Summary of Final Report, BC353-46
March 2004

THE RELATIONSHIP BETWEEN LAND USE, URBAN FORM AND VEHICLE MILES OF TRAVEL: THE STATE OF KNOWLEDGE AND IMPLICATIONS FOR TRANSPORTATION PLANNING

PROBLEM STATEMENT

Many transportation and land use planners believe that strategies to reduce transportation demand via coordination of land use and transportation planning can contribute to meeting future mobility needs. This position envisions the land use characteristics of density, mix of uses, urban form, urban design, activity scale, and contiguousness of development playing a meaningful role in reducing the demand for vehicle travel by reducing vehicle trip frequency and trip lengths and by altering mode choices for travel.

Developing a richer knowledge of the transportation–land use relationship is a critical need for planning professionals and policy makers. Consequently, investigation into the relationship between land use and urban form and the vehicle miles of travel by persons is warranted.

OBJECTIVES

The objectives of this study are to provide a conceptual outline of the transportation-land use relationship. The researcher will synthesize a broad review of the literature and explore various aspects of the state of knowledge regarding the transportation-land use relationship. In addition, he will provide (1) a discussion of various perspectives and motivations, analytical methods, variables for measurement, and urban scale focuses, (2) an overview of research findings categorized by geographic scale ranging from site level to neighborhood level to urban area level, (3) policy implications, and (4) observations on how the available knowledge can be used in decision-making.

FINDINGS AND CONCLUSIONS

Technical conclusions are offered with respect to six characteristics of land use.

All other things held constant, higher **development density or intensiveness** is more supportive of a viable transit alternative and enables more activities to be served with shorter auto trips or walk and bike modes of travel. Density is correlated with a host of other travel behavior influencing factors such as transit availability, income, auto availability and operating/parking cost, centrality of location, and urban design features (including pedestrian amenities). The quantification of the impact of density on vehicle miles traveled (VMT) is thus highly variable depending upon which factors are controlled in the analysis. The savings in VMT may not translate into a saving in travel time because non-auto modes are often slower and higher congestion levels can confront auto travelers. Elasticity of travel with respect to density alone appears to be modest, which suggests that a multi-element strategy for influencing VMT would be most effective. Both residential density and activity or employment density are important to travel behavior.

A **mix of land uses** can enable more activities to be served by shorter trips. The nature of the activity and the nature of the *mixing* of uses may influence the travel response. The scale of geography and socio-demographic match between the residential population and the activities provided in the mix of uses is relevant to the magnitude of the travel benefit of mixing uses. Mixing of uses can facilitate trip chaining—and further impact travel demand. Job-housing balance is most beneficial if there is balance in income distribution and in the temporal development of the housing and employment opportunities.

Urban form characteristics are clearly factors in travel behavior and VMT. The nature of the transportation network can influence travel circuity, and the pattern of development can influence the viability of transit and other modes and the length of trips. Urban form influences accessibility, which is unquestionably a factor in travel behavior. Optimal conditions regarding the pattern of the network and development is less well understood, dynamic as an area changes its size, and subject to changes as a function of travel cost, technology, social values, and other factors. Transportation sensitive **urban design** offers an opportunity to make property more accessible for alternative modes while providing aesthetic, safety, and other benefits. These benefits on overall travel behavior are difficult to evaluate in isolation and are not always without potential tradeoffs in cost, convenience, perceived safety, and other factors. The influence of **activity scale** on VMT has been under-appreciated. If the size of the economically viable operation for a school, store, hospital, or other function continues to increase, it can offset the benefits of other land use strategies for minimizing the need for travel.

Increasing **contiguousness of development** can reduce VMT but only applies within the boundary of the developed area. Caution is required here, however, as regulating contiguousness of development can cause jurisdictional and legal challenges and has been known to have unintended consequences such as leapfrogging of development to more distant unregulated areas. Absent those unintended consequences, contiguousness will increase density in the study area and reduce travel. Strategies to support more contiguous development can also have benefits with regard to other infrastructure costs, habitat preservation, and efficiencies in service delivery.

BENEFITS

Greater success in transportation-land use coordination offers the opportunity to slow the growth of VMT and improve livability characteristics of the urban environment. This study offers both information to enhance the state of knowledge and specific guidance regarding how policymakers might evaluate decisions in light of the current state of knowledge.

Given what is known about transportation and land use, a number of actions can be identified, which, if taken, appear prudent even in light of the uncertainty regarding the relationship between transportation and land use.

This project was conducted by Steven Polzin, Ph.D. with assistance from other faculty and staff at the University of South Florida, Center for Urban Transportation Research. For more information, contact Mr. David Blodgett, Project Manager, (850) 414-4815 david.blodgett@dot.state.fl.us.