



**Year 14 (2001-2002)**  
**Semi-Annual Progress Report**  
**For the**  
**University of California Transportation Center**

**February 28, 2002**

**Director: Prof. Elizabeth Deakin**  
**Tel. 510 642-4749**  
**Fax 510 643-5456**  
**Email [edeakin@uclink.berkeley.edu](mailto:edeakin@uclink.berkeley.edu)**

**Staff Contact: Diane Sutch**  
**Tel. 510 643-7378**  
**Fax 510 643-5456**  
**Email [dsutch@uclink.berkeley.edu](mailto:dsutch@uclink.berkeley.edu)**

**108 Naval Architecture Bldg.**  
**University of California**  
**Berkeley CA 94720-1782**

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## **Success Stories**

The University of California Transportation Center funds faculty research, underwrites graduate student fellowships and PhD dissertation grants, supports new educational initiatives, and sponsors conferences, symposia, and other technology transfer activities. We receive equal funding from the US Department of Transportation (for whom we are the designated Region 9 University Transportation Center) and the California Department of Transportation. In our most recent Strategic Plan, we made a commitment to increase our outreach efforts and to make special efforts to help put research into practice. The following examples document some of our results to date in the first half of the UCTC's 2001-2002 grant year – Year 14 of the Center.

### **Conferences and Symposia**

#### **Asilomar Conference**

August 2001

Asilomar Conference Center

Monterey, California

Conference Organizer: Daniel Sperling, UC Davis

This weeklong conference, held at the Asilomar Conference Center in Monterey, California, is held every other year with support from UCTC and others. Participants include senior researchers and executives in the fields of transportation, automotive manufacturing, automotive fuels, energy, and environment. Some 100 participants attended the invitational event this year.

#### **The Second International Symposium on Transportation Infrastructure Management**

October 11 and 12, 2001

University of California

Berkeley, CA

Conference Organizer: Samer Madanat, UC Berkeley

The International Symposium on Transportation Infrastructure Management (ISTIM) served as a forum for detailed presentations and discussions of issues concerning transportation infrastructure management. The first symposium was organized by Professor Kiyoshi Kabayashi of Kyoto University and held there in August 2000. Presentations covered deterioration modeling, maintenance decision-making, and finance.

The second meeting, held at the UC Berkeley campus, aimed to build upon the first and expand the scope to cover broader issues relating to integrated asset management, institutional and contractual design, environmental impacts, and economic development. Presenters, who appeared by invitation only, were selected in light of their contributions to the field of infrastructure planning, provision, and operation. Their presentations concerned either a specific research question they have been addressing or their detailed thoughts and perspectives on issues related to any of this year's topics that they are actively investigating. Session topics covered construction impact on performance, optimal maintenance and repair, life cycle costing, and risk management.

## **Arrowhead Transportation/Land Use/Air Quality Symposium**

The Fall 2001 Lake Arrowhead Transportation / Land Use / Air Quality Symposium, convened by the UCLA Extension Public Policy Program in association with UCTC and a number of government sponsors, was held on October 14-16, 2001. This year's sessions focused on the future of transit. Topics covered included transit's financial situation, new concepts for improving service, and new technologies. The symposium also probed the best ways to measure the costs and benefits of transit, environmental justice and equity issues, land use connections, and environmental impact issues.

The invitational retreat had 130 participants, including academics and researchers from UC and other universities, federal, state and local policy-makers and advisors, public agencies responsible for transportation and air quality; environmental organizations; and private industry (including developers, utilities, and other industry groups). The sessions are organized to engage policy-makers, practitioners, and researchers in in-depth discussions.

## **IURD Seminar Series**

UCTC helped support the Institute of Urban and Regional Development (IURD) Dinner Seminar Series. Each seminar brings together a small group of 20-30 faculty members, state and local elected officials, senior staff members from state and local agencies and the Legislature, and other interest group members to hear a talk about a current policy issue and to discuss the issue in depth. The seminar topics this fall were housing, growth, and collaborative decision-making.

## **Transportation Research Board Annual Meeting**

Three dozen faculty members and graduate students affiliated with UCTC presented papers at sessions of the annual meeting of the Transportation Research Board this January in Washington, DC. A link to these TRB papers will be placed on the UCTC website during the spring. In addition, the UC Transportation Center jointly hosted a reception at TRB with its ITS partners from the Berkeley, Irvine, Davis, and LA campuses, the UC PATH program, the UC Center for Traffic Safety, and the National Center of Excellence for Aviation Operations Research. Over 300 faculty and students from all UC campuses, alumni of the UC transportation programs and UCTC, and friends from many other transportation centers and research groups joined us in the Omni Shoreham Bird Cage Room for good company and good cheer. The reception was held Monday, January 8 in the Omni Shoreham Hotel, Bird Cage Room.

## **Awards and Honors**

### **Student of the Year**

Jeffrey Brown, a PhD student at UCLA, was chosen UCTC Student of the Year. The award was given at a special ceremony for all Transportation Centers during the Transportation Research Board Meeting in Washington, DC, in January 2001.

### **Research Prizes**

Berkeley Prof. John Quigley's research on the transport problems of low wage workers was one of two bodies of work cited in the presentation of the Walter Isard Award "for Contributions to Regional Economics" to him at the Annual Meetings of the Regional Science Association International. Quigley's research on these problems has been sponsored by grants from UCTC, most recently during 1999-2000.

Alan Erera's thesis, "Design of large scale logistics systems for uncertain environments" received first prize in the international competition sponsored by INFORMS. Erera's supervisor was Prof. Carlos Daganzo of UC Berkeley, whose input into the work was partly supported with a 1999-2000 UCTC research grant.

Ricardo Archilla, whose PhD research was funded through two UCTC major research grants, was awarded the 2000 Milton Pikarsky award for best dissertation in Transportation Science and Technology by the CUTC in 2001. Prof. Samer Madanat of UC Berkeley was the dissertation supervisor.

An undergraduate in Dr. Amelia Regan's research group was selected to represent UC Irvine at the annual UC Day in Sacramento in March of 2002. Jiri Herrmann was one of two UC Irvine students selected to present their research to an audience that included Governor Gray Davis and UC President Richard C. Atkinson. Hermann's UCTC-sponsored research is on the topic of dynamic and stochastic logistics network optimization. Herman was also UCI's undergraduate researcher of the month in February 2002.

### **Research into Practice**

**Advising the House.** Prof Dan Sperling of UC Davis testified to the House Science Committee on the Bush Administration's proposal to replace the Partnership for a New Generation of Vehicles with a new public-private R&D program called FreedomCAR. His testimony was based on a UCTC grant about public-private research partnerships.

**Research Exchange on Trucking Issues.** Professor Amelia Regan presented her UCTC research as an invited speaker at the Entretiens J. Cartier, an international conference of primarily French, French Canadian and Belgian researchers in Montreal in October, 2000.

The work addressed the issue of the impacts of congestion on various sectors of the trucking industry.

**Regional Modeling Improvements.** Professor Bob Johnston has been implementing the MEPLAN integrated land use and transportation model in the Sacramento, California region for several years, partly supported with UC Transportation Center funds. SACOG, the region's MPO, has recently decided to use this model for alternatives analysis in a program investigating land use and transportation scenarios. SACOG will now join Johnston in funding the continuing work to further improve the model and apply it. SACOG is also using a GIS-based model designed by Johnston to disaggregate the zonal land use projections from MEPLAN. This model development was supported by UCTC a few years ago. Together, the economic model and the GIS model permit the simulation of a great variety of policies and the resultant travel and land use patterns. Related GIS and other models allow the agency to project the impacts of the policy sets on habitats, service costs, costs from flooding and wildfires, erosion, and mobile emissions.

**Advanced Survey Methods.** REACT!, a computer-aided self-administered interview to survey travel and activity behavior, is being used for the evaluation of travel behavior impacts resulting from participation in ZEVNET, a shared-use station car program in Irvine CA. ZEVNET, a unique public/private partnership, is utilizing electric vehicles provided by Toyota to local corporations for use in daily business travel as well as to access rail service at the Irvine Transportation Center. A GPS-based vehicle monitoring system provides tracings of vehicle use as part of the REACT! survey. REACT! Was developed by a team led by Professor Michael McNally and Ming S. Lee of UC Irvine with support from a 1998-2000 UCTC faculty grant.

**Vision and Safety.** Prof. Theodore Cohen's UCTC escalator project dealt with how we judge our distance to objects. Insights gained from that and from other studies have led to proposed new warning signals for transit vehicles (to prevent rear-end collisions) that will be field tested in Ann Arbor during the coming year. Further down the road are (1) rear-end collision warning devices for passenger vehicles to be tested at VTTI with NHTSA funding, based upon principles that Cohen developed in follow-on studies, (2) improved railroad crossing signals, and (3) embedded pavement warning signals for rail crossings. Each of these research thrusts based upon a mixture of engineering and the biology of vision, but all require serious and competent understanding of policy issues to achieve deployment.

**Wearable Computers for Data Collection.** Professor Reginald Golledge presented material from his research on wearable computers as activity data collection devices as part of a presentation on "Smart Environments" at the NSF/NIH/NASA sponsored workshop on Converging Technologies - Nanotechnology, Biotechnology, Information Technology and Cognitive Technology. The workshop was held in Washington, D.C. on December 3-4, 2001.

**Transit-Oriented Development Lectures.** Professor Robert Cervero has given a number of speeches to public officials and public organizations over the past year, drawing upon his two most recent UCTC projects one on induced demand, and the other on ridership impacts of transit-oriented developments - TODs. His overseas lectures include talks at Simon Fraser University, Vancouver, British Columbia; the South Asia Urban Management Course, Jaipur,

India; the Indian Institute of Technology, Kanpur, India; the Annual Congress, Beurs van Berlage, Amsterdam, The Netherlands; and the Universidade Federal do Cear, Fortaleza, Brazil. He also has spoken recently at the Pat Brown Institute, California State University, Los Angeles, the School of Architecture, University of Maryland, College Park, Maryland, and the UCLA Public Policy Program California Futures Conference.

**Bus Stop Crime.** Professor Anastasia Loukaitou Sideris' UCTC project on the environmental attributes of bus stop crime led has the Los Angeles County Metropolitan Transportation Authority (MTA) to allocate over \$500,000 for the environmental retrofit a dangerous bus stops in downtown Los Angeles, and another \$500,000 for similar retrofit of dangerous bus stops in other municipalities of the L.A. County.

### **Publications**

UCTC helps put research into practice by making our publications available free of charge. Publications include final reports (a new series started with Year 12 grants) – brief statements of the work performed on each completed UCTC project. However, most UCTC projects produce many other products, including technical reports, working papers, journal article reprints, monographs, and even books and films. Our publications are listed on our web page, where we have over 1000 visitors per month. All final reports and an increasing number of other UCTC publications can be directly downloaded from the web; others are mailed to anyone who requests a copy.

Publications produced so far in 2001-2002 are shown in Table 1.

**Table 2 UCTC Publications - Fall 2001-Winter 2002**

Boarnet, Marlon G. and Andrew F. Haughwout	Do Highways Matter? Evidence and Policy Implications of Highways' Influence on Metropolitan Development	2001, Fall	515
Leung, Carolyn, Evelyn Blumenberg and Julia Heintz-Mackoff	The Journey to Work: UCLA Symposium on Welfare Reform and Transportation	2001, Fall	516
Mason, Jonathan and Elizabeth Deakin	Information Technology and the Implications for Urban Transportation	2001, Fall	517
Deakin, Elizabeth, Chris Ferrell, Tanu Sankalia and Patricia Sepulveda	The San Pablo Dam Road Commercial District in El Sobrante, California: Baseline Study	2001, Fall	518
Deakin, Elizabeth	Sustainable Development & Sustainable Transportation: Strategies for Economic Prosperity, Environmental Quality, and Equity	2001, Fall	519
Cervero, Robert	Road Expansion, Urban Growth, and Induced Travel: A Path Analysis	2001, Fall	520
Mokhtarian, Patricia L. and Ilan Salomon	How Derived is the Demand for Travel? Some Conceptual and Measurement Considerations	2001, Fall	521
Turrentine, Thomas S. and Kenneth S. Kurani	Marketing Clean and Efficient Vehicles: Workshop Proceedings	2001, Fall	522
Burke, Andrew	Meeting the New CARB ZEV Mandate Requirements: Grid-Connected Hybrids and City Evs	2001, Fall	523
Goldman, Todd, Sam Corbett and Martin Wachs	Local Option Transportation Taxes in the United States	2001, Fall	524
Brown, Jeffrey, Daniel Baldwin Hess and Donald Shoup	Unlimited Access (from Transportation 28)	2001, Fall	525
Redmond, Lothlorien S. and Patricia L. Mokhtarian	The Positive Utility of the Commute: Modeling Ideal Commute Time and Relative Desired Commute Amount	2001, Fall	526
Cervero, Robert, John Landis, Juan Onesimo Sandoval, and Mike Duncan	The Transition from Welfare-to-Work: Policies to Stimulate Employment and Reduce Welfare Dependency	2001, Fall	527
Shoup, Donald C.	Parking Cash Out	2001, Fall	528
Elizabeth Deakin, John Thomas, Christopher Ferrell, Kai Wei Manish Shirgaokar, Songju Kim, Jonathan Mason, Lilia Scott, and Vikrant Sood	Overview and Summary: Twelve Trends for Consideration in California's Transportation Plan	2001, Fall	529
Thomas, John V., and Elizabeth Deakin	California Demographic Trends: Implications for Transportation Planning	2001, Fall	530
Ferrell, Christopher, and Elizabeth Deakin	Changing California Lifestyles: Consequences for Mobility	2001, Fall	531

Shirgaokar, Manish, and Elizabeth Deakin	California Housing Trends: Implications for Transportation Planning	2001, Fall	532
Wei, Kai, and Elizabeth Deakin	Trends in California's Jobs	2001, Fall	533
Ferrell, Christopher E., Songju Kim, and Elizabeth Deakin	California's Freight Patterns	2001, Fall	534
Thomas, John V., and Elizabeth Deakin	Addressing Environmental Challenges in the California Transportation Plan	2001, Fall	535
Deakin, Elizabeth, and Songju Kim	Transportation Technologies: Implications for Planning	2001, Fall	536
Deakin, Elizabeth	The Central Valley: Coping with Growth and Change	2001, Fall	537
Clark, William A. V., Youqin Huang, and Suzanne Davies Withers	Does Commuting Distance Matter? Commuting Tolerance and Residential Change	2001, Fall	538
Golledge, Reginald G., and Jianyu Zhou	GPS-Based Tracking of Daily Activities	2001, Fall	539

## **New Academic Courses**

The design of several new courses has been initiated at the various campuses, but will not be offered until Spring 2002 or the 2002-2003 academic year. Reports on these courses will be included after they have been fully developed.

## **New Academic Programs**

We have no new academic programs to report at this time.

## **B. Research Project Status**

Fifty faculty research projects have been underway during UCTC's Year 14, because of carry-overs from Years 12 and 13. Year 12 projects were delayed because of late receipt of funds (which also were on an October-September grant cycle instead of the current August-July grant cycle.) During Year 13, accounting system changeovers at several campuses caused delays in transferring and recording funds and setting up project accounts. We are happy to report that most year 12 projects are now complete (seven projects of the 20 are closed out) or nearly so (with expected completion during the next several months.) Most Year 13 projects are on target for completion by the end of this grant cycle – two are complete now. Year 14 projects, which started this past August, are well underway.

Consequently, we are reporting on twenty Year 12 projects, 15 Year 13 projects, and 15 Year 14 projects.

The projects for each year are listed in Tables 2, 3, and 4. Please note that all UCTC projects include funding for one or two graduate student research positions and for one or two faculty summer months. Other faculty time during the academic year is donated. In addition, the California Department of Transportation and the US DOT jointly sponsor all projects. Caltrans' dollar-for-dollar match of federal funds for UCTC has been critical to our success.

Following the tables are brief reports that present the status of each faculty research project underway at UCTC in 2001-2002. The reports cover performance through January 2002.

## **Table 2. Year 12 (1999-2000) Projects (20 Projects)**

### **A. Completed (final reports submitted to UCTC) – 7 Projects**

#### **Induced Travel Demand: A Systems Analysis of Longer Term Impacts of Road Expansion**

Robert Cervero, City and Regional Planning, Berkeley

#### **Measuring the Impact of the Internet on the Trucking Industry**

Carlos Daganzo, Civil & Environmental Engineering, Berkeley

#### **Roadway Tunnel Measurements of Carbon and Nitrogen-Containing Air Pollutants**

Robert Harley, Civil & Environmental Engineering, Berkeley

#### **Estimation of Latent Pavement Properties Using Condition Survey Data**

Samer M. Madanat, Civil and Environmental Engineering, Berkeley

#### **Online Versus Rolling Horizon Algorithms for Dynamic Service Fleet Operations**

Amelia Regan and Sandra Irani, Civil & Environmental Engineering

#### **Regional Transportation Infrastructure Finance in the U.S.**

Martin Wachs, Institute of Transportation Studies, Berkeley

#### **Estimating Freeway Traffic Stream Modal Activities for Air Quality Modeling**

H. Michael Zhang, Civil and Environmental Engineering, Davis

### **B. Continuing (See Status Reports) – 13 Projects**

#### **The Transportation Behavior and Needs of Welfare Recipients**

Evelyn Blumenberg, Public Policy and Social Research, Los Angeles

#### **New Highways and Urban Growth Patterns: Using Locally Weighted Regression to Measure the Development Impacts of the Orange County Toll Roads**

Marlon Boarnet, Urban & Regional Planning, Irvine

#### **GPS-Based Data Handling for Activity Based Modeling**

Reginald G. Golledge, Department of Geography, Santa Barbara

#### **Impacts of Shipping Changes on the Efficiency of the Freight Transportation Network**

Tom Golob and Amelia Regan, Institute of Transportation Studies, Irvine

#### **The Effects of Urban Land Use Patterns on Household Trip-Making Behavior: An Empirical Analysis**

John D. Landis, City & Regional Planning, Berkeley

#### **Putting Behavior in Household Travel Behavior Data: An Interactive GIS-based Survey Via the Internet**

Michael G. McNally, Institute of Transportation Studies, Berkeley

#### **Measuring the Role of Transportation in Facilitating the Welfare-to-Work Transition**

Paul M. Ong, Public Policy and Social Research, Los Angeles

#### **Development of Estimation Procedures for Activity-Based Model Forecasting**

Will Recker, Institute of Transportation Studies, Irvine

**Table 2 cont. – Continuing Projects, Year 12**

**Evaluating a University Transit Pass Program**

Donald Shoup, Institute of Transportation Studies, Los Angeles

**Journeys to Crime: Documentation and Evaluation of Crime Incidence on and around Railway Stations in Los Angeles**

Anastasia Loukaitou-Sideris, Urban Planning, Los Angeles

**The Viability of Value Pricing Demonstrations**

Kenneth Small, Institute of Transportation Studies, Irvine

**Greenhouse Gas Emissions Trading and the Transport Sector**

Daniel Sperling, Institute of Transportation Studies, Davis

**Driving for Dollars: How the Politics of Finance Has Shaped the California Highway System**

Brian D. Taylor, Urban Planning, Los Angeles

### **Table 3. Year 13 (2000-2001) Research Projects (15 Projects)**

#### **A. Completed as of March 1, 2002 (final reports submitted to UCTC) – 2 Projects**

**Does Commuting Distance Matter? Commuting Tolerance and Residential Change**

William A.V. Clark, Geography, UCLA

**An Evaluation of Local Option Transportation Taxes in California**

Professor Martin Wachs, Institute of Transportation Studies, UC Berkeley

#### **B. Continuing (See Status Reports) – 13 Projects**

**Stationary Traffic Models and Freeway Geometry**

Michael Cassidy, Civil and Environmental Engineering, UC Berkeley

**E-Commerce and the Efficiency of the California Freight Network: Perspectives of Shippers, Carriers and Third Party Logistics and Information Services Providers**

Thomas F. Golob and Amelia C. Regan

**Assessing the Influence of Residential Location Changes on Travel Behavior**

Michael G. McNally, Civil and Environmental Engineering, UC Irvine

**The Impact of Attitudes toward Mobility, Adoption of Previous Strategies, and Demographic Characteristics on Responses to Congestion**

Patricia L. Mokhtarian, Civil and Environmental Engineering, UC Davis

**Measuring the Role of Transportation in Facilitating the Welfare-to-Work Transition (Third Year)**

Paul Ong, Urban Planning, UCLA

**Systematic Transport Access and Policies for Low Wage Labor Markets**

John M. Quigley, Public Policy, UC Berkeley

**Activity-Based Forecasting Model for Planning Applications**

Will Recker, Institute of Transportation Studies, UC Irvine

**Inventory Theoretic Models of Freight Demand: Revisiting the Past in Light of the New Economy**

Amelia Regan, Civil Engineering, and Charles Lave and Amihai Glazer, Economics, UC Irvine

**The Environment - Transit Crime Connection: Continuing Study of the Metro Green Line and its Vicinity**

Anastasia Loukaitou-Sideris, Urban Planning, UCLA

**Has Parking Cashout Failed in California?**

Don Shoup, Public Policy and Social Research, UCLA

**Reconsidering the Effects of Fare Reductions on Transit Ridership**

Brian D. Taylor, Urban Planning, UCLA

**Planes, Trains, or Camionetas (little buses)? A Baseline Study of an Informal Travel Mode**

Abel Valenzuela Jr., Public Policy and Social Research, UCLA

**Understanding and Modeling Driver Behavior in Dense Traffic Flow**

H. Michael Zhang, Civil and Environmental Engineering, UC Davis

**Table 4. Year 14 (20012002) Research Projects (15 Projects – New)**

**Note: All projects are scheduled to be completed in July 2002 unless otherwise noted in status reports.**

**Using the Spatial Configuration of Cities to Estimate the Impact of Commuting Time on Hours of:**  
Antonio Bento, UC Santa Barbara

**Evaluation of the California Safe Routes to School Program**  
Marlon Boarnet and Kristen Day, UC Irvine

**Forecasting Demand and Values of Travel Time Savings for Freeway HOV, Toll and HOT Facilities: Incorporating Attitudes and Perceptions into Commuter Choice Models**  
David Brownstone and Thomas Golob, UC Irvine

**Transit-Based Housing: Residential Sorting and Its Influence on Mode Choice**  
Robert Cervero, UC Berkeley

**How Does Travel Behavior Change When Households Change Jobs?**  
William Clark, UCLA

**Design of Vehicle Routes and Driver Shifts for Systems with Uncertain Demand**  
Carlos Daganzo, UC Berkeley

**Real-time Travel Data Collection System Augmented with Speech Interface**  
Reginald Golledge, UC Santa Barbara

**Effect of Driving Mode on Light-Duty Vehicle Emissions Measured On-Road**  
Robert Harley, UC Berkeley

**Life -Cycle Environmental and Economic Assessment of Using Recycled Materials for Asphalt Pavements**  
Arpad Horvath, UC Berkeley

**Reinforcement Learning in Transportation Infrastructure Management**  
Samer Madanat, UC Berkeley

**Dissonance between Desired and Current Residential Neighborhood Type: Relationships to Travel-Related Attitudes and Behavior**  
Patricia Mokhtarian and Ilan Salomon, UC Davis

**Optimal Control Policies for Urban Corridor Management**  
Wilfred Recker, UC Irvine

**The Impact of Motor Vehicle Transportation on Water Quality**  
Jean Daniel Saphores, UC Irvine

**Putting Back the Pleasure in the Drive: Reclaiming Urban Parkways for the 21<sup>st</sup> Century**  
Anastasia Loukaitou-Sideris, UCLA

**Equity and Environmental Justice in Transportation**  
Martin Wachs, UC Berkeley

## **Year 12 (1999-2000) Project Status Reports – Continuing Projects**

### **The Transportation Behavior and Needs of Welfare Recipients**

#### **Principal Investigator:**

Evelyn Blumenberg  
Public Policy and Social Research  
3250 Public Policy Building  
Los Angeles, CA 90095-165  
310-825-1803  
[ebumenb@ucla.edu](mailto:ebumenb@ucla.edu)

#### **Abstract:**

This study applies survey research and data analysis to investigate travel patterns and identify transport needs of welfare recipients. In particular, the study will focus on the travel patterns and needs of Southeast Asian welfare participants in Los Angeles and Fresno Counties. **Key Words:** welfare-to-work, transportation needs, survey research

#### **Work Completed to Date:**

A contract was negotiated, allowing the research team access to confidential data from which to draw a sample of welfare recipients. A survey instrument was developed and tailored to the project, and was approved by the UCLA Human Subjects Committee. A sample of welfare participants was drawn, and the survey was translated into Spanish and Hmong. The survey was administered in May 2001. The sample of Southeast Asian welfare recipients in Fresno has been combined with a similar sample from Los Angeles. Preliminary analysis of the data has been conducted and a draft of the paper has been produced. This final analysis and paper will be completed within the next two months.

#### **Papers to Date:**

None.

#### **Conferences Attended:**

None to date

#### **Other Accomplishments:**

None to date

#### **Percent Complete:**

85%

#### **Direct Cost:**

\$15,085

## **New Highways and Urban Growth Patterns: Using Locally Weighted Regression to Measure the Development Impacts of the Orange County Toll Roads**

### **Principal Investigator:**

Marlon Boarnet  
Urban & Regional Planning & Institute of Transportation Studies  
University of California, Irvine  
Irvine, CA 92697-3600  
Tel: (949) 824  
Fax (949) 824-8385  
[mgboarne@uci.edu](mailto:mgboarne@uci.edu)

### **Abstract:**

Recent prominent discussions of the link between highways, urban decentralization and induced automobile travel have created a need to better understand the specific nature of any influence that new highways have on urban development. This research will use econometric models of house sales prices and census tract population and employment growth to examine whether and how toll roads have changed land values and, by extension, development patterns in Orange County, California. The research will carefully examine how the opening of the county's extensive toll road network influenced house prices and census tract population and employment. Such a test has never been done using advanced empirical techniques, with the extensive data that are currently available, and in the context of a road building project as extensive as the recent construction of the three major toll roads in Orange County. The results of this research will provide the first statistically and theoretically sound "before and after" test of the effect of highways on urban growth patterns. **Key words:** highways, urban development, land use-transportation link, econometric models

### **Work Completed to Date:**

This project contained two separate analyses of the impact of new toll roads on urban development. The first analysis examined how the opening of the toll roads influenced house prices. We compiled data on all home sales prices in Orange County, California from 1988 through early 2000. The data were cleaned and address matched using a GIS program. Distances from each house to the nearest toll road and highway on-ramp were calculated. Several regression models were estimated to analyze the impact of the toll roads on house prices in nearby corridors. The results show that the toll roads influenced house prices, and by inference land prices.

The second analysis used an econometric model of population and employment growth to estimate the impact of access to the toll roads on development patterns in Orange County. An econometric model of population and employment growth was fit on census tracts for two time periods, 1980-1990 (before the construction of the toll roads began) and 1990-1997 (a time period that included the opening of the first two segments of toll roads). For both time periods, a variable that indicated whether a tract was in the toll road corridor was included in the model. This provided a "natural experiment," since the variable describing access to the toll road would be expected to be insignificant in the 1980-1990 model, but significant (under the hypothesis of an impact from the toll road) in the 1990-1997 model. The results, while at times difficult to interpret, reflect a pattern that suggests that the toll roads increased employment growth in nearby tracts but possibly did not have an influence on population growth.

The final results from the econometric model still need to be written in a form that can be submitted for journal publication, and a final report for the UCTC web site will be prepared.

### **Papers to Date:**

M. Boarnet and S. Chalermpong, "New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, California," *Housing Policy Debate*, forthcoming.

M. Boarnet, S. Chalermpong, E. Geho, "Specification Issues in Models of Intrametropolitan Population and Employment Growth," working paper, January 2002.

**Conferences Attended**

EPA symposium on induced travel, Berkeley, CA, June 2000  
Association Collegiate Schools of Planning, Nov. 2000  
North American Regional Science Association, Nov. 2000  
Transportation Research Board meetings, Jan. 2001

**Other Accomplishments**

“New Highways, Urban Development, and Induced Travel,” an earlier version of “New Highways, House Prices, and Urban Development: A Case Study of Toll Roads in Orange County, California,” won the Fannie Mae Foundation prize for best paper on a housing and community development topic at the 2000 Association of Collegiate Schools of Planning meeting.

**Percent Complete:** 95%

**Direct Cost:** \$32,199

## **GPS-Based Data Handling for Activity Based Modeling**

### **Principal Investigator:**

Reginald G. Golledge  
Department of Geography  
University of California, Santa Barbara  
805-893-2731  
[golledge@geog.ucsb.edu](mailto:golledge@geog.ucsb.edu)

### **Abstract:**

We use the U.S. Department of Transportation's GPS-generated Lexington Travel Data to conduct a detailed spatial and temporal analysis of activities, including single-trips and trip chains and compare it with the data needs of SMASH and ALBATROSS, two leading packages for activity analysis, and we will conceptually define how a GIS can be adapted to perform the analytical functions required by SMASH and ALBATROSS. Finally, we adapt the Santa Barbara-based GISICAS CPM to handle these requirements. **Key Words:** GIS, behavioral travel model, GPS, activity analysis

### **Work to Date:**

This project is essentially complete. We have examined the Lexington database, have determined the extent of the data that can be analyzed, and have calculated day by day correlations of activity patterns, grouped functions and activities with similar spatial and temporal occurrence patterns. We calculated spectral signature for daily and weekly activity patterns, calculated distance traveled to activity source using circular statistics, and conducted discriminant analysis to define different clusters of activities that differentiate daily behavior patterns. The GPS tracked data shows that Monday, Tuesday, and Wednesday produced remarkably similar spatio-temporal patterns, while Fridays were clearly demarcated at hosting different behaviors, different travel times, and different distances traveled. A research report provides details. A final summary report is being prepared.

### **Papers to date:**

- Zhou, J. and Golledge, R. A GPS-based Analysis of Household Travel Behavior. Presented at the 39th Annual Meeting of the Western Regional Science Association, Kauai, Hawaii, February 26-March 1, 2000.
- Zhou, J. and Golledge, R. An Analysis of Household Travel Behavior Based on GPS. Presented at IATBR Conference, Gold Coast, Australia, July 2000.
- Zhou, J. Analysis of Variability of Weekly Travel Behavior Using GPS-Recorded Data - A thesis submitted for the degree of Master of Arts in Geography by Jianyu (Jack) Zhou

### **Conferences Attended:**

- 39th Annual Meeting of the Western Regional Science Association, Kauai, Hawaii, February 26-March 1, 2000.
- IATBR Conference, Gold Coast, Australia, July 2000.

### **Other Accomplishments:**

None to date

**Percent Complete:** 100% except final report, which is being prepared

**Direct Cost:** \$25,552

## **Impacts of Shipping Changes on the Efficiency of the Freight Transportation Network**

### **Principal Investigators:**

Tom Golob and Amelia Regan  
Institute of Transportation Studies  
University of California, Irvine  
949-824-5989  
[tgolob@uci.edu](mailto:tgolob@uci.edu); [aregan@uci.edu](mailto:aregan@uci.edu)

### **Abstract:**

Manufacturing and distribution systems have undergone significant changes in recent years; "just-in-time" production and distribution systems have led to an increase in the number of time-sensitive freight movements. Time-definite services and regular updates on the status of en-route shipments are expected of many shippers. Additionally, freight movements take place in smaller units, increasing overall freight movements. This study extends an earlier study of the trucking industry in California by focusing on the impacts of shipper decisions on performance of the highway transportation system. Information will be gathered using both stated preference and revealed preference survey techniques. Forecasts of future freight transport growth will be developed and of likely changes in the configuration of the freight network in southern California. **Key Words:** freight demand modeling, commercial vehicle operations, urban goods movement, shipper behavior

### **Work to Date:**

We began with an in-depth examination of the 3rd Party Logistics Industry. This examination is detailed in the first two papers listed below. We developed two surveys for 2001 deployment. The first is a survey of the trucking industry completed in June 2001. We are examining those data now. We have three working papers and expect to have these finished by the end of September. The second survey is of the 3PL industry.

### **Papers to date:**

A. C. Regan and J. Song (2001), An Industry in Transition: Third Party Logistics in the Information Age, CD Rom proceedings of the 80th meeting of the transportation research board

J. Song and A.C. Regan (2001), Transition or Transformation? Emerging Freight Transportation Intermediaries, *Transportation Research Record*, in press.

Golob, T.R and A.C. Regan (2001), Trucking Industry Demand for Information Technologies, A Structural Multivariate Probit Model, *Transportation Research, Part C*, in press.

Golob, T.F. and A.C. Regan (2001), Impacts of Information Technology on Personal Travel and Commercial Vehicle Operations: Research Challenges and Opportunities, *Transportation Research, Part C, Emerging Technologies*, 9, pp. 87-121.

Forster, P. and A.C. Regan (2001) Information Technology in Air Cargo: Interorganizational Systems and On-Time Performance, *Transportation Journal*, in press.

### **Conferences Attended:**

TRB 2001

### **Other Accomplishments:**

The project has caught the attention of industry professionals, who have expressed interest in the work.

**Percent Complete:** 99% --we are working on the final report and additional publications.

**Direct Cost:** \$30,601

## **The Effects of Urban Land Use Patterns on Household Trip-Making Behavior: An Empirical Analysis**

### **Principal Investigator:**

John D. Landis  
City & Regional Planning  
UC Berkeley CA 94720-1850  
510-642-5918  
[landis@uclink.berkeley.edu](mailto:landis@uclink.berkeley.edu)

### **Abstract:**

Little empirical work has been done to confirm or reject the belief, held by most planners, that land use patterns and forms significantly affect travel behavior. Studies of household trip-making behavior typically focus on household economic and demographic characteristics, regional activity patterns and densities, and the availability and cost of competing travel modes, usually to the exclusion of local land use measures. We propose to measure the statistical relationships between non-work travel behavior in the San Francisco Bay Area and the distribution and quality of nearby land uses (including transportation facilities and transportation-related land uses). Using 1) a 1995 household travel survey conducted by the Metropolitan Transportation Commission, and 2) a data set of urban land uses collected by the Association of Bay Area governments, we propose to test the hypothesis that households which reside in cities with a "fine-grained" land use (and street) pattern--where land uses and activities are contained in a small area--will make more home-based trips, and will make greater use of non-auto travel modes as compared with demographically similar households residing in communities with a more homogenous urban land use pattern. **Key Words:** urban land use, travel behavior

### **Papers to date:**

None

### **Conferences Attended:**

None to date.

### **Other Accomplishments:**

None to date.

**Percent Complete:** 95%

**Direct Cost:** \$10,704

## **Putting Behavior in Household Travel Behavior Data: An Interactive GIS-based Survey Via the Internet**

### **Principal Investigator:**

Michael G. McNally  
Institute of Transportation Studies  
University of California, Irvine  
Irvine, CA 92697-3600  
Tel: (949) 824-8462  
Fax (949) 824-8385  
mmcnelly@uci.edu

### **Abstract:**

This project focuses on obtaining travel behavior data that more truly reflected underlying behavior. In a previous project a prototype of REACT!, a web-based, self-administered survey instrument for collecting household travel/activity data (see <http://www.its.uci.edu/~react/>) was produced. In the second phase, a beta test of REACT! was performed, followed by selected program modifications. A formal field study was completed where 47 households used REACT! to provide 24 hours of travel/activity data over a 7 day period. REACT! documents not only the resultant behavior but also the scheduling process that produces that behavior by having each respondent record activities as they are initially planned, updated, and executed. REACT! was run locally on the respondent's PC and data was transmitted via the internet to a server in ITS where the survey process was continuously monitored. **Key Words:** travel behavior, activity diaries, internet, GIS

### **Work Completed to Date:**

Formal analysis of the REACT! data was completed, with results presented at several conferences and papers being submitted to journals. Results include the identification of distinct spatial and temporal behaviors for planned and unplanned activities, with defined gender differences observed. Classification and structural equation models were developed to identify regularities in scheduling behavior. Follow-on research is focused on integrating REACT! with data from a GPS-based vehicle tracking system and extending the range of program applications.

### **Papers to date:**

1. Lee, MS and McNally, MG (2002). "On the Structure of Weekly Activity/Travel Patterns", presented at the 81st Annual Meeting of the Transportation Research Board, Washington, DC.
2. Lee, MS, Marca, JE, Rindt, CR, Koos, AM, and McNally, MG (2001). "A Shared-Use Electric Vehicle Program: Integrating a Web-based Survey with In-vehicle Tracking", presented at the *17th PacRim Regional Science Association Meeting*, Portland, July 2001
3. Seems and McNally, MG (2001). "Experiments with A Computerized Self-Administrative Activity Survey", *Transport Research Record*, 1748, 125-131.
4. Lee, MS (2001). "Experiments with A Computerized Self-Administered Activity Survey: Evaluation of a Pilot Study", PhD dissertation, Department of Civil and Environmental Engineering, University of California, Irvine, March 2001.
5. Kulkarni, A and McNally, MG (2001). "A Microsimulation of Daily Activity Patterns", presented at the 80th Annual Meeting of the Transportation Research Board, Washington, DC.
6. Lee, MS, Doherty, St, Rindt, CR, and McNally, MG (2000) "Extending the Scope of Computerized Household Activity Scheduling Surveys", presented at the 9th International Association of Travel Behavior Conference, Gold Coast, Queensland, Australia.
7. Kulkarni, AA and McNally, MG (2000) "An Activity-based Microsimulation Model for Generating Synthetic Activity-Travel Patterns: Initial Results," presented at the 9<sup>th</sup> International Association of Travel Behavior Conference, Gold Coast, Queensland, Australia.
8. Marca, JE, Rindt, CR, and McNally, MG (2000) "A Latent Factor Model of Observed Traveler Activity Sequences", presented at the 9th International Association of Travel Behavior Conference, Queensland, Australia.
9. Kulkarni, AA and McNally, MG (2000) "An Activity-based Travel Pattern Generation Model", presented at the 39th Annual Meeting of the Western Regional Science Association, Kauai, Hawaii, February 2000
10. Lee, MS, Doherty, ST, Sabetiashraf, R, and McNally, MG (2000). "iCHASE: An Internet Computerized Household Activity Scheduling Survey", presented at the 79th Annual Meeting of the Transportation Research Board, Washington, DC.

11. Marca, JE, Rindt, CR, and McNally, MG (2000). "A Simulation Framework and Environment for Activity-based Transportation Modeling", presented at the 79th Annual Meeting of the Transportation Research Board, Washington.

**Conferences Attended to Date:**

1. The 81st Annual Meeting of the Transportation Research Board, Washington, DC, January 2002
2. *17th PacRim Regional Science Association Meeting*, Portland, July 2001
3. The 80th Annual Meeting of the Transportation Research Board, Washington, DC, January 2001
4. The 9th International Association of Travel Behavior Conference, Gold Coast, Queensland, Australia, July 2000.
5. The 39th Annual Meeting of the Western Regional Science Association, Kauai, Hawaii, February 2000
6. The 79th Annual Meeting of the Transportation Research Board, Washington, DC, January 2000.

**Other Accomplishments:**

REACT!, a computer-aided self-administered interview to survey travel and activity behavior, was developed by a team led by Professor Michael McNally and Ming S. Lee with support from a 1999-2001 UCTC faculty grant. REACT! is currently being utilized in several projects including the evaluation of travel behavior impacts resulting from participation in ZEVNET, a shared-use station car program in Irvine CA. ZEVNET, a unique public/private partnership, is utilizing electric vehicles provided by Toyota to local corporations for use in daily business travel as well as to access rail service at the Irvine Transportation Center. A GPS-based vehicle monitoring system (Tracer) provides tracings of vehicle use as part of the REACT! survey.

**Percent Complete:** 100% except for final report, which is in preparation

**Direct Cost:** \$76,833

## Measuring the Role of Transportation in Facilitating the Welfare-to-Work Transition (Year 12)

### Principal Investigator:

Paul M. Ong  
UCLA School of Public Policy and Social Research  
3250 Public Policy Building  
Los Angeles, CA 90095-1656  
310-825-8557  
fax 310-825-1575  
pmong@ucla.edu

### Other Key Participants:

Evelyn Blumenberg UCLA SPPSR 3250 Public Policy Building Los Angeles, CA 90095-1656 310-825-1803 eblumenb@ucla.edu	Brian Taylor UCLA SPPSR 3250 Public Policy Building Los Angeles, CA 90095-1656 310-825-7442 btaylor@ucla.edu
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### Abstract:

Anecdotal evidence and preliminary research suggest that transportation services are crucial to helping welfare recipient's transition into the labor market; however, empirical research on the relationship between transportation and welfare use is limited. Also, welfare reform since 1996 is creating new conditions that are altering that relationship. To fill the research gap, we use administrative data on the geographic distribution of jobs in low wage firms and measures of access to transportation. This study analyzes employment outcomes as a function of population and labor market characteristics and access to employment, including access to transportation and proximity to licensed child care centers. **Key Words:** Welfare-to-work, case studies (California), transit and employment

### Work Completed To Date:

With a previous grant, agreements with the State of California and the County of Los Angeles established a secured data facility allowing construction of baseline data for Los Angeles, including measures of job access incorporating travel time by public transit and private car. In the current grant we are updating the Los Angeles data, analyzing the role of transit access on early employment outcomes in Los Angeles, and constructing a baseline data for Alameda County, California. We have modified our schedule in accordance to how quickly we are able to enter into a cooperative agreement with counties. We have reached such an agreement with Fresno County CA's Board of Supervisors, so we have increased our activities there. Given our limited resources, this change has required us to decrease our activities in Alameda County, CA, although we continue to work there. Significant milestones include gaining access to a survey of recipients in Alameda County to analyze the relationship between access to cars and employment, and to analyze other transportation issues facing this population. We are in the process of analyzing access to transportation. Also, we have a signed agreement with the Fresno County Department of Employment and Temporary Assistance for access to confidential data. We received transportation data from the area's three major transit systems -- Fresno Area Express (FAX), Clovis Transit, and Fresno County Rural Transit Agency (FCRTA). We have digitized transit lines and geocoded bus stops. These data have been complemented with data from the 1990 U.S. census (STF3) on travel mode and average travel time by block group. We have completed the spatial analysis for Fresno County. We have analyzed (1) the relationship between welfare usage and job access and (2) welfare recipients' spatial access to jobs, transit and services. We are currently finalizing two articles to be submitted for publication.

### Papers to date:

-Blumenberg, Evelyn (under review). "En-gendering Effective Planning: Transportation Policy and Low-Income Women."  
-Blumenberg, Evelyn (forthcoming). "Planning for the Transportation Needs of Welfare Participants: Institutional Challenges to Collaborative Planning," Journal of Planning Education and Research.  
-Blumenberg, Evelyn and Paul Ong (2001). "Cars, Buses and Jobs: Welfare Recipients and Employment Access in Los Angeles." Journal of the Transportation Research Record, No. 1756.  
-Blumenberg, Evelyn and Kimiko Shiki (in progress). "Welfare Participants, Jobs, and Public Transit in Fresno County, California."

-Blumenberg, Evelyn and Kimiko Shiki (in progress). "Jobs, Residential Location, and Welfare Usage: Urban-Rural Dynamics in Fresno County, California."  
-Houston, Douglas and Paul Ong (paper in progress). "Child-care Usage Patterns among Welfare Recipients."  
-Ong, Paul (forthcoming 2002). "Car Ownership and Welfare-to-Work," Journal of Policy Analysis and Management, Vol. 21, No. 2, pp 255-268.  
-Ong, Paul and Douglas Houston (accepted for publication). "Transit, Employment, and Women on Welfare," Urban Geography.  
-Ong, Paul, Douglas Houston, John Horton, and Linda Shaw (May 2001). "Los Angeles County CalWORKs Transportation Needs Assessment," Lewis Center Working Paper No. 36.

Dissertation Supported by Access to Los Angeles Data:

Kawabata, Mizuki (Massachusetts Institute of Technology): "Urban Spatial Structure: Job Access and Employment Opportunities for Low-Skilled Autoless Workers in U.S. Metropolitan Areas"

**Conferences Attended:**

-Association of Collegiate Schools of Planning Conference, Atlanta, Ga., November 2000. Paper presented: "Planning for the Transportation Needs of Welfare Recipients: Barriers to Interagency Collaboration."  
-Transportation Research Board Conference, Washington, D.C., January 2001. Paper presented: "Cars, Buses and Jobs: Welfare Recipients and Employment Access in Los Angeles."

**Presentations:**

-2002, "En-gendering Effective Planning: Transportation Policy and Low-Income Women," invited presentation as part of the Transportation Seminar Series, University of California Transportation Center, Institute of Transportation Studies, Department of Civil and Environmental Engineering, University of California, Berkeley, February 15, 2002.  
-2002, "En-gendering Effective Planning: Transportation Policy and Low-Income Women," presentation at the Annual Meeting of the Transportation Research Board, Washington, D.C., January.

**Other Accomplishments:**

None to date.

**Percent Complete:** 75%

**Direct Cost:** \$34,823

## **Development of Estimation Procedures for Activity-Based Model Forecasting**

### **Principal Investigator:**

Wilfred W. Recker  
Institute of Transportation Studies  
University of California, Irvine  
949-824-5642  
wwrecker@uci.edu

### **Abstract:**

The activity-based modeling framework offers an analytical option for estimating the relative importance of factors associated with the spatial and temporal interrelationships among the out-of-home activities that motivate household's needs or desire to travel. Demand estimation within the activity-based modeling framework is seen to provide both necessary constraint considerations on the household's decision alternatives within a utility-maximizing structure and a convenient mechanism for generating the set of feasible alternatives that are likely to be considered. This study is based on previous activity-based research conducted by the principal investigator and his colleagues, and will be directed toward developing a practical estimation procedure to enable the use of a mathematical programming activity-based model as a demand forecasting tool.

**Key words:** travel demand forecasting, activity-based modeling

### **Work Completed to Date:**

A dataset comprising all members of all households within the Portland activity survey with complete information has been constructed in the form of the required input to the HAPP model, i.e., activity profiles and temporal and spatial constraints. Contingency matrices based on probability distributions of pertinent decision variables contained in the model have been constructed. The sample drawn for the survey includes 2,232, households and 5,125 persons with a total of 67,016 activities and 37,965 trips (each split fairly equally between two consecutive survey days). Household information includes: household size, household income, type of dwelling unit, and the number of available vehicles. The survey also provides person-level data including age, gender, employment status, occupation, student status, and driver license status. The activity locations listed in the geocode file have been matched to the different activities of the household by the unique identification number of the activity. The duration of the activity and travel have been computed from the given data for each activity. The average activity starting and ending times for each activity type have been computed for the whole sample to provide benchmark information on the temporal flexibility of the activities. Extensive GIS-based (ARC/Info) files for the area have been constructed and include mapping of land use, census demographic information, and local employment estimates. Portland Metro has also made available 1990 Census Tiger files and tract demographics, as well as EMM/2 coded transportation networks and models. The street address map of the Portland network is based on an enhanced version of the Census Bureau's TIGER files. Shortest path travel times between all activity locations of a household have been generated for all the households in the sample using TRANSCAD. This procedure allows for the exploration of all possible activity/travel linkages for each household, which is fundamental to the optimization procedure. An algorithm for estimating a distance measure based on the sequence alignment method for comparison of model output to revealed activity patterns has been constructed. To test the estimation procedure, we randomly selected a few household activity patterns executed in a day. Our implemented estimation procedure can handle only one household each time; it is intended to form the basis for extension to the joint estimation over any sample of households.

### **Papers to Date:**

Recker, W.W. (2001). A Bridge between Travel Demand Modeling and Activity-based Travel Analysis. *Transportation Research , Part B: Methodological*, 35, 481-506.

### **Conferences Attended:**

None to date

### **Other Accomplishments:**

None to date

**Percent Complete:**80%

**Direct Cost:** \$38,735

## **Evaluating a University Transit Pass Program**

### **Principal Investigator:**

Donald Shoup, Director  
Institute of Transportation Studies, UCLA  
Los Angeles, CA 90095  
310 825-5705  
fax 310 206-5566  
shoup@ucla.edu

### **Abstract:**

Some universities in the U.S. have devised a new way to finance public transit services for their communities. They contract with local transit operators to allow students, staff, and faculty use of public transit free of charge when they display a university photo-ID card. We will 1) survey universities providing fare-free transit passes for university students and personnel, 2) explore the potential for extending these programs to non-university settings, and 3) analyze the theoretical rationale for providing such programs to a defined population. **Key words:** public transit, fare-free transit, university transit

### **Work Completed to Date:**

UCLA's pilot transit-pass program began in September 2000, and we are analyzing the data for the project. We have done a considerable amount of preparation for the evaluation, however, and the pilot program has been extended through May 2001-2002. We will analyze the data from the boardings to evaluate the cost-effectiveness of the program in reducing vehicle trips and parking demand on campus. We have collected comments from 1,600 users to help in our evaluation.

### **Papers to Date:**

"Unlimited Access," forthcoming in Transportation

### **Conferences Attended:**

Transportation and University Communities Conference Gainesville, Florida, April 1-4 2000  
Transportation Research Board, Washington, DC, January 2001  
American Collegiate Schools of Planning Conference, Atlanta, GA, November 2000

### **Other Accomplishments:**

The main accomplishment was to inaugurate the transit-pass program at UCLA. All UCLA students, staff, and faculty can use their UCLA ID cards as a transit pass on the Santa Monica Municipal Bus Lines.

**Percent Complete:** 70%

**Direct Cost:** \$34,965

## **Journeys to Crime: Documentation and Evaluation of Crime Incidence on and around Railway Stations in Los Angeles**

### **Principal Investigator:**

Anastasia Loukaitou-Sideris  
Department of Urban Planning, School of Public Policy and Social Research  
3250 Public Policy Building, Box 951467  
University of California, Los Angeles  
Los Angeles, CA 90095-1467  
310-206-9679  
[sideris@ucla.edu](mailto:sideris@ucla.edu)

### **Other Key Participants:**

Robin Liggett  
Department of Urban Planning, School of Public Policy and Social Research  
and Department of Architecture, School of Fine Arts and Architecture  
University of California, Los Angeles  
310-825-6294  
[rliggett@ucla.edu](mailto:rliggett@ucla.edu)

### **Abstract:**

In Los Angeles, fear of crime is one of three reasons cited for non-use of transit. This study examines the incidence of crime on the Green Line metro stations in Los Angeles to investigate how the introduction of this line has affected crime occurrence in the surrounding communities and how, in turn, characteristics of the immediate station neighborhood affect crime on the station. Using crime statistics, interviews, ridership and environmental data, the study documents and evaluates 1) spatial and temporal distribution of crime along the metro line; 2) the impact of socio-demographic and environmental attributes on crime occurrence; 3) the possibility of crime dislocation; and 4) the possibility of transit-related crime in outlying areas. **Key Words:** light rail, environmental design, transit crime, rail station security

### **Progress to Date:**

The following tasks have been completed:

- Literature review on transit crime.
- Collection of ridership data for all Green Line stations.
- Collection of crime data by station for all stations for 1998 and 1999; aggregated crime data for Los Angeles County and City and other cities adjacent to the Green Line from 1989-1998; and individual crime data for six cities adjacent to the Green Line.
- Processing and geocoding of all crime data collected; compilation of GIS data and maps.
- Interviews with Los Angeles Sheriff's Department transit division and MTA security
- Compilation of census block data for 1/2 mile radius around Green Line stations 1990 and 1996; also .
- Compilation of land use and environmental data. We have completed fieldwork for all fourteen stations.
- Photographic documentation of the 14 stations and station neighborhoods.
- Analysis of fieldwork and socio-demographic data and crime statistics.

The final report is in progress.

### **Papers to date:**

Loukaitou-Sideris, A., R. Liggett, and H. Iseki, "The Geography of Transit Crime: Documentation and Evaluation of Crime Incidence on and around Green Line Stations in Los Angeles," *Journal of Planning Education and Research*, forthcoming.

### **Other Accomplishments:**

Grant from the Haynes Foundation to continue work on the environmental attributes of railway crime

**Percent Complete:** 100% except for final report, which is being prepared

**Direct Cost:** \$49,775

## **The Viability of Value Pricing Demonstrations**

### **Principal Investigator:**

Kenneth A. Small  
Institute of Transportation Studies  
University of California, Irvine  
949-824-5658  
ksmall@uci.edu

### **Abstract:**

Recently, the transportation policy community has turned to small-scale demonstration projects to test and publicize road pricing. Short-term demonstrations were carried out in Stuttgart, Germany and Bristol, England, while potentially permanent projects now operate in Orange County, (California), San Diego (California), and Houston (Texas). The latter three make use of value pricing, in which travelers can choose between free and priced roadways. Recent research, however, has uncovered a problem for such demonstrations: minimizing aggregate travel-delay costs on two parallel roadways- when one must be free--may call for tolls on the express roadways that are far lower than those now charged. In simulation studies, value pricing is sometimes worse than no pricing at all. **Key words:** value-pricing, road pricing, value of time, demonstration projects, second-best pricing

### **Work Completed to Date:**

The simulation work is complete, and has led to a paper that was presented in many venues and has been published in *Journal of Urban Economics*. This work was very successful in explaining how the desirability of road-pricing demonstration projects using "value pricing" depends critically on differences in the value different people place on time savings. The alternative simulation model using a continuous value of time has also been completed, leading to a working paper that is being revised following peer review at a journal. Results from the two papers are summarized in an article in *Access* magazine in spring 2001.

The portion of the research involving empirical measurement of variation in value of time has been completed and written in a working paper with Jia Yan and Clifford Winston. That paper was presented at the American Economic Association annual meeting in January 2002. Based on comments received there, some revisions are in progress.

### **Papers to Date:**

- Small, Kenneth A., and Jia Yan, "The Value of 'Value Pricing' of Roads: Second-Best Pricing and Product Differentiation", *Journal of Urban Economics*, vol. 49 (2001), pp. 310-336.
- Verhoef, Erik T., and Kenneth A. Small, "Product Differentiation on Roads: Constrained Congestion Pricing with Heterogeneous Users", working paper, Dept. of Economics, UC Irvine (revised December 2000).
- Small, Kenneth A., "The Value of 'Value Pricing'", *Access* No. 18 (Spring 2001), pp. 23-27. Republished in *Public Works Financing*, July-August 2001, International Supplement, pp. 1-4.
- Small, Kenneth A., Clifford Winston, and Jia Yan, "Uncovering Motorists' Preferences Using Revealed and Stated Preference Data," Dept. of Economics, Univ. of California at Irvine (Oct 2001). Presented to American Economic Association, Jan. 2002.

### **Conferences Attended:**

Transportation Research Board, Washington, DC, Jan. 2000; Workshop on The Politics of Pricing, Govt. Institute for Econ. Research, Helsinki, Finland, Aug. 1999; Tinbergen Institute (Amsterdam), May 2000. Katholieke Universiteit, Leuven (Belgium), May 2000; American Economic Association, Atlanta, Jan. 2002.

### **Other Accomplishments:**

None to date

**Percent Complete:** 98%

**Direct Cost:** \$32,932

## **Greenhouse Gas Emissions Trading and the Transport Sector**

### **Principal Investigator:**

Daniel Sperling  
Institute of Transportation Studies  
One Shields Avenue, 2028 Academic Surge  
Davis, CA 95616  
530-752-6572  
dsperling@ucdavis.edu

### **Abstract**

Climate change has become an internationally recognized environmental issue. Transportation contributes about 25% of greenhouse gas emissions in the U.S. International negotiations to reduce greenhouse gas emissions have foundered in part over debates over the role of emissions trading. So far, no reports or papers addressing emissions trading issues have addressed the transport sector in a comprehensive fashion. Emissions trading schemes provide the potential for large emission reductions at low cost and may be more politically acceptable than tax and command-and-control approaches. But the diffuse nature of emission sources and other unique attributes of the transport sector create special challenges and opportunities for study. **Key words:** greenhouse gas, climate change, emissions trading, marketable permit

### **Work Completed to Date**

Work is complete except for refinements of two draft reports. An extensive literature review of emissions trading schemes and experiences has been completed. A key report was prepared in coordination with the International Energy Agency – an agency that will play a central role in designing and overseeing an international emissions trading scheme. In the report, we focused on the difficult problem of determining the appropriate baselines to be using in creating emission trading programs, where transportation is seen as the most difficult sector to handle. The baseline methodology will be used in determining what emissions can be treated as credits (and therefore be eligible for trading.) We also analyzed emissions trading and cooperative development mechanisms (CDM) for reports on transport-related greenhouse gas policies and strategies.

### **Papers to date:**

- D. Sperling, "Toward Effective Transportation Policy," Innovative Policy Solutions to Global Climate Change, Pew Center on Global Climate Change and Royal Institute of International Affairs, Washington, D.C., 4/26/00/
- Deborah Salon, "An Initial View on Methodologies for Emissions Baselines: Transport Case Study." International Energy Agency. November 2001.
- D. Sperling and Deborah Salon, *Developing Countries and Global Climate Change: Transportation Strategies and Policies*, Pew Center for Climate Change, Arlington, Virginia, 2002.

### **Conferences Attended:**

Transportation Research Board, Annual Meetings, January 2001 and 2002; COP 6B, Kyoto Protocol Conference Negotiations, Bonn, Germany, July 20, 2001 (featured presentation at side event); Energy Roundtable, Cambridge, England, Dec. 99 and Aspen, Colorado, September 2000 (invited, evening keynote); Toward a Greener Road Vehicle: Innovation Paths for Sustainability, Workshop at Aston University, Aston Business School, June 29-30, 2000 (kick-off presentation) (invited); Innovative Policy Solutions to Global Climate Change, Pew Center on Global Climate Change and Royal Institute of International Affairs, Washington, D.C., 26 April 2000 (invited)

### **Other Accomplishments:**

Deborah Salon was invited to spend 3 months at the International Energy Agency to develop a methodology for establishing baselines to use for transportation emissions trading (internationally). The report is under review at EIA. With expertise and background gained from this study, a successful proposal was submitted to Pew Center for Climate Change, and is being used in developing Pew Center's position on US policy toward controlling greenhouse gas emissions in developing countries.

**Percent Complete:** 96%

**Direct Cost:** \$53,034

## **Driving for Dollars: How the Politics of Finance Has Shaped the California Highway System**

### **Principal Investigator:**

Brian Taylor  
Department of Urban Planning  
School of Public Policy & Social Research  
University of California, Los Angeles  
310-825-7442  
[btaylor@ucla.edu](mailto:btaylor@ucla.edu)

### **Abstract:**

A clear understanding of how the politics of public finance has shaped the development of transportation systems is crucial if we are to effectively manage and develop transportation infrastructure in the future. This research relies on a combination of historical, quantitative, and qualitative methods to explore three questions: 1) why did California embrace a user-fee-based transportation system in the 1920s, and why the recent shift to non-user-based finance instruments?; 2) why has California been unable to adopt an effective, equitable system of heavy vehicle fees?; and 3) why are current urban freeway systems so different than the early plans for cities? **Key words:** freeway planning, transportation planning, public finance of transportation, transportation system development, transportation planning policy.

### **Work Completed to Date:**

During the fall 2001 quarter, Jeffrey Brown and Brian Taylor developed a detailed chapter-by-chapter outline of the manuscript to emerge from this research. Brown continued to review the transportation plans prepared for major U.S. metropolitan areas and has conducted an extensive investigation of the secondary and tertiary source literature on metropolitan transportation planning and engineering from 1900 to 1950. From this research Brown has prepared two papers: an overview of the evolution of the urban freeway as seen through the contrasting planning activities and visions of Robert Moses and Harland Bartholomew, and an overview of transportation planning at the state level in California. He is also preparing an in-depth analysis of the efforts of early transportation planners and engineers to develop a "science" of urban transportation planning based on rational, empirical methods. During the fall 2001 quarter, Taylor drafted a chapter from previous research by Brown and Taylor, which explores federal freeway planning between the end of the First World War to the end of the Second World War.

### **Publications to date:**

"Statewide Transportation Planning: Lessons from California," forthcoming in *Transportation Quarterly*.  
"The Evolution of Statewide Transportation Planning in California," paper presented at the California Transportation Futures Symposium in Sacramento, California on 1 December 2000.

"A Tale of Two Visions: Harland Bartholomew, Robert Moses, and the Development of the American Freeway," paper presented at the 9th Biennial Conference of the Society for American City and Regional Planning History (Philadelphia, 2001) and the Annual Conference of the Association of Collegiate Schools of Planning (Cleveland, 2001).

### **Conferences Attended:**

California Transportation Futures Symposium, Sacramento, CA: Nov/Dec 2000.  
9th Biennial Conference of the Society for American City and Regional Planning History, Philadelphia, PA: November 2001  
Annual Conference of the Association of Collegiate Schools of Planning, Cleveland, OH: November 2001

### **Other Accomplishments:**

None to date.

**Percent Complete:** 85%

**Direct Cost:** \$24,589

## **Year 13 (2000-2001) Project Status Reports - Continuing Projects**

### **Stationary Traffic Models and Freeway Geometry**

#### **Principal Investigator:**

Michael Cassidy  
Dept. of Civil & Environmental Engineering  
University of California  
416 McLaughlin Hall  
Berkeley, CA 94720  
510-642-7702  
cassidy@ce.berkeley.edu

#### ***Abstract:***

The research is examining how relations between freeway traffic variables, namely flow and occupancy, are influenced by the segment's number of lanes. The traffic measurements are jointly extracted from prolonged periods marked by nearly stationary conditions. In this way, bivariate plots of the data exhibit relatively little scatter; i.e., the relational forms are readily determined from visual inspections. Moreover, the data are measured by loop detectors on neighboring freeway segments that differ only in their number of travel lanes. In this way, virtually all influences, save the number of lanes, are held fixed so that the affects of the number of lanes are apparent by comparing the relations measured on each neighboring segment. **Key Words:** travel lanes, stationary travel models, flow, occupancy

#### **Work Completed to Date:**

We have performed the above experiments using data from neighboring freeway segments in 1) Hayward, CA; 2) Los Angeles, CA; 3) St. Paul, MN, and 4) Toronto, Canada. The findings to date clearly show that the number of lanes influence the shapes of the relations. Most notably, average vehicle speeds are less sensitive to increasing flows as the number of lanes (and thus the opportunity to over-take slower-moving vehicles) increases. I.e., the number of lanes in a freeway section clearly influences the relation between vehicle speed and flow (fewer lanes means greater sensitivity of speed on flow).

#### ***Papers to Date:***

None yet – a manuscript currently is being prepared.

#### **Conferences Attended:**

None

#### **Other Accomplishments:**

None yet

**Percent Complete:** 85%

**Direct Cost:** \$40,190

## **E-Commerce and the Efficiency of the California Freight Network: Perspectives of Shippers, Carriers and Third Party Logistics and Information Services Providers**

### **Principal Investigators:**

Thomas F. Golob	Amelia C. Regan
Inst. of Trans. Studies	Civil and Environmental Engineering
University of California	University of California
Irvine, CA 92697-3600	Irvine, CA 92697
949-824-6287	949-824-1074
tgolob@uci.edu	aregan@uci.edu

### **Abstract:**

A substantial portion of all business-to-business transactions in the U.S. now occurs online or electronically, over private specialized networks using EDI (electronic data interchange) and over the Internet. Such business-to-business "e-commerce" is expected to increase dramatically, particularly the share that occurs on the Internet. Online activities include, but are not limited to, issuing catalogs, quotes and schedules, placing orders and bids, and consolidating, scheduling, and tracking shipments. While e-commerce is increasing productivity, it is not known how it is affecting freight transportation, and particularly urban goods movement. We are studying the impact of e-commerce and related information technology on shippers, carriers, and third party logistics and information providers by analyzing data from three new closely related and simultaneously implemented Internet-based (online) industry surveys. The Internet surveys will be used to gather industry representatives' perceptions of e-commerce impacts on freight demand by mode and by the size and timing of shipments. The surveys will also explore which aspects of e-commerce can be most effective in alleviating congestion on the freight network. These data will be analyzed using discrete choice models and multivariate statistical methods to describe technology adoption and to allow forecasting of e-commerce effects on freight demand patterns.

**Key Words:** internet, e-commerce, freight transportation, urban goods movement, information technology

### **Work Completed to Date:**

We have conducted a literature review, launched two surveys (one of carriers, the other of 3PLS).

### **Papers to Date:**

- Golob, T.F. and A.C. Regan (2001), Impacts of Information Technology on Personal Travel and Commercial Vehicle Operations: Research Challenges and Opportunities, *Trans. Res. C*, 9, pp. 87-121.
- Regan A.C. and R. Garrison (2001), Freight Demand and Shipper Behavior Modeling: State of the Art, Directions for the Future, in Hens her, D.A. and King, J. (eds) *The Leading Edge of Travel Behavior Research*, Pergamon Press, Oxford, in press.
- Regan, A.C. and J. Song (2001), Freight Transportation Intermediaries in an Information Age, *Transportation Journal*, under review.
- Forster, P. and A.C. Regan (2001) Information Technology in Air Cargo: Interorganizational Systems and On-Time Performance, *Transportation Journal*, under review.
- Regan, A.C. and J. Song (2001) Transition or Transformation? Emerging Freight Transportation Intermediaries, *Transportation Research Record*, in press.

### **Conferences attended:**

TRB annual meeting, 2001, Invited lecture, USC (J. Song)

### **Other accomplishments:**

None to date.

**Percent complete:** 90%.

**Direct Cost:** \$52,673

## **The Environment - Transit Crime Connection: Continuing Study of the Metro Green Line and its Vicinity**

### **Principal Investigator:**

Anastasia Loukaitou-Sideris  
Department of Urban Planning, School of Public Policy and Social Research  
3250 Public Policy Building, Box 951467  
University of California, Los Angeles  
Los Angeles, CA 90095-1467  
310-206-9679  
[sideris@ucla.edu](mailto:sideris@ucla.edu)

### **Other Key Participants:**

Robin Liggett  
Department of Urban Planning, School of Public Policy and Social Research  
and Department of Architecture  
School of Fine Arts and Architecture  
University of California, Los Angeles  
310-825-6294  
[rliggett@ucla.edu](mailto:rliggett@ucla.edu)

### **Abstract :**

This study is an in-depth examination of case study stations along a light rail line in Los Angeles. The study explores how environmental and social characteristics of the neighborhood affect crime at the station, and how, in turn, the existence of the station affects crime at the neighborhood. The study utilizes crime statistics, census and ridership data, and environmental data and uses a mix of qualitative and quantitative methodologies, including the compilation of environmental inventories, GIS and spatial analysis techniques, and block-group level correlation and regression analyses. **Key Words:** light rail, environmental design, transit crime, rail station security

### **Work Completed to Date:**

We are continuing work on the second half of our two part study of crime and the Green Line. Our current work focuses on whether the introduction of the Green Line has had an impact on crime in the immediate neighborhoods surrounding the Green Line stations. We have collected crime data for the station neighborhoods for a ten-year period (five years before the opening of the Green line and five years following the opening), as well as aggregate crime data for the municipalities abutting the Green Line. We have completed the geo-coding of crime addresses for all the communities in our study (Redondo Beach, Manhattan Beach, Hawthorne, El Segundo, Downey, and the sections of the City of Los Angeles, which border the Aviation, Vermont, Harbor, Avalon, and Wilmington stations. We have completed a set of regression models for the El Segundo stations that look at changes in crime over time and test for significant changes in intercept/and or slope after the opening of the Green Line. We will now apply a similar analysis for the remaining case study stations. We have also generated a series of maps using hot spot analysis to visually display shifts in crime patterns in El Segundo. We are in the process of completing this type of analysis for the other communities in the study.

### **Papers to date:**

“The Geography of Transit Crime: Documentation and Evaluation of Crime Incidence on and around the Green Line Stations in Los Angeles,” [Journal of Planning Education and Research](#), forthcoming.

### **Conferences Attended:**

None to date.

**Percent Complete:** 80%

**Direct Cost:** \$50,931

## Assessing the Influence of Residential Location Changes on Travel Behavior

### Principal Investigator:

Professor Michael G. McNally

Institute of Transportation Studies

University of California, Irvine

Irvine, CA 92697-3600

Tel: (949) 824-8462

Fax (949) 824-8385

[mmcnally@uci.edu](mailto:mmcnally@uci.edu)

### Abstract:

When a household relocates, what are the immediate and longer-term impacts on travel behavior? How do household travel patterns evolve? This project proposes to use technologies developed in prior UCTC, PATH, and Testbed research projects to facilitate the observation of a small number of households re-locating from other areas in Orange County, CA to selected new home developments in Irvine. In-vehicle GPS/Wireless Communication units are installed in all respondent household vehicles to measure specific vehicle use for two to three multi-day period following relocation to Irvine. Sampled households use REACT! computer-aided self-administered travel-activity survey software developed in prior UCTC research to record their household activities during this period. GIS-based data sets depicting both the local activity-systems and transport networks are used together with the survey data to examine the evolution of travel behavior after residential relocation. **Key Words:** household relocation, travel patterns, GIS, GPS, travel behavior

**Objective:** This research aims to determine the immediate and longer-term impacts on travel behavior of a household relocation

**Tasks:** Measure household travel and activity behavior for multi-day periods prior to moving, upon relocation, and a few months after relocation and to analyze data to identify changes in travel behavior.

### Work Completed to Date:

Tasks completed include extension of a literature review, the final selection of a new community in southern Orange County and development of a sampling scheme to identify households in that community, submittal of human subject review protocols, and modification of REACT! and Tracer software to reflect project specific question areas.

**Relationship to Other UCTC Research:** This project proposes to use technologies developed in prior UCTC, PATH, and Testbed research projects.

**Potential Benefits:** This research will provide insights into the ways that location changes affect travel behavior due to relocation, as well as the evolution of behavior over time.

### Papers to Date:

none

### Conferences Attended to Date:

none

**Percent Complete:** 50%

**Direct Cost:** \$51,980

## **The Impact of Attitudes toward Mobility, Adoption of Previous Strategies, and Demographic Characteristics on Responses to Congestion**

### **Principal Investigator:**

Patricia L. Mokhtarian  
Department of Civil and Environmental Engineering  
University of California, Davis  
One Shields Ave.  
Davis, CA 95616  
(530) 752-7062  
plmokhtarian@ucdavis.edu

### **Other Key Participants:**

Professor Ilan Salomon, Researcher  
Institute of Transportation Studies  
University of California, Davis  
One Shields Ave.  
Davis, CA 95616  
msilans@mscc.huji.ac.il

### **Abstract:**

A number of policies designed to alleviate congestion have failed to have the intended or desired effect. While various external factors have been identified as explanations for this, we believe that insufficient attention has been paid to travel-related attitudes and predispositions. A key purpose of this study is to empirically examine the role of travel-related attitudes in an individual's adoption and consideration of various strategies in response to congestion. We hypothesize that people who have an intrinsic desire for mobility, and those who are currently mobility-deprived, are less likely to adopt travel-reducing strategies (such as telecommuting, changing to a compressed work week) or major lifestyle changes (job or residential relocation, quitting work). We also hypothesize that these people are more likely to adopt coping strategies that enable them to maintain or increase their travel (such as getting a mobile phone or a more comfortable car, changing work trip departure time). We will further examine the effect of previous adoption of various strategies on the consideration of additional responses, and the demographic distribution of the adoption and consideration of the strategies studied. **Key**

**Words:** attitudes, desired mobility, congestion, behavioral response

### **Work Completed to Date:**

I have just finished reviewing and editing the first draft of one of two reports to be produced on this project. This report analyzes the variables significant to the consideration and adoption of 19 travel-related strategies, using chi-squared and t-tests to look at one associated variable at a time. Results confirm our expectations that (a) those that feel travel-deprived (want to travel more) are less likely to consider strategies that reduce travel, and (b) women are more likely than men to consider major lifestyle/relocation changes that reduce commuting. Work on the models is proceeding in parallel. This portion of the analysis involves developing binary logit models of the consideration of (a) each individual strategy and (b) bundles of similar strategies. Results to date are consistent with expectations, while providing useful insight into combinations of conditions (explanatory variables) that increase or decrease the propensity to consider various strategies with differing implications for transportation. The results of these models will constitute the second report.

### **Papers to date:**

First draft of first report completed. Second report will be written after the modeling work is completed.

### **Conferences Attended:**

None to date

### **Other Accomplishments:**

None to date

**Percent Complete:** 60%

**Direct Cost:** \$52, 782

## **Measuring the Role of Transportation in Facilitating the Welfare-to-Work Transition (Year 14)**

### **Principal Investigator:**

Paul Ong  
UCLA School of Public Policy and Social Research  
3250 Public Policy Building  
Los Angeles, CA 90095-1656  
310-825-8557  
fax 310-825-1575  
pmong@ucla.edu

### **Other Key Participants:**

Evelyn Blumenberg  
UCLA SPPSR  
3250 Public Policy Building  
Los Angeles, CA 90095-1656  
310-825-1803  
eblumenb@ucla.edu

Brian Taylor  
UCLA SPPSR  
3250 Public Policy Building  
Los Angeles, CA 90095-1656  
310-825-7442  
btaylor@ucla.edu

### **Abstract:**

This is the third and final project in our assessment of the role of transportation in facilitating welfare-to-work in Los Angeles, Fresno, and Alameda Counties. The study will go beyond the role of personal characteristics (e.g., education, age) and examine how transportation can enhance or hinder access to jobs and childcare. The three counties provide us with a valuable comparison of two different major urban areas and one agricultural-based area. **Key Words:** welfare-to-work, job access, childcare access

### **Work Completed to Date:**

We have received and processed the following at the state level: 1) the welfare and employment histories (1993 to 1998) of millions of recipients, 2) 1998 information on nearly a million private-sector establishments, and 3) detailed 1998 audit data on several thousand recipients. For Los Angeles, we have: 1) assembled an extensive inventory of the public transportation system, 2) received and analyzed data on 1998 child-care providers, 3) conducted (with other agencies) a 1999-2000 survey of the transportation patterns and needs of 1,600 recipients, and 4) surveyed in 1999-2000 over 200 firms hiring recipients. For Alameda, we are working with the Public Health Institute to analyze the transportation questions in the Institute's survey of recipients in that county. For Fresno, we have received approval from the Board of Supervisors to access and use the county's administrative files, and we are planning to secure some survey-based data for recipients. Significant milestones include gaining access to a survey of recipients in Alameda County, California, to analyze the relationship between access to cars and employment, and to analyze other transportation issues facing this population. We are in the process of analyzing access to transportation. We also have agreements from the Board of Supervisors to do an analysis in Fresno County, CA. Currently we are negotiating access to a survey of sanctioned and non-sanctioned recipients in Alameda County.

### **Papers to date:**

Nonaka, Katsumi, "Employment, Welfare Recipients and Community Services in Alameda County, California", Thesis, UCLA.

### **Conferences Attended:**

None to date

### **Other Accomplishments:**

None to date.

**Percent Complete:** 50%

**Direct Cost:** \$44,724

## **Systematic Transport Access and Policies for Low Wage Labor Markets**

### **Principal Investigator:**

John M. Quigley  
Goldman School of Public Policy  
2607 Hearst Avenue MC 7320  
University of California 94720-7320  
510-643-7411  
quigley@econ.berkeley.edu

### **Other Key Participants:**

Steven Raphael  
Goldman School of Public Policy  
University of California  
Berkeley CA 94720  
sraphael@econ.berkeley.edu

Harry J. Holzer  
Public Policy Institute  
Georgetown University  
Washington DC  
holzer@ui.urban.org

### **Abstract:**

This research helps to understand the linkages between spatial access and labor market outcomes for low-wage workers, especially teenagers, minorities, and welfare recipients. The work includes: (1) an analysis of the effect of transport improvements upon minority employment, (2) an analysis of spatial isolation and teenage employment, (3) an investigation into whether auto access "causes" higher levels of employment. The research provides insights on the role of transportation in supporting the employment of low income, minorities, welfare recipients, and teenagers. **Key Words:** spatial access, labor market outcomes, low-wage workers

### **Work Completed to Date:**

A paper has been published on the effects of auto ownership on minority employment. A paper has been drafted on the effects of public transit improvements on the level and distribution of minority employment

### **Papers to Date:**

"Can Boosting Minority Car-Ownership Rates Narrow Inter-Racial Employment Gaps?" *The Brookings-Wharton Papers on Urban Affairs*, 2, 2001: 99-145.

"Public Transit and the Spatial Distribution of Minority Employment: Evidence from a Natural Experiment," Working Paper WP01-005, Berkeley Program on Housing and Urban Policy, University of California, Berkeley, 2001.

### **Other Accomplishments:**

Paper invited for presentation at the 40th Annual Meetings of the Western Regional Science Association, Palm Desert, CA, February, 2001. Paper invited for presentation at the Brookings Institution, October 2000. Paper presented at seminars at Brown University, University of Connecticut, 2001, 2002.

### **Percent Complete:**

90%

### **Direct Cost:**

\$30,000

## **Activity-Based Forecasting Model for Planning Applications**

### **Principal Investigator:**

Will Recker  
Institute of Transportation Studies  
University of California, Irvine  
Irvine, CA 92697-3600  
(949) 824-5642  
fax (949) 824-8385  
wwrecker@uci.edu

### **Abstract:**

In this research, we seek to complete the activity-based modeling framework that has evolved over past research efforts by extending it to a “traditional” planning framework. Specifically, we will couch the activity-based approach in terms that provide output consistent with accepted trip-based static planning methodologies as well as full estimates of the associated dynamics of trip generation, distribution and route selection. The work will derive from a theoretically consistent paradigm based on the need/desire of households to interact with their environment. We will show that the particular mathematical programming paradigm can be used to describe the demand modeling processes both for conventional trip-based travel demand and for activity-based approaches. **Key Words:** activity-based model, travel demand forecasting, mathematical programming

### **Work Completed to Date:**

Work completed to date includes: 1) The development of all of the necessary activity files from the Portland data set that serve as input to the Household Activity Pattern Problem (HAPP) model; 2) The development of measurement algorithms to assess the error between the observed and predicted activity patterns, 3) The development of the general schematic that will be used in the estimation process, 4) a complete set of contingency tables, based on the full Portland data set, relating cross-correlations among all pertinent household characteristics and exhibited travel/activity behavior, and 5) development of a “synthetic household” generation heuristic based on these contingency tables.

### **Papers to Date:**

None.

### **Conferences Attended:**

None to date.

### **Other Accomplishments:**

None to date.

**Percent Complete:** 80%.

**Direct Cost:** \$53,531.

## **Inventory Theoretic Models of Freight Demand: Revisiting the Past in Light of the New Economy**

### **Principal Investigators:**

Amelia Regan	Charles Lave	Amihai Glazer
Civil & Env. Engr	Economics	Economics
4151 Engr. Gateway	3103 SSPA	3107 SSPA
Univ of CA	Univ of CA	Univ of CA
Irvine, CA 92697	Irvine, CA 92697	Irvine, CA 92697
949 824-2117	949 824-6502	949 824-5974
<a href="mailto:aregan@uci.edu">aregan@uci.edu</a>	<a href="mailto:calave@uci.edu">calave@uci.edu</a>	<a href="mailto:aglazer@uci.edu">aglazer@uci.edu</a>

### **Abstract:**

The basic modeling of freight transportation was done thirty years ago. Since then, new institutional entities have emerged -- the third party logistics provider -- performing new kinds of information and coordination services to meet the new needs created by just-in-time manufacturing, distribution systems and visible supply chains. We propose to revisit basic inventory theoretic freight demand models with the aim of developing new models which explicitly uncouple order processing time from transportation time, and which incorporate several new mode choice characteristics -- visibility, control, and trust -- into the mode selection step. Our objective is to develop new freight demand models that uncouple order processing time from transportation time, and otherwise update the models to accommodate new institutional entities that have developed since the creation of the original models. We will re-examine basic inventory freight demand models and update them, incorporating several new mode choice characteristics, as well as explicitly uncouple order processing time from transportation time. The work will result in the creation of models that better take into account the new needs and providers that have developed in response to just-in-time manufacturing, distribution systems, and visible supply chains. **Key Words:** freight transportation, freight demand models, visible supply chains

### **Work Completed to Date:**

We have completed and published an extensive review of the freight demand modeling literature. We have begun working on a series of papers on inventory routing models and what are known as buy-back inventory models. These will be finished and sent out for review in March 2002.

### **Papers to Date:**

Regan A.C. and R. Garrido (2001), Freight demand and shipper behavior modeling: state of the art, directions for the future, in Hensher, D.A. and King, J. (eds) **The Leading Edge of Travel Behavior Research**, Pergamon Press, Oxford, in press.

Lu, X. and A.C. Regan, Inventory Routing in the presence of Buy Back Options, work in progress.

Lu, X. and A.C. Regan, Inventory Routing under real-time information, revisiting the models of the past, work in progress.

Regan A.C. (2002), The Transformation of the Freight Industry: from Regulation, to Competition, to Decentralization in the Information Age, Access Magazine, in press.

### **Conferences Attended:**

TRB, ITSC '01, TRISTAN

### **Other Accomplishments:**

None to date

**Percent complete:** 100% except for completing papers in progress.

**Direct Cost:** \$15,687

## **Has Parking Cash Out Failed in California?**

### **Principal Investigator:**

Donald Shoup, Director  
Institute of Transportation Studies, UCLA  
Los Angeles, CA  
shoup@ucla.edu

### **Abstract:**

In 1992, California enacted a parking cash-out requirement to reduce the traffic congestion and air pollution. The law requires employers to offer commuters the option to take the cash value of free parking at work if they do not take the free parking itself. Poor enforcement of the cash-out law has given many people the impression that parking cashout does not work. However, one city in California -Santa Monica- requires all employers in its jurisdiction to comply with the state's cash-out requirement. Twenty-six employers in Santa Monica have established parking cash-out programs for their employees. This municipal island of compliance with the state's cash-out law presents a unique opportunity for research. In this study I will examine how Santa Monica has obtained employers' compliance with California's cash-out law, and to estimate what the effects of compliance have been. Specifically, I will examine (1) how Santa Monica has enforced the state's parking cash-out law for employers in its jurisdiction, (2) how compliance with the law has reduced vehicle travel and vehicle emissions, (3) how the regulated employers in Santa Monica describe their experience with parking cash out, and (4) the statewide effects on vehicle travel and vehicle emissions if employers in all jurisdictions complied with California's parking cash-out law. **Key Words:** parking cashout, vehicle travel, emissions

### **Work Completed to Date:**

We have (1) interviewed the city officials who administer the program, (2) assembled the sample of employers who offer parking cash out programs in Santa Monica, and (3) devised the interview questions. We are currently obtaining other needed data.

### **Papers to date:**

"Parking Cash Out" prepared for the European Conference of Ministers of Transport, for a roundtable in Paris in Fall 2001.

### **Conferences Attended:**

Transportation Research Board, Washington, DC, January 2001  
American Collegiate Schools of Planning Conference, Atlanta, GA, November 2000

### **Other Accomplishments:**

I have also been in contact with the California Air Resources Board. They are taking steps to advertise the law, announce it on their web site, and to work with the AQMDs to encourage compliance.

**Percent Complete:** 70%

**Direct Cost:** \$42,145

## Reconsidering the Effects of Fare Reductions on Transit Ridership

### Principal Investigator:

Brian D. Taylor  
UCLA Institute of Transportation Studies  
3250 Public Policy Building  
Los Angeles, CA 90095-1656  
310-825-7442  
[btaylor@ucla.edu](mailto:btaylor@ucla.edu)

### Abstract:

This study uses national data maintained by the Federal Transit Administration and more detailed demographic, economic, and operating data for a sample of transit operators to examine the influence of fare reductions on transit ridership. Using data from the National Transit Database, we are first conducting a statistical analysis of the relationship between changes in fare levels and ridership on U.S. public transit systems, taking into account many of the factors shown in the literature to affect ridership. One goal of this first phase is to identify cases where fare reductions, which include *de facto* fare reductions such as free transfer and discount multi-ride tickets, have been associated with substantial ridership increases. These cases, which will almost certainly include the New York MTA in the mid-1990s, will then be explored in more detail through interviews and examination of detailed budgetary, operating, population and employment data. Our literature review of past studies shows large variance in fare elasticity by characteristics of transit trips, types of fare changes, socio-demographic characteristics of riders, functional forms to estimate elasticities, and research methods, but does not provide definite conclusion on fare elasticities. In addition, we have found no systematic studies examining fare-reduction elasticities for U.S. transit systems in recent years accounting for exogenous factors such as the regional economy, employment levels, fuel price, the changes in auto availability among households, and so on which need to be considered when examining the net fare change effects on ridership. We will conclude this work by examining the role of fare reductions in stimulating additional ridership taking into account the present socio-demographic characteristics of riders in the U.S. transit systems. **Key Words:** fare reductions, transit ridership, transit fare elasticity.

### Work Completed to Date:

The literature review has been completed. We have conducted the cross-sectional analysis on ridership in individual transit systems, using the National Transit Database, and a preliminary analysis to evaluating cases, while still collecting other data. We have begun the data collection and analysis and are evaluating cases.

### Papers to Date:

None

### Conferences Attended:

None

### Other Accomplishments:

None

**Percent Complete:** 50%

**Direct Costs:** \$33,406

## **Planes, Trains, or Camionetas (little buses)? A Baseline Study of an Informal Travel Mode**

### **Principal Investigator:**

Abel Valenzuela Jr.  
School of Public Policy and Social Research  
Lewis Center for Regional Policy Studies  
University of California, Los Angeles  
3250 Public Policy Building  
Los Angeles, CA 90095-1656  
(310) 825-9156  
fax (310) 206-4472  
[abel@ucla.edu](mailto:abel@ucla.edu)

### **Abstract :**

This project provides a case study of an informal transportation mode - camionetas or mini buses (vans). I hope to document and better understand the day-to-day functions and the consumers who use this travel mode.

Throughout California, immigrant and other low-income groups are increasingly using alternative and in some instances informal or illegal (not regulated) modes of transportation. For example, there exist many unregistered camioneta or mini-vans (gypsy) that transport riders throughout California and beyond the U.S. Mexican border. The attraction of this form of transportation is its low cost, door-to-door service, and convenience (flexibility) of scheduling. Three primary research methods will drive this study: 1) referral sampling and archival research, 2) in-depth interviewing, and 3) participant observation (ethnography). Data collected from this initial study will be used as a springboard for a larger, more comprehensive research study on this burgeoning travel mode. The objective is to document, and better understand the day-to-day functions and the consumers who use mini buses (vans). **Key Words:** paratransit, vans, transportation regulation

### **Work Completed to Date:**

I have completed all of the archival research, undertaken several interviews, and have taken two ethnographic field trips.

### **Papers to date:**

None

### **Conferences Attended:**

None to date.

### **Other Accomplishments:**

None to date

**Percent Complete:** 60%

**Direct Cost:** \$10,000

## **Understanding and Modeling Driver Behavior in Dense Traffic Flow**

### **Principal Investigator:**

H. Michael Zhang  
Dept. of Civil and Environmental Engineering  
3145 EU III  
University of California at Davis  
Davis, CA 95616  
530-754-754-9203  
[hmzhang@ucdavis.edu](mailto:hmzhang@ucdavis.edu)

### **Abstract:**

This research will examine drivers' car-following behavior in dense traffic flow and identify the critical behavioral elements and parameters that control traffic flow phase transitions. Such an understanding will aid the development of more sound microscopic traffic models that are the central building blocks of popular traffic simulation packages such as CORSIM, TRANSIMS and PARAMICS. The specific tasks include: 1) understanding situation-related driver psychology and driver behavior from empirical evidence, 2) identify critical factors that control phase transitions in traffic flow and 3) incorporate these factors into microscopic traffic flow models to enable them to reproduce certain important yet elusive traffic phenomena such as the often observed "capacity-drop" and stop-start waves. **Key Words:** driver psychology, behavioral parameter, microscopic traffic flow models, phase transitions, traffic flow

### **Work to Date:**

Review of the literature and identification of critical factors has been completed, and model building is underway.

### **Papers to Date:**

H. M. Zhang and T. W. Kim (2001) A car-following theory for multiphase vehicular traffic flow, pre-print 01-3456, 2001 TRB Annual Meeting. - Accepted for publication by Transportation Research Part B.

### **Conferences Attended:**

2001 TRB Annual Meeting.

### **Other Accomplishments:**

A doctoral proposal based on this work is successfully defended.

**Percent Complete:** 85%

**Direct Cost:** \$10,000

## **Year 14 Projects (Aug. 1, 2002- July 31, 2003 – 15 Projects)**

### **Using the Spatial Configuration of Cities to Estimate The Impact of Commuting Time on Hours of Work**

**Principal Investigator:**

Antonio M. Bento  
Donald Bren School of Environmental Science and Management  
University of California, Santa Barbara  
Santa Barbara, CA 93106-5131.  
Phone: (805) 893-5804;  
Fax: (805) 893-7612  
Email: [bento@bren.ucsb.edu](mailto:bento@bren.ucsb.edu)

**Abstract:**

We propose, what we believe to be, the first study of the causal impact of fixed time costs (commuting) on labor supply. While a limited number of studies have estimated the correlation between hours of work and observed commuting, none have dealt with the endogeneity of commuting and thus yield biased estimates. We propose to isolate the exogenous impact of commuting using a novel instrumental-variables approach based on the dispersion of residential locations within and across cities. A credible estimate of the elasticity of hours of work with respect to commuting time is clearly important to our understanding of labor supply behavior and therefore the reaction of people to urban transportation policies aimed at changing commuting patterns **Key Words:** commuting time; labor supply; urban spatial structure

**Work Completed to date:**

The vast majority of the research tasks in this project are complete or substantially complete. We have put together the data set (this includes both the census data and the GIS data that characterizes the spatial configuration of cities) and we have constructed our instrument to commuting. At this point we are running our empirical model. A preliminary version of the paper was already sent for presentation to the Summer Institute of the National Bureau of Economic Research and we plan to submit the paper to the American Economic Review.

**Papers to date:**

None

**Conferences Attended:**

None

**Other Accomplishments:**

None to date

**Percent Complete:** 75%

**Direct Cost:** \$38,514

## Evaluation of the California Safe Routes to School Program

### Principal Investigator:

Prof. Marlon Boarnet  
Department of Urban and Regional Planning and Institute of Transportation Studies  
University of California, Irvine  
Irvine, CA 92697-3600  
Tel. 949 824-7695  
Email: [mgboarne@uci.edu](mailto:mgboarne@uci.edu)

### Other Key Participants:

Prof. Kristen Day  
Department of Urban and Regional Planning  
University of California, Irvine  
Irvine, CA 92697-7075  
Tel. 949 824-5880  
Email: [kday@uci.edu](mailto:kday@uci.edu)

Dr. Craig Anderson  
Health Policy Research  
University of California, Irvine  
Irvine, CA 92697  
Email: [clanders@uci.edu](mailto:clanders@uci.edu)

### Abstract:

In this research, we will conduct a pre- and post-evaluation of the California Safe Routes to School (SR2S) construction program. The California SR2S allocates \$20 million to local governments for street, sidewalk, and neighborhood and/or traffic design construction projects to improve the safety and feasibility of walking and bicycling to school. This program grew out of the confluence of several trends, including broad national interest in improving the livability and pedestrian friendliness of urban areas. We will select six SR2S sites, and six sites not in the SR2S program as a “control group.” We will assess and document changes to SR2S sites that are associated with the construction program, comparing changes to sites not in the program. We will observe pedestrian and bicyclist behavior before and after SR2S construction at each site, and will survey parents before and after SR2S construction at each site to obtain information on attitudes and perceptions of safety. These data will allow an evaluation of the effectiveness of different neighborhood and traffic interventions in improving the safety of children’s non-motorized travel near schools, the frequency of walking and bicycling among children, and the interaction between perceived safety, traffic patterns, the physical environment, and walking and bicycling behavior. **Key Words:** school access, safety, pedestrians, bicycles, sidewalks

### Work Completed to Date:

Our research efforts in the fall of 2001 were focused in three areas: (1) background research, (2) canvassing SR2S projects for study site selection, and (3) development of study instruments. We have made substantial progress in all three areas, and expect to have the initial (pre-construction) evaluation of the 12 southern California SR2S sites completed by the end of the current academic year.

Our background research included reviews of the literature on walking behavior, adult and child attitude formation regarding public space, and the literature on health promotion. This led to revising our theoretical framework for the research, to include several factors such as parent or caregiver perceptions about the appropriate level of independence for children, parental perceptions about the safety of a neighborhood (including issues unrelated to traffic safety), parent schedules, and attitudes about the health and psychological benefits of walking, all of which might influence the effectiveness of SR2S interventions at particular sites.

The second task was to canvass first-round SR2S projects for site selection. We have narrowed the potential study sites to schools whose construction schedule fits our research timeline, while maintaining variation in neighborhood setting and SR2S project type. We are currently approaching schools in Anaheim, Santa Ana,

and Garden Grove to conclude agreements for participation in the study, and will expand our discussions to include schools in Los Angeles and San Diego.

The third task, which has consumed a large portion of our time, is the development of the research instruments. We have developed three instruments – a written protocol for the urban design observations, a written protocol for traffic observations, and the survey of parents (or guardians) of 4<sup>th</sup> and 5<sup>th</sup> grade students. All three instruments will be used to assess the urban design, motorized and non-motorized traffic, and child behavior and parental attitudes before and after SR2S project construction. The urban design protocol specifies objective measures of the environment near schools that we hypothesize (based on our literature review and preliminary focus groups) will have an impact on walking and bicycling safety and frequency. The traffic observation protocol similarly specifies characteristics of traffic, with detailed instructions for how those characteristics will be measured. The parent survey includes questions about the child’s walking or bicycling behavior, the parents’ schedule and other constraints, and parental attitudes toward walking, bicycling, and perceptions of safety, social expectations, and child abilities that will influence parental decisions regarding whether children can walk or bicycle to school.

We have submitted the survey instruments for review by our University’s human subjects review board, and the human subjects review board approved the instruments in February 2002.

Note: After careful consideration, the study team has decided to modify the research design. We originally proposed to use a “test/control” group methodology, examining 6 SR2S sites and 6 similar sites that did not get SR2S projects. We believe the value of the control group in this design would be minimal, and the most of the variation will be before and after the SR2S project is completed. For that reason, we now intend to examine 12 SR2S project sites, without including a control group of sites that did not get SR2S projects.

**Papers to Date:**

None

**Conferences Attended:**

Cooper Institute Conference on Public Health Interventions to Promote Physical Activity, October 2001, “Analytical Methods and Data for Understanding Walking Behavior.” (Invited presentation by Marlon Boarnet)

Symposium on Cities and Transportation: Choices and Consequences, Simon Fraser University, February 2002, “Science and Land Use-Travel Behavior Interactions.” (Invited presentation by Marlon Boarnet)

**Other Accomplishments:**

None to date

**Percent Complete:** 25%

**Direct Cost:** \$71,902

## Forecasting Demand and Values of Travel Time for Freeway HOV, Toll and HOT Facilities

### Principal Investigators:

David Brownstone  
Department of Economics  
University of California  
Irvine, CA 92697-5100  
949-824-6231  
[dbrownst@uci.edu](mailto:dbrownst@uci.edu)

Thomas F. Golob  
Institute of Transportation Studies  
University of California  
Irvine, CA 92697-3600  
949-824-6287  
[tgolob@uci.edu](mailto:tgolob@uci.edu)

### Abstract:

Accurate forecasts of demand for restricted roadway facilities – high occupancy vehicle (HOV) lanes, toll lanes (including congestion pricing), or combined HOV and toll (HOT) lanes on freeways and bridges – are key to the success of such projects. Yet the track record for predictions for such projects throughout the U.S. is dismal; transportation professionals have not been successful in understanding traveler behavior regarding such choice alternatives. The objective of the proposed research is to explore reasons for these failings and to make recommendations regarding priorities for better models. Alternative model specifications documented in the literature will be compared on a common dataset. The most effective dataset for this purpose is the panel survey collected in 1997-1999 for evaluation of the San Diego I-15 Congestion Pricing Project, combined with recorded toll data and traffic speed data from freeway loop detectors and floating car measurements. The key new feature of this work is the joint modeling of commuters' choices, perceptions of key trip attributes, and attitudes about road pricing. These variables will be related to commuter's socio-demographic information as well as objective traffic network data typically used in demand analysis. This new model is designed to predict both the economic and political feasibility of a project. **Key words:** travel demand forecasting, hot lanes, hov lanes, value pricing

### Work Completed to Date:

We have almost completed merging the freeway loop detector, floating car, and panel survey data. These merged data are crucial for estimating our models, and the merger requires complex modeling and imputation of the missing data in the floating car measurements. The methodology we are using is an extension of our earlier UCTC-funded work in Brownstone et al. (2001). We expect to quickly begin estimating models and writing papers based on these models.

### Papers to Date:

"Modeling Non-ignorable Attrition and Measurement Error in Panel Surveys: An Application to Travel Demand Modeling." (with C. Kazimi and T.F. Golob), in Groves, R.M., D. Dillman, J.L. Eltinge and R.J.A. Little (eds.), Survey Nonresponse. New York: Wiley, pp. 373-388, 2001. Based on earlier UCTC funded work using earlier waves of the panel data.

### Conferences Attended:

None

### Other Accomplishments:

None to date

**Percent Complete:** 30%

**Direct Costs:** \$14,690

## **Transit-Based Housing: Residential Sorting and Its Influence on Mode Choice**

### **Principal Investigator:**

Prof. Robert Cervero  
Institute of Urban and Regional Development  
University of California  
Berkeley CA 94720-1787  
Tel. 510-542-0779  
Email [robertc@uclink.berkeley.edu](mailto:robertc@uclink.berkeley.edu)

### **Abstract:**

This research examines the impacts of transit-based housing on both residential location and mode choice. The degree to which ridership benefits are a product of self-selection or the inherent advantages of proximity to transit will be gauged. An operative hypothesis is that high ridership is a product of households conscientiously sorting themselves into rail-station areas for the very purpose of economizing on commuting. Living near rail stops is thought to also lower vehicle ownership rates. The combination of “residential sorting” and fewer cars are thought to be dominant factors in explaining mode choice for journeys to work. This hypothesis will be tested using nested logit models and year-2000 data on residential location, car ownership, and commute mode choice from the San Francisco Bay Area. Models will predict whether households reside within a half-mile ring of a rail station and how this in turn influences mode choice. Separate analyses will be carried out for the BART heavy-rail system, the CalTrain commuter rail system, and the VTA light-rail system. The results of the research will help inform policy-making in the areas of transit joint development and affordable housing production, including policy initiatives like Location Efficiency Mortgages. **Key Words:** mode choice, location choice, housing policy, transit policy

### **Work Completed to Date:**

A literature review of nested-logit modeling in the transportation and land-use planning field was conducted. Literature on residential location and sorting was also reviewed extracting work-trip data. The year-2000 Bay Area Travel Survey (BATS) was acquired. Considerable effort went to from an activity-based survey. In consultation with staff from the Metropolitan Transportation Commission (MTC), rules and procedures were developed for estimating home-based work trips from the activity-based data file. Using the extracted travel-data as the source data base, files were merged and cross-referenced, accounting for the household, personal, and car-ownership attributes of each imputed trip record. Once the database was organized, Geographic Information System (GIS) tools were used to identify whether the residences of persons in the trip data-file were within one-quarter, one-half, or one mile radii of BART, CalTrain, ACE, and Santa Clara County light-rail transit services. GIS buffers were created and records were 0-1 coded to indicate whether they were within a sphere of influence of rail transit stations. Information was next recorded on whether the workplaces of individuals were within one-quarter, one-half, and one-mile radii of Bay Area rail stations.

Currently, work is underway to compute job accessibility metrics for all records in the data, both via the transit and highway network. With these supplemental variables, we will then estimate a nested multinomial logit model that predicts residential-choice and mode-choice as co-dependent decisions. The degree to which residential sorting explains large shares of the ridership among residents of TODs will be determined. The ALOGIT software package has been acquired for estimating the nested logit models.

### **Papers to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 50%

**Direct Costs:** \$45,284

## **How Does Travel Behavior Change When Households Change Jobs? (YR 14)**

### **Principal Investigator:**

Prof. William Clark  
Dept. of Geography  
UCLA  
Los Angeles, CA  
Tel. 310 .  
Email [wclark@geog.ucla.edu](mailto:wclark@geog.ucla.edu)

### **Abstract:**

Research with a previous grant from UCTC established the relationship between the probabilities of moving closer to the job with increasing distance from the work place. Households beyond a threshold distance moved closer to the job when they changed residence and the probability of moving closer increased with greater work-residence separation. The current project builds on that research and examines the actual commuting behavior of workers in two-worker households when they change jobs. Do workers minimize commute distances in response to job changes and, when they change jobs do their travel patterns and travel modes change, and if so in what ways? The new research project uses panel data on travel to examine hypotheses about commuting distances, commuting times, mode choice and changing spatial patterns of employment. The study will provide important new data on how two-worker households negotiate job changes to minimize commuting. **Key**

**Words:** Residential location choice, workplace location, commute patterns, two-worker households

### **Work completed to Date:**

A data file has been constructed from the travel diaries for the Puget Sound region and the residential addresses and work locations have been geo-coded. A file of all households with two workers who changed jobs in any of the two-year periods for which data is available, has been compiled and the analysis of mode choice changes has been appended to the job change file. Additional data on tract characteristics in which households are located is being assembled from 1990 and preliminary 2000 Census data.

### **Papers to Date:**

"Disentangling the interaction of migration, mobility and labor force participation" working paper presented at the Western Regional Science Meetings in Monterey California.

### **Conferences Attended:**

Western Regional Science Assn. February 17-20, 2002.  
Population Association of America, March 2001

**Percent Complete:** 45%

**Direct Cost:** \$41,432

## **Design of Vehicle Routes and Driver Shifts for Systems with Uncertain Demand**

### **Principal Investigator:**

Prof. Carlos Daganzo  
416 McLaughlin Hall  
University of California  
Berkeley CA 94720  
Tel. 510 642-3853  
Email [daganzo@ce.berkeley.edu](mailto:daganzo@ce.berkeley.edu)

### **Abstract:**

This is a proposal to develop improved methods for making intermediate-term decisions for transit systems with predetermined routes and schedules and for one-to-many, demand-responsive transportation systems. In designing these systems, one must decide the number of vehicles to buy or lease, a menu of different work-shifts covering all work-hours and work-days, a number of crews to hire, an assignment of crews to shifts, and an operating strategy that determines the routes and schedules. These design decisions have to be made before the demands are known. Uncertainty makes the optimization problem quite difficult because the set of vehicle routes and schedules should cover the unknown realized demands. Depending on the problem, the routes and schedules may be allowed to change seasonally, weekly and/or be demand responsive. We propose to develop and test new design methods that use large-scale analytic approximations in conjunction with numerical optimization and simulations. The methods will be applied to a variety of problems and scenarios. Prior experience with simpler but related problems, and our preliminary work on the problem at hand, shows that the proposed hybrid methodology is quite effective. With a computational complexity of order  $O(n)$ , where  $n$  is the number of realized demands in one design period, the methodology has proven to be very accurate. **Key Words:** transit, routing, equipment management, crew scheduling

**Work Completed to Date:** The research is progressing as expected, without any changes in its goals. We expect to produce two PhD theses (by J. Muñoz and Y. Li), and two ensuing papers. The support of UCTC is will be acknowledged in these publications. The students are projected to finish their work toward the end of the summer or perhaps in the fall.

### **Publications to date:**

None

### **Conferences Attended:**

UCTC Annual Conference: Presentation by J. Muñoz, Spring 2002.

### **Other Accomplishments:**

None to date

**Percent Complete:** 30%

**Direct Cost:** \$45,907

## **Real-time Travel Data Collection System Augmented with Speech Interface**

### **Principal Investigator:**

Prof. Reginald Golledge  
Dept. of Geography  
UC Santa Barbara  
Santa Barbara, CA 93106  
Tel. 805 893-2731  
Email marstonj@geog.ucsb.edu

### **Abstract:**

In this research we propose developing a conceptual model of a real time activity data collection device. This will be operationalized as a wearable computer complete with GPS recorder and speech input card. The wearable computer will be tied to a wireless local area network (WLAN) and real-time travel decisions (e.g. en-route changes in destinations and routes) can be immediately entered by voice into a database contained in a central server. We will pilot the results using pedestrian travel on the UCSB campus, and suggest ways of extrapolating from a localized pedestrian domain to a larger scale vehicular environment at an urban scale. **Key Words:** equity, environmental justice, civil rights, social impact

### **Work Completed to Date:**

This project has not developed as planned because of the PI's illness Summer and Fall 2001. An extension to July 31, 2003 has been granted.

### **Publications to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 5%

**Direct Cost:** \$54,537

## **Effect of Driving Mode on Light-Duty Vehicle Emissions Measured On-Road**

### **Principal Investigator:**

Prof. Robert Harley  
Dept. of Civil and Environmental Engineering  
University of California  
Berkeley CA 94720  
Tel. 510 643-9168  
Email harley@ce.berkeley.edu

### **Abstract:**

Motor vehicles are an important source of air pollution on urban, regional, and national scales. A great deal of research has been conducted to characterize vehicle emissions over standardized city and highway driving cycles. Much less is known about the relationship between real-world vehicle emissions and changes in vehicle speed and engine load that occur as driving conditions change. This knowledge is needed to assess the air pollution impact of traffic congestion and its mitigation strategies. We will measure on-road vehicle emissions in a California highway tunnel where vehicle speed increases from <40 to ~60 mph between peak and off-peak hours. We will also measure the effects of engine load on emissions by comparing emissions from vehicles driving downhill (morning) versus uphill (afternoon) on a 4% grade. We will quantify effects due to changes in the mix of vehicles driving through the tunnel, using visual observations, license plate surveys, and measurements collected during both weekday and weekend sampling periods. A further objective of this research is to characterize long-term trends in California light-duty vehicle emissions, by adding to a record of on-road measurements that stretches back to tunnel studies conducted in the late 1980s and early 1990s. **Key Words:** air pollution, speed effects, engine load effects

### **Work Completed to Date:**

During summer 2001, we successfully completed field measurements of vehicle emissions at the Caldecott tunnel, adding to a record of vehicle emissions measurements at this site that already includes data for summers 1994-97 and 1999. We documented continuing downward trends in vehicle emissions of carbon monoxide, hydrocarbons, and nitrogen oxides. In past years, we measured vehicle emissions in the middle bore of the tunnel (light-duty vehicles only), for uphill traffic on a 4% grade during the afternoon commuter peak period (4-6 PM). In summer 2001, we made measurements that include both morning hours (downhill traffic) and peak/off-peak afternoon hours (with uphill traffic). We are currently analyzing our data to quantify variations in pollutant emissions with changes in vehicle speed and engine load observed during the course of our measurements at the tunnel. Improved understanding of vehicle speed and engine load effects is needed to quantify effects of changes in freeway driving conditions on air pollution emissions. The field measurements for this project have been completed. Laboratory analysis of air samples collected at the tunnel is 80% complete. Time-consuming reduction of data from videotapes of traffic is also 80% complete -- we still need to match license plates to DMV registration data for individual vehicles. Data analysis is about 33% complete. Results will be presented at a conference on vehicle emissions in San Diego, and then submitted for publication as a journal article. Both a Ph.D. student (Andrew Kean in Mechanical Engineering), and an undergraduate (Bryce Wilson in Civil & Environmental Engineering) have been actively involved in the project.

### **Papers to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 45%

**Direct Cost:** \$42,434

## **Life-Cycle Environmental and Economic Assessment of Using Recycled Materials for Asphalt Pavements**

### **Principal Investigator:**

Arpad Horvath  
Department of Civil and Environmental Engineering  
109 McLaughlin Hall  
UC Berkeley  
Berkeley CA 94720  
Tel 510 642-7300  
Email Horvath@ce.berkeley.edu

### **Abstract:**

The public, industry and governments have become increasingly interested in green design and engineering to improve environmental quality and sustainability. Pavement construction is one of the largest consumers of natural resources. Recycling of pavements represents an important opportunity to save the mining and use of virgin materials, conserve energy, divert materials away from landfills, and save scarce tax dollars. How much pollution, energy, natural resources, and money could be saved by using secondary materials in road construction? What are the engineering limits of using recycled materials in roads? Can we recycle over and over again pavements that contain rubber, glass, and other secondary materials? This research will quantify the environmental and economic costs and benefits of recycling asphalt pavements, and using secondary materials for their construction. The impacts will be traced through the related life-cycles and supply chains for material and energy inputs, water consumption, hazardous and non-hazardous waste generation, toxic discharges, and greenhouse gas as well as particulate matter emissions. Life-cycle environmental and economic assessment methods will be coupled with construction process models. Stakeholders will be able to use the resulting computer tool for decision-making and scenario analysis as parameters of the pavement recycling model change over time and from region to region. **Key Words:** pavement management, lifecycle costs, environmental costs

### **Work Completed to Date:**

Our literature search is substantially complete on estimating the volume of asphalt pavement recycling in the U.S. In January 2002, we started a literature review on the use of secondary aggregates and coal combustion byproducts in asphalt pavements. We have started the economic assessment of asphalt pavement construction and are collecting data on the price of recycled materials, the economics of pavement recycling technologies, and the amount of landfill tipping fees, in order to estimate the costs and benefits associated with recycled materials use. To estimate the environmental effects of substituting recycled for virgin materials, we have collected literature and data on the material inputs of pavement construction, estimated energy use and emissions associated with mining aggregates, constructing, and recycling pavements (including various equipment). We are attempting to trace environmental effects (greenhouse gas, particulate matter, and toxic emissions, releases to water, and waste generation) through the related life-cycles and supply chains using life-cycle assessment (LCA) models. Both U.S. and international sources of information have been reviewed and synthesized. We have found case studies on the percentage of recycled materials used in asphalt pavements, and are summarizing the findings; information on the future recyclability of pavements that already contain recycled materials is scarce. We have identified most of the economic and environmental parameters that will be used in the computer model, and are exploring the best user interface based on the anticipated user groups and usage modes. Finally, we are assessing the uncertainty associated with all data sources as we proceed.

### **Publications, presentations:**

None

### **Conferences Attended:**

A. Horvath, presentation at the conference "Beneficial Use of Recycled Materials in Transportation Applications", Washington, DC, November 13, 2001.

### **Other Accomplishments:**

None to date

**Percent Complete:** 50%

**Direct Costs:** \$45,546

## **Putting Back the Pleasure in the Drive: Reclaiming Urban Parkways for the 21<sup>st</sup> Century**

### **Principal Investigator:**

Anastasia Loukaitou-Sideris  
Department of Urban Planning  
School of Public Policy and Social Research  
3250 Public Policy Building, Box 951467  
University of California, Los Angeles  
Los Angeles, CA 90095-1467  
310-206-9679  
[sideris@ucla.edu](mailto:sideris@ucla.edu)

### **Other Key Participants:**

Robert Gottlieb  
Urban and Environmental Policy Institute  
Occidental College  
1882 Campus Road  
Los Angeles, CA 90041  
323-259-2712  
[gottlieb@oxy.edu](mailto:gottlieb@oxy.edu)

### **Abstract:**

This research proposes to investigate the problems and prospects of urban parkways by focusing on the "first freeway of the West," the celebrated Arroyo Seco Parkway. Hailed in the 1920s and 1930s as marvels of engineering innovation, and as safe and efficient alternatives to non-limited access arterials, urban parkways are facing a series of problems today that include high accident rates and congestion. The Arroyo Seco Parkway was originally, built to carry 27,000 automobiles per day at 45mph. Today it carries over 120,000 cars per day at speeds often exceeding the official limit of 55mph. While the parkway is a cherished part of the area's heritage, is eligible for the National Register of Historic Places, and has been recently designated as an American Civil Engineering Landmark, the historic and aesthetic significance of the road is not recognized from an operational and legal perspective. This research will use the Arroyo Seco Parkway as a case study to evaluate the prospects for managing existing historic parkways, and to investigate the relationship between the physical qualities of parkways, their usefulness as transportation corridors, and their relative safety. Research tasks will include analysis of historic plans and documents, experiential analysis, analysis of accidents, and compilation of policies for the management of urban parkways. **Key Words:** Urban parkways, Arroyo Seco Parkway

### **Work Completed to Date:**

We have reviewed the literature on historic parkways in general and the Arroyo Seco Parkway in particular. We have almost completed the comparative safety audit of the Arroyo Seco Parkway and the spatial analysis of all accidents. Using the Traffic Accident Surveillance and Analysis Systems database we have documented the time, location, and conditions of all accidents occurring on the parkway in the last five years. We are in the process of conducting the experiential analysis of the driving experience along the parkway.

### **Papers to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to Date

**Percent Complete:** 30%

**Direct Cost:** \$49,284

## **Reinforcement Learning in Transportation Infrastructure Management**

### **Principal Investigator:**

Samer Madanat  
Institute of Transportation Studies  
University of California  
Berkeley CA 94720  
Tel. 510 643-1084  
Email: madanat@ce.berkeley.edu

### **Abstract:**

Infrastructure Management Systems support agencies in developing efficient policies to monitor, maintain and repair deteriorating facilities in transportation infrastructure networks. Traditionally, Infrastructure Management Systems have been based on a time-invariant characterization of a facility's deterioration process. However, a constant single model of a facility's deterioration may not be appropriate given the variability over time of causal factors such as traffic and environmental conditions. When this variability over time is accounted for, the infrastructure management problem becomes a Reinforcement Learning problem. One possible approach for solving this Reinforcement Learning problem would be to represent facility deterioration process using a time-varying stochastic model. The problem of finding optimal policies to manage infrastructure facilities and networks can then be formulated as an adaptive control problem, where observations of facility condition over time can be used to update the parameters of the models. An alternative to this approach is to use temporal difference learning. This approach allows us to develop policies without having to model a facility's deterioration process. Instead, the information that is gathered by the transportation agency is used to evaluate maintenance and repair policies directly, without using a stochastic process to represent facility deterioration. **Key Words:** infrastructure deterioration, infrastructure management, difference learning models

### **Work Completed to Date:**

A review of the literature and initial data gathering are well underway and model specifications are being developed.

### **Papers to date:**

Durango P. and Madanat S., "Maintenance and Repair Decision-Making for Infrastructure Facilities without Models: a Reinforcement Learning Approach", submitted for publication in the Proceedings of the AATT 2002 conference.

### **Conferences Attended:**

Annual Meeting of the Transportation Research Board, January 2002.

### **Other Accomplishments:**

None to date

**Percent Complete:** 50%

**Direct Cost:** \$70,582

## **Telecommuting over the Long Term: Patterns of Engagement and Impacts on Residential Location**

### **Principal Investigator:**

Patricia L. Mokhtarian  
Department of Civil and Environmental Engineering  
University of California, Davis  
One Shields Ave.  
Davis, CA 95616  
(530) 752-7062  
plmokhtarian@ucdavis.edu

### **Other Key Participants:**

Professor Ilan Salomon, Researcher  
Institute of Transportation Studies  
University of California, Davis  
One Shields Ave.  
Davis, CA 95616  
msilans@mscc.huji.ac.il

### **Abstract:**

Although studies show that telecommuting reduces vehicle travel in the short term, there is little empirical evidence with respect to the longer-term impacts on residential relocation (and hence travel). This study would continue the analysis of a unique and valuable data set providing 10-year retrospective telecommuting and residential/job relocation histories for a sample of 227 employees of the State of California (including non-telecommuting control group cases), many of whom have been telecommuting for at least five years. We will analyze telecommuting frequencies, durations, and patterns of engagement for the current and former telecommuters, and will compare their residential relocation behavior to that of the non-telecommuters to ascertain whether the long-term net impact of telecommuting is to reduce or increase VMT. This research will provide a first look at the answers to some important questions with respect to the long-range effects of telecommuting -- questions that have been raised for many years but for which, until now, the data were not available to answer. The findings will serve as useful background to policies that promote telecommuting as a trip reduction strategy. **Key Words:** telecommuting, residential location, cluster analysis

### **Work Completed to Date:**

Work on this project began in earnest after the first of the year. The research assistant is creating new data files that will restructure the available data into formats that are more useful for analysis. We will soon be in a position to analyze the transportation impacts of telecommuting over the 10-year retrospective period of data collection.

### **Papers to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 10%

**Direct Cost:** \$46,489

## **Optimal Control Policies for Urban Corridor Management (YR 14)**

### **Principal Investigator:**

Professor Will Recker  
Institute of Transportation Studies  
University of California, Irvine  
Irvine, CA  
Tel. 949 824-5642  
Email wwrecker@uci.edu

**Abstract:** This proposal will develop an integrated optimal control approach, with an embedded travel demand model that reflects drivers' response to the integrated optimal control system that determines the on-ramp metering rates and the urban vehicle-actuated signal timing settings in corridor networks so as to achieve a pre-specified common goal. A primary goal of the work proposed herein is to demonstrate that congestion within corridor networks can be reduced in a more effective way if the control strategies for each component sub network are geographically integrated and coordinated to reflect interaction among systems, allowing the various traffic control measures to cooperate rather than compete. The integrated control problem relating to on-ramp and urban signal control strategies will be formulated as an optimal control problem of determining such control variables as the on-ramp metering rates, the minimum green duration, the maximum green duration (or force off), background cycle length (if coordinated) and the critical time gap for vehicle actuated urban signals, subject to the control constraints, so as to minimize the system total travel time. The approach will take into consideration the interaction between the control strategy and drivers' response to it. A numerical method will be proposed for the solution of the formulated optimal control problem. **Key Words:** signal timing, ramp metering, demand analysis, optimal control strategy

### **Work Completed to Date:**

A logic-based method has been developed for the modeling of a transportation network of surface streets where traffic is controlled by fully actuated traffic signals. The formulation is shown to have high efficiency, both in terms of modeling and solution time. The model developed consists of a set of linear inequalities of discrete and continuous variables. This structural property allows the development of an integrated control strategy as a linear optimal control problem which can be solved as a Large-scale Mixed Integer Programming problem.

### **Papers to Date:**

Pavlis, Y. and W. Recker (2001). A Methodological Framework for Integrated Control in Corridor Networks. Proceedings, IEEE Conference on Intelligent Transportation Systems, Oakland, CA, 637-642.

### **Conferences Attended:**

IEEE Conference on Intelligent Transportation Systems, Oakland, CA

### **Other Accomplishments:**

None to date.

**Percent Complete:** 30%.

**Direct Cost:** \$33,784

## **The Impact of Motor Vehicle Transportation on Water Quality**

### **Principal Investigator:**

Prof. Jean Daniel Saphores

Urban and Regional Planning and Institute of Transportation Studies

University of California, Irvine

Irvine, CA 92697

Tel.949 824-7334

Email: [saphores@uci.edu](mailto:saphores@uci.edu)

**Abstract:** This research will analyze the impact of road transportation by motor vehicles on water quality in California. Air pollution and noise externalities have been the object of many studies to inform public policy on pollution control, yet the impact on water quality of operating motor vehicles on roadways has not received much attention. Our investigation will include the impacts on water quality from constructing motor vehicles and road infrastructure, operating vehicles, and disposing of used motor vehicles. We will review the engineering, planning, and economic literatures; collect information about relevant policies in OECD countries and at the federal, state, and local levels; quantify pollution impacts whenever possible; identify data gaps; and critically review the policies that have been proposed to deal with this problem. Better understanding sources of water pollution is important at a time where the population of California is growing and there are few options for new supplies of water. Finally, we will develop policy recommendations tailored to the situation in California. **Key Words:** road transportation, water quality, environmental quality

### **Work Completed to Date:**

Together with a student, we have conducted a review of the economic, planning, and transportation literatures. We also have contacted local, federal, and international agencies to collect data, and we have explored the Internet for information available in OECD countries. We are about to contact by mail a number of foreign environmental agencies. In addition, we are working on the quantification of the impacts of motor vehicles operation on water quality.

### **Papers to Date:**

1. Nixon, H. and J.-D. Saphores (2001), Used Oil Policies to Protect the Environment: An Overview of Canadian Experiences, to be presented at the Third International Conference on Traffic and Transportation Studies in China, July 2002 and to be published in the conference proceedings.
2. Nixon, H. and J.-D. Saphores (2002), The Environmental Impacts of Motor Vehicle Operation on Water Quality: A Preliminary Assessment, Working Paper, University of California Irvine.

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 50%

**Direct Cost:** \$48,109

## **Equity and Environmental Justice in Transportation**

### **Principal Investigator:**

Prof. Martin Wachs  
109 McLaughlin Hall  
UC Berkeley  
Berkeley CA 94720  
Tel 510 542-3585  
Email mwachs@uclink.berkeley.edu

### **Abstract:**

The Environmental Justice movement in transportation has based many claims on concerns for equity in transportation finance and in the distribution of direct and indirect costs and benefits of transportation. Under Title VI of the Civil Rights Act and under several executive orders, the U.S. Department of Transportation requires transit agencies and metropolitan planning agencies to report on the equitability of their programs. In addition, there is a scholarly literature on the theme of equity and its measurement. This research project will review formal, scholarly definitions of equity and analytical measures by which equity in transportation can be measured. It will also review measures of equity used by public agencies as they comply with federal reporting requirements and it will review equity measures used by environmental justice advocacy groups. It will note consistencies and inconsistencies in these definitions, and will propose indicators of equity that can advance the cause of environmental justice by providing better measures for use in the analysis of transportation projects or programs. The project will produce a scholarly analysis of equity in environmental justice for transportation, and a primer on the measurement of equity for environmental justice advocates and transportation agency practitioners. **Key Words:** equity, environmental justice, civil rights, social impact

### **Work Completed to Date:**

Work is underway and we expect to produce a draft final report by the end of the current academic year. We have encountered no unexpected problems and the work is progressing smoothly. There are two graduate students, Shannon Cairns and Jessica Greig, employed on the project.

### **Papers to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 20%

**Direct Cost:** \$53,937

### C. Project Financial Status

It is the UCTC's longstanding policy to commit all funds received from our sponsors, the US Department of Transportation and the California Department of Transportation, in the year that they are received. Occasionally funds are not fully expended in the year received; in such cases the funds may be carried over into the next fiscal year with the permission of the UCTC Director, but remain committed to the categories to which they were initially allotted.

Our report is based on 2001-2002 program allotments using 2001-2002 funds received. Allocated amounts differ in some cases from amounts initially budgeted because of changes in salaries or expense items, or reallocations of administrative budget amounts to research and technology transfer accounts.

**Table 5. Allocated Amounts as of February 2002**

ITEM	BUDGET
Center Director Salary	61,370
Faculty Salaries	211,588
Administrative Staff Salaries	103,300
Other Staff Salaries	0
Student Salaries	505,170
Staff Benefits	61,244
<b>Total Salaries and Benefits</b>	<b>942,672</b>
Scholarships	610,000
Permanent Equipment	5,000
Expendable Property & Supplies	103,416
Domestic Travel	36,200
Foreign Travel	0
Other Direct Costs (Specify)	0
<b>Total Direct Costs</b>	<b>754,616</b>
Facilities & Admin. (Indirect) Costs	43,112
<b>TOTAL COSTS</b>	<b>1,740,400</b>
Federal Share	870,200
Matching Share	870,200