



# Research Digest

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## *Item 1*

### **Drayage Activity in Texas**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/07/0-5684-2 • 2007*

The following report chronicles the first year's findings of project 0-5684. The report characterizes Texas drayage activity while focusing principally on activity occurring at the Port of Houston Barbour's Cut Container Terminal, the UP and BNSF rail yards located in Houston, and the border Ports of Laredo and McAllen. The seaport drayage component of the report draws upon information gained from interviews with dray managers and drivers as well as a database of truck activity provided by the Port of Houston. Patterns of delay at the port are broken into processing times that accrue outside and inside the port gates. The rail section describes the Pearland, Englewood, and Settegast yards in Houston. The border analysis relies on interviews with brokers and analysts in describing the emerging patterns of drayage.

Full-text PDF of this report is available for free download from  
<http://swutc.tamu.edu/publications/technicalreports/0-5684-2.pdf>

## *Item 2*

### **Population Updating System Structures and Models Embedded Within the Comprehensive Econometric Microsimulator for Urban Systems (CEMUS)**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/07/167260-1 • 2008*

This report describes the development of a population update modeling system as part of the development of the Comprehensive Econometric Microsimulator for SocioEconomics, Land-use, and Transportation Systems (CEMSELTS). CEMSELTS itself is part of the Comprehensive Econometric Microsimulator for Urban Systems (CEMUS) under development at The University of Texas at Austin. The research in the report recognizes that modeling the linkages among demographics, land use, and transportation is important for realistic travel demand forecasting. The population update modeling system focuses on the modeling of events and actions of individuals and households in the urban region. An analysis framework is proposed to predict the future-year population characteristics by modeling the changes to all relevant attributes of the households and individuals. The models identified in the analysis framework are estimated for the Dallas-Fort Worth region. The econometric structures used include deterministic models, rate-based probability models, binary logit models, multinomial logit models, and ordered-response probit models. To verify the outputs from these models, the predicted results for the year 2000 are compared against observed 2000 Census data.

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## *Item 3*

### **Microsimulation of Household and Firm Behaviors: Couple Models of Land Use and Travel Demand in Austin, Texas**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/07/167262-1 • 2007*

Households and firms are key drivers of urban growth, yet models for forecasting travel demand often ignore their dynamic evolution and several key decision processes. An understanding of household and firm behavior over time is critical in anticipating urban futures and addressing transportation, land use and other concerns. Birth and death, migration and location choice are defining events in a household's and firm's life cycle, and a study of household and firm evolution requires the estimation and application of models for each of these. Such an exercise is hindered primarily by a lack of quality micro-data. This study develops a basic framework for modeling household and firm demographics using microsimulation. Year 2005 zonal household population and employment point data for the Austin, Texas region, coupled with various, more aggregate data sets, are used to simulate household and firm evolution over time and space.

To ensure a jobs-worker balance, the model may well merit greater synchronization of the population and firm synthesis models. The simulations also suggest a clear shift of firms and households towards more central zones, in part because of the cross-sectional nature of the data sets used to calibrate the location choice models and the lack of density restrictions or other reflections of land-availability constraints on new development. Essentially, households and firms exhibit a strong centralizing tendency, that Austin's land market simply cannot allow, due to space and other constraints on new building. Explicit expressions of such constraints should prove helpful in future implementations of this work.

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<http://swutc.tamu.edu/publications/technicalreports/167262-1.pdf>

## *Item 4*

### **Compendium of Student Papers: 2007 Undergraduate Transportation Scholars Program**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/07/473700-00003-12 • 2008*

This report is a compilation of research papers written by students participating in the 2007 Undergraduate Transportation Scholars Program. The ten-week summer program, now in its seventeenth year, provides undergraduate students in Civil Engineering the opportunity to learn about transportation engineering through participating in sponsored transportation research projects. The program design allows students to interact directly with a Texas A&M University faculty member or Texas Transportation Institute researcher in developing a research proposal, conducting valid research, and documenting the research results through oral presentations and research papers.

The papers in this compendium report on the following topics, respectively: 1) analysis of trip generation estimates for mixed-use developments; 2) pedestrian and motorist perception of pedestrian signs in work zones; 3) analysis of driver compliance with work zone speed limits; and 4) nighttime driver needs: an analysis of current guide sign standards and the need for change.

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## **Item 5**

### **North American Transportation Corridor Network**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/07/473700-00091-1 • 2007*

Trade flows across the three North American countries have increased substantially since the implementation of the North American Free Trade Agreement (NAFTA), but there is no movement toward developing a true North American Transportation Corridor Network. This report examines two types of North American transportation corridor networks. The first is a transportation infrastructure network that spans across the three North American countries, including highways, railroads, and port of entries which are all part of a large multimodal transportation network. The second type of network analyzed, is a research network that is a collection and collaboration of organizations, individuals, and research that have the goal of improving transportation in North America. Through this research project, a group of transportation experts from the United States, Mexico and Canada was assembled through a webinar to discuss issues related to a North American transportation corridor plan. The formation of a North American transportation center is recommended to research and educate government officials on the current and projected state of transportation in North America.

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<http://swutc.tamu.edu/publications/technicalreports/473700-00091-1.pdf>

## **Item 6**

### **Developing Specifications for Performance-Based Maintenance Contracts**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167161-1 • 2008*

Performance-based maintenance contracts are becoming an increasingly popular method of procuring maintenance work. This study presents a framework for specifying such contracts. This framework is based on developing a pavement reliability model that is able to account for the effects of rehabilitation actions. The developed reliability model is able to predict the pavement performance before as well as after rehabilitation actions. Numerical illustration for the optimization model shows that the developed model can be used to obtain an optimal tradeoff between cost and performance. Further, the model considers a tradeoff between economies of scale associated with managing longer pavement sections, and risk mitigation benefits with managing relatively smaller e.g. more homogenous sections. The results indicate that the length of optimal management sections depends not only on risk premium costs, but also the ability of the contractor to explore economies of scale. The model is illustrated using typical data available to transportation agencies.

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## *Item 7*

### **Texas Urban Triangle: Framework for Future Growth**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167166-1 • 2008*

This project came into being due to the dramatic transformation of the four core Texas metropolitan areas into an emergent megalopolis: Dallas-Fort Worth, Houston, San Antonio, and Austin. Its aims are two-fold: to provide a framework for decisions about future growth in the fastest growing region of Texas, and to spur further research into the complexities of this vast and rapidly emerging mega-region. The Texas Urban Triangle- 17 million persons spread over 58,000 square miles- is a new urban phenomenon, a triangular megalopolis whose development is not linear and contiguous. This report gives policy makers and investors from all sectors the critical knowledge they need to make decisions that will shape the future of Texas.

The Texas Urban Triangle is one of the most dynamic urban regions in the nation, and to ensure it continues to flourish, we must build a future based on sustainable growth principles. Our preliminary findings suggest that this is not always the case. Further research needs to be conducted to obtain a complete, detailed, and comprehensive portrait. Nonetheless, even these preliminary findings are robust and point to more sustainable options for the future.

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<http://swutc.tamu.edu/publications/technicalreports/167166-1full.pdf>

## *Item 8*

### **Simulating Land Use Impacts of Highway Development in the Texas Triangle -- A Case Study of the Austin Metropolitan Region**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167266-1 • 2008*

This report is part of an ongoing research on the Texas Triangle megaregion, which refers to the region delineated by the metropolitan areas of Dallas/Fort Worth, San Antonio/Austin, and Houston. As the region expects a population growth by approximately 10 million in the next 40 years, it is important to understand the land use/land cover (LULC) implications of the vast growth. Even more important is to understand how public policies and investments (in infrastructure, for example) will influence LULC. The study reported here focuses on the effect of highway construction on LULC through a case study of the Austin, TX area. The methodologies developed from the Austin case may be applied to the entire Triangle to understand the effects of state-wide transportation strategies, for example, the Trans-Texas Corridor (TTC), on urban development outcome in the region. The Austin case study included three parts. First, historical data on highway constructions in the Austin area are collected and visualized in GIS. Next, land use/land cover maps are derived from classifying LandSat images. A binary logit model is then formulated, quantifying the impacts of transportation accessibility and neighborhoods on the likelihood of LULC change.

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## *Item 9*

### **A Scoping Study of the Impacts of Bioenergy and Alternative Fuels on the Southwest Region's Economy and Transportation Infrastructure**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167271-1 • 2008*

This scoping study inventories renewable energy alternatives and assesses their impact on the Southwest region's transportation sector. Biofuel transportation requirements and domestic/international supply chains are illustrated. A variety of potential solutions are described, including technologies currently commercially available and those still in a research phase. However, biofuels constitute the focus of this research given the current level of development and potential to impact the Southwest in the near term. Ethanol is the biofuel most widely marketed at the present time and therefore commands the bulk of this narrative.

The world's primary producers of ethanol are Brazil and the United States. These two nations employ different methods to manufacture the fuel from separate crops. Brazil utilizes sugarcane whereas the United States employs corn. A four parameter comparison focusing on the energy budget, carbon emissions reduction, land use, and production costs of each biofuel type strongly suggests Brazil's fuel is superior to the American derivative. Case studies illustrate how ethanol would reach Texas markets depending on whether the biofuel originated in American corn fields or the Brazilian cerrado.

Additional discussion cites Texas' limited ability to grow existing commercial biofuels locally. However, the Southwest region holds greater promise as a producer of next-generation alternatives still undergoing laboratory evaluation.

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## *Item 10*

### **An Analysis of the Texas 2002 Safe Routes to Schools Program in Selected Cities**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167362-1 • 2008*

Fewer children are walking to school than ever before. Many researchers contribute this to parents' fears that the walking environment is unsafe for children. As a result, federal and state programs were created to provide safe routes to school for children. This research will examine the Texas Department of Transportation's 2002 Safe Routes to Schools Program (SR2S) and will look at the differences between this program and the new program being implemented under SAFETEA-LU.

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## *Item 11*

### **Analysis of Federal and State Discretionary Funding of Highway and Transit Projects in FTA Region VI 1993-2000**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167622-1 • 2008*

The divestiture of the Federal Highway Trust Fund gave local officials the financial resources necessary to encourage the development of new transportation-related projects. Under the auspices of the Intermodal Surface Transportation Efficiency Act (ISTEA), some of these projects included bikeways, alternative fuel demonstration projects, and corridor beautification. ISTEA was not designed to hinder highway development and research, but encourage the implementation of alternate mobility strategies, especially in the country's urban cores. While ISTEA was the first attempt at discretionary funding, it was eventually replaced by the Transportation Efficiency Act for the 21st Century (TEA-21) and subsequently the Safe, Accountable, Flexible Efficient Transportation Equity Act- A Legacy for Users (SAFETEA-LU). Despite the efforts of this legislation, most urban cores still seem dependent upon highways.

This study conducts a historical evaluation of federal and state discretionary funds from 1993 to 2000 to determine the distribution patterns in Region VI (Texas, Louisiana, New Mexico, Arkansas, and Oklahoma).

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## *Item 12*

### **An Evaluation of Environmental Justice and Environmental Equity: Laws and Issues that Affect Minority and Low-Income Populations**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/167921-1 • 2008*

Environmental Justice and transportation equity concerns pertain to discriminatory outcomes in planning, operation and maintenance, and infrastructure development by state and metropolitan systems. On February 11, 1994, President Bill Clinton signed Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Two major federal laws, the National Environmental Protection Agency (NEPA) and Title VI of the Civil Rights Act, are highlighted in the Executive Order. This study provides an overview of literature and case studies regarding Environmental Justice issues and concerns. Additionally, the study includes survey responses of state DOT's and MPO's about their methods and viewpoints of addressing environmental justice in planning and projects.

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## *Item 13*

### **Evaluation of the Role and Needs of Air Cargo in Texas**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/473700-00037-1 • 2008*

According to the U.S. Department of Transportation, the cargo industry continues to grow, with air cargo identified as the fastest growing segment within the cargo industry. The value of freight moved by air has doubled since 1993 and currently exceeds \$2.7 billion per day. During that same period, the typical freight shipment distance increased 40 percent, partly due to the distances of the air cargo movements. Because most air cargo shipments begin and end using trucks, growth in this segment will undoubtedly create additional growth in truck movements in and around the airport environment.

It has been more than 30 years since the state has made a comprehensive review of the air cargo business within its borders. In that time, much has changed in Texas, in the United States, and across the globe. The industry has changed through consolidation and mergers with ground transportation companies, in the services they provide, and in the current level of technology employed. The world is a different place, our economies have been transformed, and the nature of doing business has altogether changed. So far, the impact of growth in air cargo on the Texas transportation system has gained little attention when compared to issues related to seaport traffic.

The research objective for this project is to better understand the operations of the air cargo industry in Texas in order to better accommodate the industry's needs, provide for a more efficient transportation network, better utilize general aviation facilities, and provide for economic development across the state. This research identifies the existing demand for air cargo movement in Texas, the ground facilities available to process this demand, and a network that would be efficient and responsive to the needs of industry stakeholders. It also identifies the state's network of existing air cargo facilities, both those handling existing air cargo activity and those capable of handling air cargo in the future.

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## ***Item 14***

### **A Synthesis of Transportation Emissions Research: Current Status and Future Directions**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/473700-00049-1 • 2008*

Transportation related emissions are one of the dominant contributing sources of air pollutants today. Considering the negative impacts of transportation related emissions on our social and economic environment, extensive efforts have been made by researchers and practitioners attempting to find solutions to reducing emissions. In order to synthesize these research efforts, various reviews of relevant studies have been conducted by researchers. However, because of the diversity of the topics, most of existing reviews have only focused on specific and narrowed areas. Further, none of the existing reviews has attempted to summarize the researchers' personal opinions on the current research and their prospects of the future research directions. Therefore, this report is intended to fill this gap by conducting a comprehensive review of the research on transportation related emissions and implementing an extensive survey to the transportation emission professionals. In the report, a review of existing research and developments on each of the emission related topics is provided, which is followed by a presentation of the respective survey results and analysis. Future research directions in this field are presented based on the findings of the review and results of the survey. As a conclusion, current research status is summarized for each topic and recommendations are made for future research directions.

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## ***Item 15***

### **Performance Assessment and Comparison between Fixed and Flexible Transit Services for Different Urban Settings and Demand Distributions**

*SOUTHWEST REGION UNIVERSITY TRANSPORTATION CENTER (SWUTC)*

*SWUTC/08/473700-00090-1 • 2008*

In the transit business, planners often face a difficult decision when having to choose what type of operating policy to put in place in a given service area. In fact, the decision is not straightforward, mainly because the demand for the service is often unknown beforehand and it will depend on the established system itself. This is especially true for feeder lines, one of the most often used types of flexible transit services connecting a service area to a major transit network through a transfer point. They often switch operations from/to a demand responsive to/from a fixed-route policy. In designing and operating such systems, the identification of the condition justifying the operating switch is often hard to properly evaluate.

In this research, we propose an analytical modeling and solution of the problem to assist decision makers and operators in their choice. By employing continuous approximations, we derive handy but powerful closed-form expression to estimate the critical demand densities, representing the switching point between the competing operating policies.

Based on the results of one-vehicle and two-vehicle operations for various scenarios and their comparison to simulation generated values, we verify the validity of our analytical modeling approach. Estimated critical demand densities for the one-vehicle case and a service area with  $L=2$  and  $W=0.5$  range from 14 to 30 customers/hr/mile<sup>2</sup>.

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