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The Use of Transportation Models in Rural Study Areas

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The Use of Transportation Models in Rural Study Areas

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The Use of Transportation Models in Rural Study Areas

ABSTRACT

This research project focused on developing improved methodologies for evaluating and using urban transportation models in rural areas. Through the study of the Northwest Arkansas area, a greater understanding of travel patterns in rural study areas was obtained, and methodologies for transportation planning modeling in rural areas were developed.

The project resulted in the publication of research papers and the presentation of the results at several regional and national conferences. The content of these papers and presentations is found within the two doctoral dissertations and one master's thesis that resulted from project work. The first, a Master's thesis entitled "An Approach to the Problem of Non-Coterminous Boundaries, A Critique and Rejection of Traditional Splitting Factors", evaluated the traditional methods for combining information from Transportation Analysis zones with dissimilar boundaries. The author also developed trip production and attraction models for the Northwest Arkansas area and compared the results with existing models. The dissertation entitled "Transportation Dynamics in Rural Areas" explored how the population shift to the urban fringe has affected travel patterns, and developed trip generation equations for small urban areas with outlying suburban and rural land uses, based on travel survey information from northwest Arkansas. The analysis of survey data revealed that trip generation is most dependent upon area type, number of households and the stratification of age groups within the households. The last, a dissertation entitled "The Use of Urban Transportation Models in Rural Areas: The Northwest Arkansas Study" used the trip generation equations developed to build working TRANPLAN models for the Northwest Arkansas area. It also provides a template for other rapidly growing small urban areas with the ring-type land use pattern to build their own models.

INTRODUCTION

This research project focused on developing improved methodologies for evaluating and using urban transportation models in rural areas. Through the study of the Northwest Arkansas area, a greater understanding of travel patterns in rural study areas was obtained, and methodologies for transportation planning modeling in rural areas were developed.

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This report discusses the major conclusions of each of the above theses/dissertations, as well as other deliverables produced by the project.

PUBLICATIONS

"An Approach to the Problem of Non-Coterminous Boundaries, A Critique and Rejection of Traditional Splitting Factors" (1)

This is the Master's Thesis of Kevin W. Goff, BSCE, and was completed in May 1998. It is divided into three parts:
1. The first part is a description and critique of the splitting factor method. Splitting factors are a method used to partition the transportation analysis zones of one agency in to the transportation analysis zones of another. Many times the boundaries differ because of the varying needs of the agencies collecting the data, with is referred to in the thesis as "the problem of non-coterminous boundaries".
2. In part two, Goff "rejects the splitting factor method as statistically unsound and proposes an alternative approach to the problem of non-coterminous boundaries."
3. In part three, the author uses the alternative approach he developed to analyze the data from the Northwest Arkansas Study. He also evaluates established trip production and attraction models, as well as ones he developed, and how well they predicted trips in the study area.

"Transportation Dynamics in Rural Areas" (2)

This was the doctoral dissertation of Ping Jiang, who obtained her PhD in May 1999. Her research explored the change in travel behavior in a rural urbanized area due to the "ring-type" land use pattern. The "ring-type" land use pattern is where the development consists of a rural area surrounding a suburban area, which in turn surrounds an urban central area. A household travel survey was conducted in the Northwest Arkansas area, and the data was statistically analyzed to produce trip generation equations. For the Northwest Arkansas study area (and presumably for other areas with the same type of land-use pattern), the typical causal factors were not household income and level of automobile ownership, but the land use category (urban, suburban, or rural), and the number of people in each of seven age groups.

"The Use of Urban Transportation Models in Rural Areas: The Northwest Arkansas Study" (3)

This was the doctoral dissertation of Melissa S. Tooley, who obtained her PhD in May 1997. It developed and documented the methodology used to build the base year planning models for the Northwest Arkansas area. Models were built for the Metropolitan Study Area and for the combined Washington and Benton County areas. Roadway networks and Transportation Analysis Zones (TAZs) were developed in TransCAD and then converted to TRANPLAN format, within which the five-step transportation planning models were run. It was found that the trip generation equations developed by Dr. Jiang in the course of her research were better predictors of travel behavior than the traditional NCHRP methods.

DELIVERABLES

The project proposal included several deliverables for the Arkansas Highway and Transportation Department (AHTD), which co-sponsored the project. Hardware transferred to the AHTD in 1994 included a CD-Rom reader, and a 486/55 computer with accessories. Working TRANPLAN models (dated 1996) for the Northwest Arkansas Metropolitan Study Area and for Washington and Benton counties were provided in Spring 2003 to consultants working for the AHTD for reference in developing a new model for Northwest Arkansas.

CONCLUSIONS

This project resulted in a better understanding of travel behavior in Northwest Arkansas. More importantly, the increasingly common development pattern where population shifts from larger cities to small towns, and from the inner core to the outer fringe of towns, (2) is better understood. The methodologies developed may enable transportation planning models developed for urban areas to become more useful for small urban areas.

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