable highway travel.

CASE STUDY

Arizona Department of Transportation

Implementing a Suite of Travel Time Reliability Tools in Arizona

ABOUT THIS CASE STUDY

The second Strategic Highway Research Program (SHRP2) developed data and analysis tools to improve the measurement and management of travel time reliability by transportation practitioners. The SHRP2 Program provided funding to help agencies test the tools and incorporate reliability into their business practices. The Arizona Department of Transportation (ADOT) project included the following tools:

DATA COLLECTION

L02 Guide to Establish Monitoring Programs for Travel-Time Reliability

Guidebook, visualization tools, and methods for integrating data to analyze reliability, including causes and locations of unreliable performance and identification of potential mitigating strategies.

ANALYSIS

L07 Reliability by Design

Spreadsheet-based treatment analysis tool to assess how different design improvements affect reliability, delay, safety, and benefit versus cost over the lifecycle.

BACKGROUND

Congestion is a serious concern in both the Phoenix and Tucson metropolitan areas. In 2014, congestion in Phoenix caused over 155 million person-hours of delay, and 36 percent of vehicle-miles traveled (VMT) in the metro area were under congested conditions. Similarly, Tucson experienced over 35 million person-hours of delay, with 28 percent of VMT experiencing congested conditions.

ADOT sought to better understand travel time reliability (TTR) and identify mitigation strategies for non-recurring congestion in both metro areas using the L02 and L07 tools developed under the SHRP2 program. In a pilot concluded in 2020, ADOT investigated TTR on three segments of I-10 (figure 1):

- I-10 between US-60 and I-17 in Phoenix
- I-10 between 35th Avenue and Sky Harbor Boulevard in Phoenix
- I-10 between Ina Road and I-19 in Tucson

ADOT also developed a prototype travel time reliability monitoring system (TTRMS) as well as other countermeasures to address congestion. The L02 guide defines the essential components of a TTRMS, including data sources and analysis methods. ADOT used L02 to develop the prototype TTRMS.

The L07 guidebook and analysis tool help agencies estimate the reliability impacts of design alternatives for a specific location. ADOT used the tool to evaluate several countermeasures for the two segments of I-10 in Phoenix with poor TTR.

PRODUCT IMPLEMENTATION

ADOT first developed the prototype TTRMS and evaluated TTR on the three study segments. The research team found that I-10 westbound between 35th Avenue and Sky Harbor Boulevard was the worst performing segment. ADOT evaluated the potential impact of countermeasures on the segments in Phoenix using the L07 guidebook and analysis tool.

implementing the spreadsheet were the L38 Pilot Studies, rather than the L07 study itself.

ADOT makes the following recommendations to improve the tools:

- Redesign the L07 spreadsheet tool to be more user friendly.
- Create a user guide for the L07 design guide.
- Incorporate additional performance measures using the data collected in L02.
- Develop an online tool that allows the user uploads pre-formatted data and that runs calculations to prepare the data for use in the SHRP2 analysis tools.

IMPACTS ON BUSINESS PRACTICES

The TTRMS prototype contributed useful TTR information along the study segments and helped improve the agency’s understanding of the underlying causes of traffic congestion. As a result, the agency recommended developing TTRMS for Statewide use. ADOT will also consider establishing a dedicated data server and user-friendly website to facilitate access to the TTRMS for users across the State.

The project prompted the agency to consider several additional actions. ADOT recognizes the need to collect more detailed weather and special events data along the State’s major interstates and arterial roads as well as the need for traffic engineers to acquire basic coding skills, particularly in the R programming language.

CONCLUSION

ADOT used L02 and L07 to create a prototype TTRMS and evaluate countermeasures for non-recurring congestion on three

segments of I-10 in Phoenix and Tucson. The TTRMS proved useful in understanding TTR on the study segments. None of the countermeasures evaluated in L07 significantly improved TTR on the study segments, and ADOT found that the tool’s user interface could be improved. However, the design guidebook provided detailed information on a range of options for congestion mitigation.

ADOT plans to implement the Statewide TTRMS, collect additional datasets to measure non-recurring congestion, and train agency staff to incorporate reliability metrics into their work.

FOR MORE INFORMATION

Arizona Department of Transportation

<https://azdot.gov/>

SHRP2 Solutions

<https://www.fhwa.dot.gov/goshrp2>

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