

PATH/UTC Conference Fact Sheet

From Research to Practice

NOTE: This file contains a fact sheet for each presentation scheduled for the 2007 conference.

Research Title: How to Pay for Transportation? A Survey of Public Preferences in California

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1. Statement of the Problem:

This research investigated how strongly California residents might support a wide range of tax and fee options to fund transportation.

2. Methodology and Data Sources:

We conducted two random-digit-dialing phone surveys of Californians, one with a sample of 2705 adults (18 and older) and the other a sample of 815. Survey 1 examined support for ten specific transportation funding options, including raising various taxes and fees, issuing bonds, and different types of tolled facilities, and Survey 2 included more in-depth questions on tolling and public-private partnerships.

3. Findings and Policy Implications:

- The most popular tax or fee option was to increase vehicle registration fees by a variable amount depending on the vehicle's air pollutant emissions and gas mileage. Given the significant increase in support for this option compared to a flat fee, policy makers should seriously examine varying this and other types of fees to meet environmental objectives.
- Statewide levels of support were fairly strong for some tolling options, particularly HOT lanes, and people living in regions that already have toll roads and HOT lanes were particularly supportive. These findings indicate that personal experience with tolling strongly influences levels of support. Therefore, agencies wishing to introduce tolls should choose and implement tolled projects carefully, to ensure that they operate smoothly and generate a positive impression. Another conclusion policy makers may draw from these results is that even if tolling projects are initially unpopular with the public, once implemented the public may accept them without much protest.
- Three tax options—gas taxes, sales taxes, and the vehicle license fee—had virtually the same levels of overall support. This finding suggests that policy makers choosing among them should pursue the one that performs best under performance criteria such as equity and the impact on transportation system performance, rather than choosing the option thought to most appeal to voters.
- There were significant regional differences in levels of support for most of the options tested, including fuel taxes and registration fees. These differences indicate that regional solutions may be more successful with the electorate than statewide solutions.

4. Next Steps:

I recently began a follow-up study entitled "Public Support for Environmental Transportation Taxes and Fees: A Survey of Californians." The project will survey California residents to determine how likely they are to support transportation taxes and fees set at variable rates, with lower rates for more environmentally-friendly vehicles and transportation services, and higher rates for less environmentally-friendly ones. The project is funded by the Mineta Transportation Institute, and I am conducting it with co-researchers Jennifer Dill and Hilary Nixon.

6. References and Links to Research Products:

Dill, Jennifer, and Asha Weinstein. "How to Pay for Transportation? A Survey of Public Preferences in California." *Transport Policy* 14, no. 4 (2007), pp. 346-356.

Weinstein, Asha, et al, *Transportation Financing Opportunities for the State of California* (San Jose: Mineta Transportation Institute, October 2006).

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From Research to Practice

Research Title: ITS Strategies for Reducing Energy Consumption and Emissions

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1. Statement of the Problem:

Inefficient surface transportation results in excessive energy consumption as well as pollutant and greenhouse gas emissions. Different Intelligent Transportation System (ITS) strategies, such as environmentally-friendly navigation and intelligent speed adaptation, have the potential to reduce energy consumption and emissions. This research attempts to quantitatively determine these reductions.

2. Methodology and Data Sources:

Using unique transportation/emissions simulation modeling tools, we have simulated several ITS strategies to determine what conditions exist to achieve the greatest potential benefits. Further, we have carried out initial experiments in traffic using probe vehicles to verify results in the real world.

3. Findings:

In general, when considering several ITS technology implementations (such as ISA and environmentally-friendly navigation), each will have an environmental benefit in the range of 5% - 20%. If many strategies are implemented together, greater benefits can be achieved.

4. Implications, Applications, and Recommendations:

The majority of this research has been done in simulation; further experimentation needs to be carried out in real-world conditions with greater technology penetration rates.

5. Next Steps:

This research is in progress, with further data collection and analysis to take place.

6. References and Links to Research Products:

Servin, O., K. Boriboonsomsin, and M. Barth (2007) "An Energy and Emissions Impact Evaluation of Intelligent Speed Adaptation," *Proceedings of the IEEE Intelligent Transportation Systems Conference*, Toronto, Canada, September 2006.

Barth, M., K. Boriboonsomsin, and A. Vu (2007) "Environmentally-Friendly Navigation," *Proceedings of the IEEE Intelligent Transportation Systems Conference*, Seattle, Washington, October 2007.

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From Research to Practice

Research Title: Highlights of Recent Research in Road Ecology

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1. Statement of the Problem:

Road ecology is an emerging field in sustainable transportation that brings together interdisciplinary approaches to gain understanding of the ecological impacts of road networks, and to develop integrative solutions. Highlights of current research and applications in road ecology will be presented.

2. Methodology and Data Sources:

Several examples will be provided, ranging from new methods for modeling wildlife habitat fragmentation and mitigating landscape connectivity, to the establishment of research frameworks for achieving integrated roadside ecology and management.

3. Findings:

4. Implications, Applications, and Recommendations:

Research in road ecology contributes to a knowledge base that will help shape our growing awareness of the ecological footprint of transportation networks. In addition, road ecological research can inform the development of practical solutions that integrate transportation, environmental and land-use planning.

5. Next Steps:

Road ecology as a field is still in somewhat early stages of defining concepts and developing critical research themes. The presentation will bring us up to date on current progress, and point the way to next steps.

6. References and links to research products

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From Research to Practice

Research Title: Planning for Demographic Diversity: The Case of Immigrants and Transportation in California

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1. Statement of the Problem:

This presentation is part of a multi-year project on the travel behavior of immigrants in California that includes scholars from UC Davis, UCLA, and UC Berkeley. The focus of this component of the research is to examine (a) the commute travel of immigrants in California from 1980 to 2000 and (b) the implications of our findings for designing and marketing transportation systems to a diverse population.

2. Methodology and Data Sources:

The study relies on 1980, 1990, and 2000 Public Use Microdata Samples of the U.S. Census. We model commute mode choice, focusing on the likelihood of commuting by public transit or carpooling relative to driving or solo driving. Our analysis examines changes in the commute mode choice of immigrants with time in the U.S. as well as variation in commute mode choice across immigrants by racial and ethnic group.

3. Findings:

We find that immigrants rely more extensively on alternative commute modes (carpooling and transit) than native-born commuters. However, with time in the U.S., immigrants quickly assimilate away from these alternative modes and increasingly rely on solo driving. Despite this transportation assimilation process, Hispanic immigrants remain more likely to commute by public transit and by carpool than native-born whites even after more than 20 years in the U.S.

4. Implications, Applications and Recommendations:

Declining transit use among recent immigrants and slowing immigration combined suggest that, unless transit planners intervene, transit ridership in California will decline. Transit agencies can adopt policies to better meet the travel needs of immigrants and slow their assimilation to automobiles. Among other approaches, they can enhance transit services in dense urban neighborhoods that serve as ports of entry for recent immigrants. In neighborhoods outside of the central city, cars provide immigrants with more convenient access to employment and other important destinations. Policy makers and nonprofit agencies also must focus on policies to help increase immigrants' access to automobiles and their ability to drive them.

5. Next Steps:

We are currently finalizing a CD-Rom that will include our findings, policy recommendations, literature review, and supporting resource papers. It also will include data on immigrants and travel in California and the nine largest metropolitan areas in the state.

6. References and Links to Research Products:

The final product will be posted on the Caltrans web site. The various papers and data for the census-data component of the project also will be posted at <http://www.its.ucla.edu/research/immigrants/index.html>

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From Research to Practice

Research Title: Walking and Driving in the Los Angeles South Bay

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1. Statement of Problem:

Many auto-oriented urban areas are being rebuilt at higher densities, creating unprecedented prospects for increases in density and traffic in inner-ring post-World War II suburbs. Nowhere is this trend more evident than Los Angeles, the nation's prototypical automobile city, where infill development and increases in density are that city's future. With this transformation comes a pressing need to understand whether Smart Growth principles can be used to shift travel from motorized to non-motorized modes.

2. Methodology and Data Sources:

This study uses travel diary data from 2,399 persons living in the South Bay's quintessentially auto-oriented suburban neighborhoods to examine how differences in urban form are related to individual travel patterns.

3. Findings:

The results vary by trip type — individuals are more likely to shift from the car to walking for grocery and meal trips than they are for personal shopping or personal service trips. The results also show distinct travel differences across centered (village-oriented) versus linear (corridor) land use patterns.

4. Implications, Applications and Recommendations:

The results can be linked to the structure of local retail and urban design to develop planning guidelines. This allows us to go beyond simple tests of whether Smart Growth influences travel to get insight into specific planning approaches that are associated with differences in travel across modes, numbers of trips, and trip distances.

5. Next Steps:

Studies should be done on the planning approaches that are associated with more sustainable transport outcomes.

6. References and Links to Research Products:

See UCTC and UCI websites.

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From Research to Practice

Research Title: Selective Screening of Rail Passengers

Name: Bruce Butterworth and Brian Michael Jenkins

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1. Statement of the Problem:

Terrorists see urban mass transportation as an attractive target. This research focused on the terrorist risks confronting urban mass transit in the U.S. and explored how and when different forms of passenger screening, and in particular, selective screening, can reduce those risks.

2. Methodology and Data Sources:

To assess the current state of security in mass transit, and particularly in screening procedures, MTI's National Transportation Security Center used interviews and literature research to assess federal standards, guidelines, and R&D, and used a questionnaire and interviews to consult with transit operators in a variety of metropolitan areas.

3. Findings:

(1) The goal of screening and other security measures is to reduce risk, not prevent all attacks; (2) While 100% screening is not a viable option, selective screening is: It is flexible—it can be implemented quickly and then expanded or contracted—it adds to deterrence, complicates terrorist planning, and diverts attacks to less lucrative venues, thereby decreasing casualties. (3) Screening programs must be carefully planned and implemented; be based on clear policies and procedures; maximize unpredictability, passenger interaction, and deterrence; and use different combinations of random selection, behavioral profiling, and specific or general threat information depending on the threat situation. (4) Existing technologies and canines can be used for inspections, and interactions with passengers should avoid the appearance of harassment. (5) Because selective screening runs counter to Americans' preference for passive and egalitarian systems, it must be carefully managed to avoid discrimination, ethnic profiling, and attendant legal challenges. (5) It must also be accompanied by vigorous public information programs that emphasize risk reduction and help allay public concerns.

4. Implications, Applications, and Recommendations: 1) Selective screening programs are a viable security option and should be considered and incorporated into planning. (2) Future technology can play a major role in screening, and development and demonstration efforts should focus on improving current technologies and developing field-deployable systems that can detect explosives on individuals and groups at standoff distances.

5. Next Steps:

Research is complete.

6. References and Links to Research Products:

Selective Screening of Rail Passengers

<http://transweb.sjsu.edu/mtiportal/research/publications/documents/06-07/pdf/MTI-06-07.pdf>

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From Research to Practice

Research Title: Sustainable Transit for China's Hyper-growth Cities

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1. Statement of the Problem:

To design a system of "feeder" buses to access transit trunk lines (e.g. consisting of Bus Rapid Transit) and to explore how best to provide preferential treatment for buses operating on city streets.

2. Methodology and Data Sources:

Methodology: We use continuum approximations (whereby we concern ourselves with bus line densities as opposed to establishing individual route locations) to identify suitable network configurations for feeder buses. Traffic flow analysis is used to determine how to allocate road capacity for buses.

Data Sources: Traveler surveys conducted by our Chinese partners

3. Findings

With the combination of high performance vehicles for transit trunk lines and appropriate feeder systems, cities in China (and elsewhere) can often meet their desired mobility goals.

4. Implications, Applications, and Recommendations:

Using our methods for estimating transit system resource requirements, policymakers can perform financially-constrained transit planning. Staff can adapt our general (idealized) transit network designs to their specific cities.

5. Next Steps:

We intend to deploy our ideas in the City of Chengdu, China; measure the outcomes; and refine our recommended transit systems.

6. References and Links to Research Products:

Now being prepared

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From Research to Practice

Research Title: TOD and Trip De-generation

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1. Statement of the Problem:

The potential trip-reduction benefits of TODs in the U.S. are muted since most are parked and designed oblivious to the fact that a rail stop is nearby. This study looks at the trip generation attributes of 17 built TOD projects. One motivation for this research was to provide original and reliable data to help seed an update of the Institute of Transportation Engineers (ITE) trip generation and parking generation rates from which local traffic and parking impacts are typically derived, and impact fees are set. Some analysts have identified a serious "suburban bias" in the current ITE rates. Typically the empirical data used to set generation rates are drawn from suburban areas with free and plentiful parking and low-density single land uses. Moreover, since ITE's auto trip reduction factors, to reflect internal trip capture, are based on only a few mixed-use projects in Florida, there has been little or no observation of actual TODs. The end result is that auto trip generation is likely to be overstated for TODs. This can mean that TOD developers end up paying higher impact fees, proffers, and exactions than they should since such charges are usually tied to ITE rates.

2. Methodology:

The research was done by counting the passage of motorized vehicles using pneumatic tubes stretched across the driveways of 17 transit-oriented housing projects of varying sizes in four urbanized areas of the country: Philadelphia/N.E. New Jersey; Portland, Oregon; metropolitan Washington, D.C.; and the East Bay of the San Francisco Bay Area.

3. Findings:

The results of this research clearly shows TOD-housing de-generates trips in the four urbanized areas that were studied. The research confirms the ITE trip generation and parking generation rates underestimate automobile trip reduction for TOD housing. The ITE manual presents "weighted averages" of trip generation. The weighted average vehicle trip rates for this study were computed for all 17 projects combined for weekday, a.m. peak, and p.m. peak. Over a typical weekday period, the 17 surveyed TOD-housing projects averaged 44% fewer vehicle trips than that estimated by the ITE manual (3.754 versus 6.715). The weighted average differentials were even larger during peak periods - 49% lower rates during the a.m. peak and 48% lower rates during the p.m. peak.

4. Implications, applications, and recommendations:

To the degree that impact fees are based on peak travel conditions, one can infer that traffic impacts studies might end up overstating the potential congestion-inducing effects of TOD-housing in large rail-served metropolitan areas by as much as 50%.

5. Next Steps:

Expand sample.

6. References and Links to Research Products:

None. New work.

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From Research to Practice

Research Title: Mixed-income Communities and Transit-Oriented Development: A Research Agenda

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1. Statement of the Problem:

Although \$12 billion of new public transit investment has been approved by Bay Area voters, policymakers have paid little attention to the need for affordable housing and income diversity adjacent to station areas. With property values rapidly rising adjacent to stations, it is becoming important to determine where housing affordability is threatened and what mechanisms can be used to preserve it.

2. Methodology and Data Sources:

This research draws on a joint report by the Center for Transit-Oriented Development and the Center for Community Innovation (and background work on combined housing-transit costs by the Center for Neighborhood Technology). We rely primarily on census data from Geolytics, as well as the Consumer Expenditure Survey, and also use interviews to develop two case studies.

3. Findings

We find that although many stations are located in income diverse neighborhoods, most are in neighborhoods that are becoming more segregated by income because of an influx of more affluent groups.

4. Implications, Applications, and Recommendations:

We recommend that transit station planning adopt a more contextually sensitive, comprehensive approach, using policies to provide permanently affordable housing where possible. The next phase of the research will be to develop specific tools that policymakers can use to preserve income diversity around transit stations.

5. Next Steps:

This talk will discuss in more detail the research agenda that is necessary to make the case for mixed-income transit-oriented communities.

6. References and Links to Research Products:

Transit-Oriented for All: The Case for Mixed-Income Transit-Oriented Communities in the Bay Area

http://www-iurd.ced.berkeley.edu/cci/publications/GCCFramingPaper_FINAL.pdf

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From Research to Practice

Research Title: Empty Container Reuse

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1. Statement of the Problem:

In this project we study empty container movements in the Los Angeles and Long Beach (LA/LB) port area, in an effort to reduce traffic congestion by optimizing the empty container reuse.

2. Methodology and Data Sources:

We formulate analytical models of dynamic empty container reuse, and developed techniques to optimize empty container operations. We use several case studies based on estimates of current and projected future demand in the LA/LB port area, in order to evaluate the proposed techniques.

3. Findings:

Simulation experiments based on the selected case studies demonstrate that significant cost and congestion reductions can be achieved in the area through reuse of empty containers.

4. Implications, Applications, and Recommendations:

The research has practical implications regarding reduction of traffic congestion and reduction of storage requirements at the terminals. Implementation of empty container reuse will benefit all stakeholders involved, but since this is a multifaceted problem, other parameters (such as legal issues, liability etc.) need to be investigated and resolved in order for full implementation to occur.

5. Next Steps:

The next step should be to consider simulation experiments at a larger scale, using a more detailed model of the LA metropolitan area and with more detailed and updated estimates of empty container flows. An additional step would be to have a demonstration experiment where we test our approach in the field, thus obtaining more accurate estimates of the level of benefits as well as the main obstacles for widespread implementation.

6. References and Links to Research Products:

- “Port Dynamic Empty Container Reuse,” *Transportation Research Part E: Logistics and Transportation*, TR-E, Vol. 42, 1, pp. 43-60, 2006.
- “A heuristic solution for the empty container substitution problem,” *Transportation Research Part E: Logistics and Transportation*, TRE, 2007.
- METRANS website: <http://www.metrans.org>

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From Research to Practice

Research Title: Legislative Criteria for Sustainable Transportation and Development

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1. Statement of the Problem:

Many regions of California are developing blueprints for growth but simultaneously experiencing rapid outward expansion that is spilling out of their planning jurisdictions. For example, the San Francisco Bay Area has jumped its boundaries southward into Santa Cruz, Monterey, and San Benito Counties, northeast along I-80 toward Davis and Sacramento, and across the East Bay Hills into the Central Valley and beyond. Sacramento and its suburbs in turn have been rapidly developing outward.

A business-as-usual forecast suggests that the two metropolitan regions will increasingly intertwine. Similar growth patterns are apparent in Southern California, where urbanization is increasingly connected from Santa Barbara and Ventura Counties southward through Los Angeles and Orange Counties through San Diego and into Mexico, and westward through San Bernardino, Riverside, and Imperial Counties. While the magnitude of growth is smaller, development along Highway 99 in the Central Valley and along the California coast is increasingly blurring the boundaries between formerly distinct cities and towns. These development patterns raise issues of regional, statewide, and \ national significance, threatening losses of wetland, and habitat, converting prime and unique farmland to urban uses, and pushing up against critical habitat and unique landscapes. Agriculture, habitat and urban uses will increasingly compete for water, and the state will face additional challenges in power supply, transportation congestion, air pollution, housing prices, and education.

Californians have been willing to take the lead on environmental protection and to provide funding to improve the quality of life and protect the state's environmental and cultural resources, as the passage of recent bond measures demonstrates. While some of the bond funds are reserved for specific projects, others could be directed toward a more sustainable vision of growth. More fundamentally, however, in addition to individual initiatives to address particular concerns, a strategy for state growth and investment is needed, so that California can manage its growth in the most cost-effective, economically productive, environmentally sound, and socially equitable ways it can find.

2. Methodology and Data Sources:

We are using population and economic forecasts and state, local and regional land use and infrastructure data along with GIS mapping and modeling to document and assess California's growth. We also are carrying out literature reviews, in-depth interviews, and program assessments, with cases from California, other states, and abroad.

3. Findings:

The research, currently underway, will provide recommendations on 1) best practices for growth management and sustainable development; 2) planning oversight and implementation structures and strategies; 3) criteria and benchmarks for managing growth, assessing performance, and prioritizing investments, and 4) short and long term strategies to improve program effectiveness.

4. Implications, Applications and Recommendations:

Preliminary review of programs in other states and nations suggest promising approaches including tying state goals to benchmarks and allocating funding based on compliance with meeting the benchmarks.

5. Next Steps:

The work, which involves a dozen senior faculty and researchers at UC, will be carried out over the next year with presentations on findings for legislators, administrators and staff along the way.

6. References:

Elizabeth Deakin, Testimony, Senate Select Committee on Bay Area Growth, 9/27/2007

Elizabeth Deakin, Testimony, Assembly Select Committee on Growth Management, 10/23/07

Research Title: Biofuel Technologies and Policy, and Climate Change Policies

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From Research to Practice

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1. Statement of the Problem:

Transportation energy supply and use must be transformed greatly over the next several decades to avoid dangerous climate change. Biofuels may be part of the solution. My research evaluates how these changes might be enabled through public policy and what the environmental and economic implications of such changes could be.

2. Methodology and Data Sources:

Various, including life cycle analysis, energy system modeling, and policy analysis.

3. Findings:

Biofuels can contribute to energy and environmental goals, but this is likely to require new fuels, new feedstocks, and new conversion technologies. Further, the development of a sustainable biofuel industry will require global cooperation. Reductions in transportation-related greenhouse gas emissions are feasible, and may be low cost, but will require effective laws and regulation, such as a low carbon fuel standard. Energy security is not necessarily linked to renewability, but to the degree of centralization of energy supply systems. Energy markets do not take security into account.

4. Implications, Applications, and Recommendations:

See above.

5. Next Steps:

Development of tools to measure the greenhouse gas implications of fuels. Analysis of climate and fuel policies that account for uncertainties.

6. References and links:

Low carbon fuel standard

<http://www.its.berkeley.edu/sustainabilitycenter/lowcarbonfuelstandards.html>

Biofuel analysis

<http://rael.berkeley.edu/EBAMM/>

<http://repositories.cdlib.org/its/tsrc/UCB-ITS-TSRC-RR-2007-1/>

Climate change-energy security linkage

<http://www.iop.org/EJ/abstract/1748-9326/1/1/014004/>

Research Title: A GIS-based Tool for Forecasting the Travel Demands of Demographic Groups within California – An Optimal Resource Allocation Tool

Name: Konstadinos (Kostas) G. Goulias

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From Research to Practice

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1. Statement of the Problem:

Develop a general GIS-based method that shows optimal resource allocation in California accounting for equity and distributional impacts of a variety of investments. Pilot test the method using available data on infrastructure supply and accessibility and plan for its future expansion to become a comprehensive resource allocation tool.

2. Methodology and Data Sources:

Using data from the Census Transportation Planning Package and California highway networks, two geographic subdivisions (Census tract and Census block groups) were tested for their ability to represent accessibility for the entire state. Maps of accessibility were produced using concentric rings around each block group and each tract. This information was then to derive estimates of efficiency for each geographic subdivision in converting highway supply into accessibility. Then, one type of fractal analysis was used to demonstrate geographic equity analysis. Finally, using the California household survey we also estimated correlation measures of accessibility with travel behavior.

3. Findings:

A) In assessing quality of transport service offered to residents we need to consider facility impacts at different geographic levels, from the area immediately surrounding a residence or place of employment to wider areas of influence. The study demonstrates the utility of existing mathematical and statistical tools to address different aspects of the optimal resource allocation problem, but the use of these tools is limited by the lack of suitable data. Study should be followed by a complete inventory of transportation investment and the implementation of longitudinal data collection projects that will show the impact of investment on accessibility and behavior over time. We demonstrate this using concentric rings of accessibility, using factor analysis to identify the rings. B) Stochastic frontiers can be used to estimate allocative efficiency, Theil's inequality indices can estimate different geographical components of (in)equity, and structural equations models can correlate accessibility and travel behavior. Priority in investment to support accessibility can be informed by within-an-area distributional impacts based on Theil's index and comparison with other areas. C) Highway improvements can target residents that travel excessively compared to residents in other locations where travel options enable better time allocation. Also, expected efficiency of the investments can be informed by the stochastic frontiers and priorities developed accordingly. Efficiency in the transformation of roadways to access depends on the residents of each geographic subdivision and the measurement of access (outer ring vs. middle ring). It also depends on the size of the geographical area and the amount and mix of highway types within each area.

4. Implications, Applications, and Recommendations:

We recommend the following: A) Create a project to inventory transportation investments at regular intervals and monitor the impact of these investments on the level of service offered. B) Create a panel study of investment impacts that allows tracking of the sequence of allocated resources and infrastructure improvements. C) Create a panel study of travel behavior that can track accessibility changes and concomitant travel behavior changes simultaneously.

5. Next Steps

Additional analysis is planned at smaller spatial subdivisions.

6. References and Links to Research Products

Goulias K. An Optimal Resource Allocation Tool for Urban Development Using GIS-based Accessibility Measures and Stochastic Frontier Analysis. <http://www.path.berkeley.edu/PATH/Publications/PDF/PRR/2007/PRR-2007-07.pdf>

Research Title: Security Gap Analysis
Name: Peter J. Haas, Ph.D.

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1. Statement of the Problem:

State DOTs, working via TRB and other means, have sought to address transportation security concerns with many research projects. This project identifies gaps in the existing research and recommends specific projects with which to address those gaps.

2. Methodology and Data Sources:

We reviewed hundreds of existing research publications and classified their substantive focus and other characteristics and analyzed “gaps” in this body of research.

3. Findings:

Existing research tends to focus heavily on prevention of security problems and is less attuned to the response and recovery phases of emergency management issues associated with security. It also tends to be strategy-oriented at the potential expense of more practical guides and case studies. Relatively little has been prepared to guide transportation and transit agencies in their roles as emergency responders.

4. Implications, Applications, and Recommendations:

This report proposes fourteen specific research projects that are intended to address gaps in existing research.

5. Next Steps:

The findings have been presented to the Special Committee on Transportation Security of AASHTO and other interested parties, who are now considering whether to fund the project proposals.

6. References and Links to Research Products:

NCHRP Project 20-59(25) Security Research Plan “Gap Analysis.”

Research Title: Evidence-Based Strategies for Increasing Active Travel

Name: Susan Handy

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From Research to Practice

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1. Statement of the Problem:

Concerns over the growing obesity crisis and climate change are motivating efforts to increase active travel: to get more people walking and bicycling as modes of transportation. Land use policies are seen as an important strategy for increasing active travel, but evidence on their effectiveness is limited, particularly given the possibility of the “self-selection” of residents who prefer active travel into neighborhoods that support active travel.

2. Methodology and Data Sources:

We surveyed residents of 8 neighborhoods in northern California about their travel behavior, focusing on residents who had moved within the last year. Recent movers reported changes in travel behavior from before and after their move, as well as characteristics of their current and previous neighborhoods. Our “quasi-longitudinal” analyses tested the association between changes in the built environment and changes in travel behavior, while controlling for attitudes about travel.

3. Findings:

Our analyses show that changes in the built environment are associated with changes in both driving and walking. All else equal, residents walk more when they move into neighborhoods that offer greater accessibility, better walking and biking options, more sense of safety, more socializing, and a more attractive setting; they drive less when they move into neighborhoods that offer greater accessibility and more sense of safety.

4. Implications, Applications, and Recommendations:

These findings offer some encouragement that land use policies designed to put residents closer to destinations and provide them with viable alternatives to driving will actually lead to less driving and more walking. Policies that could increase accessibility in new areas include mixed-use zoning and street connectivity ordinances; policies in existing areas include incentives for infill development and redevelopment of shopping areas.

5. Next Steps:

More sophisticated research designs are needed to more firmly establish the effectiveness of these policies in bringing about an increase in active travel. UC Davis is working with researchers from six other institutions on a pilot study of a true longitudinal research design, in which we will measure physical activity, including active travel, for household members before and after they move into a walking-oriented neighborhood.

6. References and Links to Research Products:

Handy, S., X. Cao, and P.L. Mokhtarian. “Correlation or Causality Between the Built Environment and Travel Behavior? Evidence from Northern California.” *Transportation Research D*, Vol. 10, pp. 427-444. 2005.

Handy, S., X. Cao, and P.L. Mokhtarian. “Does Self-selection Explain the Relationship between Built Environment and Walking Behavior? Empirical Evidence from Northern California.” *Journal of the American Planning Association*, Vol. 72, No. 1, pp. 55-74. 2006.

Research Title: Decadal Changes in On-Road Gasoline and Diesel Vehicle Emissions
Name: Robert Harley

PATH/UTC Conference Fact Sheet

From Research to Practice

University/Department: UC Berkeley Civil and Environmental Engineering
Address: 760 Davis Hall, University of California, Berkeley, CA 94720-1710
Phone number and email: (510) 643-9168, harley@ce.berkeley.edu

1. Statement of the Problem:

Measure changes in on-road vehicle emissions of air pollutants.

2. Methodology and Data Sources:

Measured air pollutant concentrations in a San Francisco Bay area highway tunnel. Separate emission factors were calculated for light-duty passenger vehicles and medium/heavy-duty diesel trucks.

3. Findings:

For light-duty vehicles, NO_x and PM_{2.5} emission factors decreased by 67±3 and 36±17%, respectively between 1997 and 2006. Corresponding decreases in emissions from diesel trucks were 30±9% for NO_x and 48±12% for PM_{2.5}.

4. Implications, Applications, and Recommendations:

The relative importance of gasoline (mostly passenger) vs. diesel (mostly goods movement) engines as sources of air pollution has shifted over the last decade, with an increasingly important role for diesel engines as the dominant source of nitrogen oxide (NO_x) emissions.

5. Next Steps

Further data analysis is underway to obtain results for additional pollutants including aldehydes (toxic air contaminants), ammonia, and particle number/size distribution.

6. References and links to research products

<http://dx.doi.org/10.1016/j.atmosenv.2007.09.049>

Research Title: Increasing the Environmental Sustainability of Transportation Infrastructure: Key Issues, Current and Future Work

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: John Harvey

University/Department: University of California Pavement Research Center, UC Davis

Address: Dept of Civil and Env Engr, One Shields Avenue, Davis, CA 95616

Phone number and email: 530 754 6409 jtharvey@ucdavis.edu

1. Statement of the Problem:

Technology to improve the sustainability of pavements, primarily roads.

2. Methodology and Data Sources:

I will be presenting an overview of general principles and opportunities for improving sustainability, and review of several areas of current research, including rehabilitation technologies that involve recycling of in-place materials, and incorporation of recycled materials from other materials streams into pavement applications. Will mention work on application of life cycle analysis to pavements.

3. Findings:

Will present results of the performance of the pavements with recycled materials. Will refer to the development of some new analysis methods that will permit evaluation of other materials and structures.

4. Implications, Applications, and Recommendations:

Implement the analysis and design methods that have been developed because they permit analysis and design of pavement with the new types of materials. Current design methods cannot consider these materials and structures, which severely limits their usefulness. Move forward with implementation of the new materials as the research is completed. Move towards consideration of life cycle analysis when considering policy for pavement design.

5. Next Steps

Research to be presented is at various stages, some completed, some in progress, some beginning.

6) References and links to research products:

www.its.berkeley.edu/pavementresearch, various reports. Various journal and conference papers. The presentation will cover a number of projects.

Research Title: The Evolving Nature of Terrorist Acts

Name: Brian Michael Jenkins

PATH/UTC Conference Fact Sheet

From Research to Practice

University/Department: Mineta Transportation Institute, San Jose State University
Address: 210 N Fourth St, 4th Fl, San Jose, CA 95112
Phone number and email: bmjenk@ix.netcom.com

1. Statement of the Problem:

The terrorist threat to public transportation is real but not easily quantifiable, making it difficult to determine the “right level of security.” Studies are needed to document lessons learned and best practices.

2. Methodology and Data Sources:

We carried out case studies of terrorist attacks on public transportation in London, Madrid, Mumbai, and Moscow.

3. Findings:

Deterrence and prevention are difficult to achieve given the nature of terrorism and inherent vulnerability of public transportation. Advance planning is essential to effective response to threats and incidents. Effective security will be reactive and includes not only deterrent and preventive measures, but all efforts to mitigate casualties, damage, and disruption.

4. Implications, Applications, and Recommendations:

More attention needs to be paid to measures to mitigate casualties, damage, and rapidly restore service. Agencies must communicate accurate information to users and the public and provide continuing information and assistance to relatives and friends of victims—an extremely difficult task, not always done well.

5. Next Steps:

This project is in the final draft stage.

6. References and links to research products

Selective Screening of Rail Passengers (2007)

<http://transweb.sjsu.edu/mtiportal/research/publications/documents/06-07/pdf/MTI-06-07.pdf>

Saving City Lifelines: Lessons Learned in the 9-11 Terrorist Attacks (2003)

<http://transweb.sjsu.edu/mtiportal/research/publications/summary/0206.html>

Protecting Public Surface Transportation Against Terrorism and Serious Crime: Continuing Research on Best Security Practices (2001)

<http://transweb.sjsu.edu/mtiportal/research/publications/summary/0107.html>

Protecting Surface Transportation Systems and Patrons from Terrorist Activities (1997)

<http://transweb.sjsu.edu/mtiportal/research/publications/summary/9704.html>

Research Title: Street Design Contributions to Urban Sustainability
Name: Dr. Elizabeth Macdonald

PATH/UTC Conference Fact Sheet

From Research to Practice

University/Department: UC Berkeley, Department of City and Regional Planning
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In general, my research seeks to understand and measure the possible contributions of well-designed streets to creating more sustainable urban places, and to identify the institutional and cultural barriers that work against creating such streets in the United States. This research agenda requires multiple research investigations, using a variety of methods and data sources.

Street Trees and Intersection Safety Research: A recently completed research project took as its starting point the reality that AASHTO recommended street design standards call for extensive clear sight triangles at many intersections for safety, that in practice in urban contexts street trees tend to be the main things excluded from clear sight triangles, and yet an extensive body of research shows that street trees can make valuable contributions to urban sustainability, including mitigation of the urban heat island effect. A premise of the research is that street trees should not be restricted unless it can be shown unequivocally that they create unsafe environments. The research used computer modeling and drive-through simulations to analyze the visual obstruction at intersections caused by street trees and other objects. The simulations were shown to 96 individuals in controlled laboratory experiments. The finding was that the presence of high-branching trees near intersections does not significantly impact a driver's ability to see approaching cars—or at least impacts it considerably less than the presence of other common curbside objects such as parked cars and newspaper racks. The practical implication of this finding is that policymakers and city staff should carefully assess street tree placement policies in place in their cities, and make sure that the ability to plant trees within public rights-of-way is not unnecessarily constrained.

The full research report may be downloaded from: <http://repositories.cdlib.org/iurd/wps/>

The Value of Landscape Features along Transportation Corridors: A current research project is seeking to ascertain the value of landscape elements along Caltrans controlled roadways (urban arterial streets, rural highways, and freeways). The first phase of the research, currently underway, involves a broad literature review that will bring together research findings from a broad range of academic disciplines and best practice examples from the urban planning profession. The second phase of the research will create practical measures that can be used by landscape architects, street designers, and policy makers to articulate the economic, ecological, psychological, and safety value of various landscape elements.

Research Title: The Deployment of Research Results and Innovation
Name: JD Margulici

PATH/UTC Conference Fact Sheet

From Research to Practice

University/Department: California Center for Innovative Transportation
Address: 2105 Bancroft Way, Suite 300
Phone number and email: 510-642-4522 and jd@calccit.org

Departments of Transportation (DOTs) traditionally struggle to turn research products into common practice. The California Center for Innovative Transportation (CCIT) was established in 2003 as part of the University of California at Berkeley's Institute of Transportation Studies to accelerate the implementation of research results and the deployment of technical innovations. CCIT provides practitioners with objective data and technical assistance to help them adopt innovative technologies, thus creating a critical bridge between research, industry, and government.

This presentation will introduce selected projects and technologies to illustrate some of the difficulties faced by practitioners and the research community in the process of implementing innovation. Both success stories and less successful attempts will be shown in order to highlight key takeaways. The presentation will be largely based on work conducted by CCIT in partnership with the Center for Entrepreneurship and Technology, part of the University's College of Engineering.

The second part of the presentation will focus on the CCIT model and how it relates to the previous case studies. CCIT's main lines of activity will be briefly described and some early successes will be brought to light. The emphasis will be on how researchers, vendors, and public agencies can gain from collaborating with CCIT.

Sustainability is at the core of the CCIT model in more than one way. The ability given to researchers and practitioners to work together to deploy demonstrated results is key to ensuring sustained investments into transportation research. Even more broadly, innovations in transportation management are absolutely necessary to overcome the major present challenges posed by congestion, unacceptable death rates, environmental threats, and funding gaps. Sustainability is dependent upon our collective effectiveness in implementing those innovations.

Research Title: Active Safety: What and Why?

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: Jim Misener

University/Department: University of California PATH Program

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Phone number and email: 510-665-3612, misener@path.berkeley.edu

1. Statement of the Problem:

'Active Safety' is perhaps the next frontier of technologies that may prevent crashes on roads. This indirectly relates to the idea of sustainable transport until one considers further the 43,000 fatalities on our nation's roadways each year and the approximately \$230M annual cost of roadway crashes (NHTSA, 2002). Clearly and compellingly, active safety addresses an important element in our approach to saving roadway lives and the accompanying drain of human lives and financial and other resources.

2. Methodology and Data Sources:

'Active Safety' will be defined, then set in the context of total safety problems and approaches. Specific PATH projects and objectives in the area, particularly with wireless-enabled active safety, will be described within this context.

3. Findings:

Exploratory technology and the potential benefits will be described. These will be placed in the larger setting of the total safety problem and myriad of approaches, and their relevance and utility will be described.

4. Implications, Applications, and Recommendations:

In the United States, 39% of road fatalities involve alcohol, 35% involve unbelted drivers or passengers, and nearly 30% have speeding as a co-factor. What keeps traffic safety literally and figuratively under the radar? Why do we tolerate 43,000 fatalities per year—equivalent to one cataclysmic Jumbo Jet crash every three days?

The technology fix is the purported panacea, and there have been great strides, first in crash worthiness, then in technological methods to prevent crashes, which we dub 'active safety.' While very important and carrying the potential for tremendous breakthroughs, this is but a piece of the pie. The other piece – policies and legislation such as automated speed enforcement or even throttle regulators – are perceived as taking away ostensible privileges of being an American, and seat belt and breathalyzer ignition interlocks are ignored. Why can't we do both?

5. Next Steps

The research is in progress, but the policy questions and where the research fits within society's safety culture are worth continued discussion and, perhaps, objective decision making.

6. References and Links to Research Products:

www.path.berkeley.edu

www.viicalifornia.org

PATH/UTC Conference Fact Sheet

From Research to Practice

Research Title: The Economics of Port Drayage: Can We Internalize the Externalities (Without Reregulating?)

Name: Kristen Monaco

University/Department: California State University Long Beach, Dept of Economics

Address: 1250 Bellflower Blvd, Long Beach, CA 90840

Phone number and email: 562-985-5076, kmonaco@csulb.edu

1. Statement of the Problem:

Currently, truck drivers at the ports operate with very slim margins, which results in driver incentives to use older model trucks and a decrease in air quality in areas surrounding the ports. This study seeks to assess the ability and willingness of drivers to replace or retrofit their vehicles.

2. Methodology and Data Sources:

Using data from surveys conducted at the Ports of Los Angeles and Long Beach in 2004 and 2006, we analyze the working conditions, wages, and financial performance of port drivers. This quantitative data is supplemented with qualitative data on driver attitudes to assess the likelihood (and cost) of using cleaner trucks at the ports.

3. Findings

We find that drivers are willing to adopt new technology, but that there must be some subsidy to finance this in the short run. We examine the potential benefits of an interest-subsidy and the likely costs of this program.

4. Implications, Applications, and Recommendations:

The results can be used to assess the economic rationale of the currently proposed Clean Truck Program at the Ports of Los Angeles and Long Beach.

5. Next Steps:

The next step is to contrast our findings with the findings of the recently issued economic analysis of the Ports' proposed Clean Truck Program.

6. References and links to research products

Research Title: Deep Discount Transit Passes in the Long-Term Sustainability of Transit Agencies

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: Cornelius Nuworsoo

University/Department: California Polytechnic State University

Address: 1 Grand Ave., San Luis Obispo

Phone number and email: (805) 756-2573; cnuworso@calpoly.edu

1. Statement of the Problem:

Historical experience with public transit operations in the United States shows that fare increases do not always increase total revenues; and, while fare reductions can boost ridership, they can also reduce total revenues and thus increase reliance on subsidies. A different kind of strategy is needed, one that can produce more revenue for transit operators than it costs. Deep discount group pass programs can do that. This subject addresses an issue in transportation planning and finance that carries important implications for long-term sustainability of transit agencies.

2. Methodology and Data Sources:

Using survey data on two case study applications of deep discount group pass (DDGP) programs offered by AC Transit and three programs offered by the Denver Regional Transit District, this study estimated transit operator revenues from each target group prior to the introduction of the DDGP. These revenue estimates were compared with actual revenues from the DDGP programs following implementation to determine each operator's net gain.

3. Findings:

The programs studied consistently revealed either higher revenue per boarding than system-wide averages or higher total revenues from target markets with the program than without it. With discounts at forty to ninety percent of standard pass prices, it is a bargain for participating groups. These facts indicate that the program is really a good deal for both the transit operator and the entity paying for it.

Besides being an instrument to improve financial efficiency in transit operations, the passes are a great source of convenience to users. Other key benefits of the programs include the mode shifts they trigger away from the auto-drive-alone mode, the reductions they induce in parking demand and space needs, and their role as an inexpensive employee benefit. The motivation for employers and Universities to institute group pass programs lies in how these key benefits enhance the attractiveness of the employment location or University to potential employees and students.

4. Implications, Applications, and Recommendations:

To be consistent with the goal of an efficient and sustainable fare instrument, DDGP pricing should at least maintain and preferably increase revenue receipts following implementation of the programs.

5. Next Steps:

Future work should include additional periodic tracking of trends to assess the medium and long term impacts of DDGP programs on choice of (a) mode, (b) residential location, (c) time of travel, and (d) trip purpose.

6. References and links to research products

1. Cornelius Nuworsoo, "*Discounting Transit Passes*", Access, The Magazine of Transportation Research at the University of California, vol. 26, Spring 2005, pp 22-27
2. Cornelius Nuworsoo, *Deep Discount Group Pass Programs: Innovative Transit Finance*, Berkeley Planning Journal, vol. 18, 2005
3. Cornelius Nuworsoo, "*Deep Discount Group Pass Programs as Instruments for Increasing Transit Revenue and Ridership*" A **Dissertation** submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Transportation Engineering, University of California, Berkeley, USA, May, 2004 [accessible online at: <http://www.its.berkeley.edu/publications/UCB/2004/DS/UCB-ITS-DS-2004-2.pdf>]

Research Title: Regulatory Policy and Sustainable Port Operations: Extended Hours and Gate Appointments

PATH/UTC Conference Fact Sheet

From Research to Practice

Speaker Name: Thomas O'Brien

University/Department: Center for International Trade and Transportation, California State University, Long Beach

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Under continued pressure from elected officials to adjust operations in ways that mitigate traffic and air quality impacts of port operations, terminal operators in Southern California implemented both gate appointment systems for trucks and extended (i.e. off-peak) gate hours. Gate appointment systems were intended to spread out truck traffic over a greater number of hours to reduce congestion and to minimize queuing outside of terminal gates. Extended hours were also designed to spread out truck traffic. We analyze the regulatory context in which each was adopted and assess their effectiveness.

Results are based on comprehensive evaluations of both programs. Our evaluation of the gate appointment system involved extended interviews, field observations, a trucking company survey and analysis of data provided by selected terminals. Our assessment of the extended hours program known as PierPASS is based on an analysis of the use of off-peak gates by truckers and their clients. We use data provided by PierPASS, Inc. The research also involved extended interviews with terminal operators and other stakeholders, analysis of trucking company surveys undertaken by PierPASS and the California Trucking Association, and a survey of community residents near the ports. Finally, we use a traffic simulation model to estimate off-peak hour operations on highway system performance.

The results of the two programs vary greatly. We find no evidence that the appointment system affected queuing at marine terminal gates. We do find that the redistribution of port cargo moves to the off-peak is reflected in hourly patterns of heavy truck traffic volumes on the major highways serving the ports. A shift of truck traffic out of daytime and into evening hours has resulted in little change in the level of peak period traffic volume despite significant growth in container volumes since PierPASS was implemented. We conclude that the goal of reducing congestion and hence emissions has been achieved for this program. The differences in the outcomes are explained by institutional and contractual relationships that drive port operating practices, including the incentives that terminals have to take cooperative action.

It is likely that the institutional structure we have observed is not unique to Southern California. Thus the framework exists in other places for similar outcomes to take place, with actions that reflect the market power of certain stakeholders.

METRANS research reports and abstracts are available at <http://www.mettrans.org>.

Research Title: Hydrogen as Transportation Fuel: Near and Long Term Prospects

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: Joan Ogden

University/Department: Institute of Transportation Studies, UC Davis

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Phone number and email: 530 752-2768, jmogden@ucdavis.edu

1. Statement of the Problem:

How could a hydrogen infrastructure be built in response to demand for hydrogen transportation fuel? What is the design of such a system? What are costs, energy use and emissions associated with hydrogen infrastructure?

2. Methodology and Data Sources:

Using GIS-based spatial data sets and mathematical programming methods, we have examined optimized regional strategies for building hydrogen infrastructure over time.

3. Findings:

Hydrogen has tremendous long-term potential to reduce greenhouse gas emissions and oil use from transportation to near zero.

Hydrogen could be produced from a variety of low carbon sources at fuel costs per mile competitive with efficient gasoline vehicles.

It will take time for hydrogen technologies to be introduced and for hydrogen vehicles to penetrate the market. Hydrogen is unlikely to lead to large oil or carbon reductions before 2025.

Initially, hydrogen offered at a relatively small number of gasoline stations (5-10% of the total) could give consumer convenience similar to gasoline today.

4. Implications, Applications, and Recommendations:

As the state of California considers approaches to lower carbon emissions from the transport sector, this work gives important cost and emissions information about hydrogen.

5. Next Steps:

We will compare hydrogen and fuel cell pathways to other fuels and vehicles with respect to cost, environmental aspects, and timing.

6. References and Links to Research Products:

My recent research papers are available at <http://pubs.its.ucdavis.edu/> <<http://pubs.its.ucdavis.edu/>>

The STEPS research program website is: <http://steps.its.ucdavis.edu/> <<http://steps.its.ucdavis.edu/>>

Recent publications are listed below.

J. Ogden and C Yang, "Implementing a Hydrogen Energy Infrastructure: Storage Options and System Design ", in Life-Cycle Analysis Tools for "Green" Materials and Process Selection, edited by Stella Pappasavva, Vasilis Fthenakis (Mater. Res. Soc. Symp. Proc. 895, Warrendale, PA, 2006), 0895-G02-01.

Joan Ogden, "High Hopes for Hydrogen." Scientific American, Sept. 2006

Nicholas, Michael A. and Joan M. Ogden (2007) Detailed Analysis of Urban Station Siting for California Hydrogen Highway Network. Transportation Research Record <<http://gulliver.trb.org/bookstore/>> 2006 (1983), 129 - 139. (This paper won an award as the best paper on policy and energy in the 2006 TRB conference.)

Yang, C., and Ogden, J. "Determining the lowest-cost hydrogen delivery mode." International Journal of Hydrogen Energy, 32(2), 268-286.

McCarthy, Ryan W., Joan M. Ogden, Daniel Sperling, "Assessing reliability in energy supply systems <<http://dx.doi.org/10.1016/j.enpol.2006.06.016>>," Energy Policy, Volume 35, Issue 4, April 2007, Pages 2151-2162.

Guihua Wang, Joan M. Ogden and Michael A. Nicholas, "Lifecycle impacts of natural gas to hydrogen pathways on urban air quality," International Journal of Hydrogen Energy, 32 (14), September 2007, Pages 2731-2742.,

Research Title: Safety in Multimodal Transportation Systems

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: David Ragland

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Our transportation systems are facing two major crises: (i) increasing demand for energy to run these systems and (ii) enormous environmental impact associated with building and running them. Meeting these crises will require our transportation systems to become increasingly multi-modal. From the current focus on individual motor vehicles, transportation systems must accommodate transit, walking, biking, etc. to a much greater degree than is the current practice. The mix of these various modes has clear safety implications. This presentation will address policy and research issues in monitoring and enhancing safety in emerging multi-modal transportation systems. The following issues in multi-modal transportation environments will be discussed:

- Monitoring safety
- Statistical patterns of collisions and injury
- Statistical models of conflict and collisions
- Conflicting conceptual models of safe environments (e.g., separation versus integration of modes)
- Treatments to improve safety for all transportation system users
- Institutionalization of safety for non-motorized modes
- Individual versus societal benefits of transportation mode choices
- The future of safety in multi-modal environments

Research Title: Environmental Justice and Transportation

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: Lisa Schweitzer

University/Department: University of Southern California

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Phone number and email: 540-250-4271 and lschweit@usc.edu

1. Statement of the Problem:

In transportation, advocates and researchers have started to document the extent to which transportation development can cause environmental problems in impoverished communities of color (Schweitzer and Valenzuela Jr, 2004, Crane and Schweitzer, 2003). This presentation discusses the spatial probabilities of acute toxic exposures from hazardous releases during transport and what those probabilities mean for nearby communities (Schweitzer, 2006).

2. Methodology and Data Sources:

The study uses geocoded US data from the Hazardous Materials Information System from 1997 to 2006. Spatial analysis methods described geographic clusters, and a modified regression methodology examines clustering between residential locations in cities and spills.

3. Findings:

Acute exposures from hazmat releases during transport are spatially concentrated, with a few locations being exceptionally likely to experience routine and severe hazmat spills. However, once the very high volume locations are considered, severe spills are less predictable spatially than high-frequency locations. Severe hazmat spills show no statistically significant concentration according to any demographic minority in preliminary regression models, but the analysis suffers from small numbers problems.

4. Implications, Applications, and Recommendations:

While sustainable transportation advocates are very concerned about passenger transport, very little vision exists for how to manage freight and hazards in the sustainable city. This research argues that the transportation-land use connection in sustainable cities has to consider three things:

- a) Hazardous materials freight, like all freight, is growing in both volume and VMT;
- b) Serious incidents, while infrequent, are similarly growing in numbers;
- c) Intermodal facilities are high-frequency, high-consequence land uses;
- d) Lower income residential areas are likely to be on the frontline of hazards management and homeland security;
- e) Strong leadership is going to be needed in order guide future decision-making about land use, urban regeneration projects, and the location of intermodal freight opportunities; and
- f) Failure to demonstrate leadership and foresight can perpetuate injustice.

5. Next Steps:

This research is still in progress, and there are many significant future research directions. These include

- a) Examining the landscape of spills in individual major metropolitan areas in addition to Los Angeles; and
- b) Better understanding the evacuation strategies and options of impoverished communities (ongoing project in the city of Chicago with the National Science Foundation).

6. References and links to research products

Crane, R. and Schweitzer, L. (2003) Sustainability, transport, and the built environment *Built Environment* 29, 238-252.

Schweitzer, L. (2006) Environmental justice and hazardous material spills: A Los Angeles case study *Transportation Research Part D*, 11, 408-421.

Schweitzer, L. and Valenzuela Jr., A. (2004) Environmental Justice and Transportation: The Claims and the Evidence. *Journal of Planning Literature*, 18, 383-398.

Research Title: VANET: What It Is, and What It Might Mean to the Transportation System

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: Raja Sengupta

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Vehicular Ad-hoc Networks (VANET) is the convergence of cheap embedded sensing and wireless communication in the car. The car is sprinkled with sensors from bumper to tailpipe, absorbing volumes of data on speed, emissions, vibration, external temperature, and more to come. If this converges with the proliferation of mobile networking such as Wi-Fi or cellular data services, this data become accessible. The national vehicle fleet begins to morph into a vast mobile sensor fleet with impacts on safety, traffic management, and control of greenhouse gases.

Government, industry, and academia have responded rapidly to this opportunity. Mobicom instituted its first annual workshop on VANET in 2004. The Federal Communications Commission (FCC) has allocated the Dedicated Short Range Communication (DSRC) spectrum for transportation in the 5.9 GHz band. A USDOT sponsored standard process under ASTM voted to base DSRC on IEEE 802.11a. IEEE has taken up the standardization of DSRC by creating IEEE 802.11p. NHTSA and the automotive OEM's created the Vehicle Safety Communication Consortium (VSCC) to promote vehicle-vehicle networking for safety. On the infrastructure side, USDOT's Vehicle Infrastructure Integration (VII) program is rolling out the networked roadway. FHWA and three state DOT's have also created the Intersection Decision Support (IDS) consortium. They demonstrated roadside-vehicle communication to reduce collisions at intersections.

I will discuss the impacts of VANET on safety and traffic management. For a couple of decades automotive engineers have been designing in-vehicle information systems that will detect potential crash situations a second or less in advance and either warn the driver or control the vehicle. These systems are called active safety systems. Some active safety systems provide forward collision warnings, others awareness about vehicles in the blind spot, and yet others about conflicts at intersections. Active safety systems target the large class of crashes caused by driver decision errors. In the VANET version of active safety systems, vehicles are equipped with Wi-Fi and GPS broadcast position, speed, etc. Neighboring vehicles receiving this data compute the relative motion of the sending vehicle and warn the driver if necessary. Our research has resolved several of the technical challenges facing this concept.

On the traffic management side VANET has the potential to partially substitute pavement-based sensing infrastructure for traffic management. Thus the large-scale traffic control systems of the future may derive data from heterogeneous sensor sources, some mobile and others fixed. I will discuss new technologies to enable such control systems over open standards able to leverage VANET for traffic management.

Research Title: Smart Parking: Lessons Learned from San Francisco Bay Area Field Test

PATH/UTC Conference Fact Sheet

From Research to Practice

Name: Susan Shaheen

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Phone number and email: 510-665-3483, sashaheen@path.berkeley.edu

1. Statement of the Problem:

Researchers implemented a smart parking field test at the Rockridge BART station (2004-2006) to evaluate consumer response to changeable message signs (CMSs), Internet reservations and billing, mobile phone and personal digital assistant communications, and a wireless parking lot counting system, and their effects on transit ridership.

2. Methodology and Data Sources:

The field test was evaluated using reservation data from the ParkingCarma, Inc. central computer, two focus groups, a before and after Internet-based user survey, and expert interviews with project partners and the smart parking field test manager. Over 400 responses were collected during the initial survey, with 177 responses for the final survey.

3. Findings:

From an operational perspective, the wireless counting system, with the exception of problems associated with the in-ground sensors, performed well during the field test. Survey data indicated that the field test increased respondents' BART trips and resulted in 9.7 fewer miles per participant per month on average. Key success factors included the strength of the public-private partnership and the use of static wayfinding signs to direct travelers to the BART station smart parking lot. These signs also helped to address resident concerns about increased traffic. However, CMSs were not widely used in by travelers in their decision-making. The majority of participants continued to use the service when fees were implemented, but they indicated that the service should not cost more than nearby commercial parking nor monthly reserved parking at the BART station.

4. Implications, Applications, and Recommendations:

Lessons learned include: allocate additional time for the project scoping phase and permitting process; anticipate and budget to evaluate the effects on highway traffic flow due to the CMSs; use project branding for additional publicity and to increase user understanding; increase the investment in enforcement technology; make the website more user-friendly; improve interactive voice response (IVR) system communications (e.g., ensure it can repeat and confirm information); install a courtesy phone or kiosk in the parking lot for users to make reservations; increase lot signage, including signs in Spanish, to help travelers find smart parking spaces; and charge parking reservation fees on a per-transaction basis instead of carrying a balance; select a mobile service standard that will keep the costs associated with the CMSs low; and employ sensors that can account for a range of parking lot vehicle movements.

5. Next Steps:

Lessons learned from the Rockridge BART smart parking project will be applied in a three year pilot project on San Diego Coast Express Rail route and will include a value pricing component, providing the option to pay an additional fee to make advanced reservations for premium parking spots. Researchers will experiment with more detailed messages on changeable message signs, such as traffic conditions and incident reports; using smart cards or transponders to enhance parking payment options; variable pricing, charging different fees depending on factors such as time of day; and expanding the number of parking spaces at and around the transit stations. In addition, a new demonstration project will combine the use of radio-frequency identification (RFID) technology with the ParkingCarma wireless parking service tested at the Lafayette station in the East Bay.

6. References and Links to Research Products:

Susan Shaheen and Caroline Rodier. "Smart Parking Management Linked to Transit," Research Pays Off, *TR News*. July-August, 207, No. 251, pp. 30-31. (available at www.trb.org/news/blurb_detail.asp?id=8131)

Research Title: Getting the Price of Curb Parking Right

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PATH/UTC Conference Fact Sheet

From Research to Practice

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1. Statement of the Problem

Many drivers in congested traffic are cruising in search of a scarce curb parking space. How much of the traffic flow is cruising for parking? What price for curb parking will eliminate the incentive to cruise?

2. Methodology and Data Sources:

We made 240 observations of how long it takes to find a curb parking space at four sites in Westwood Village, a commercial district next to the UCLA campus. For each observation we drove to the site and then circled the block until we found a curb space.

3. Findings:

The average cruising time to find a curb space was 3.3 minutes, and the average cruising distance was half a mile (about 2.5 times around the block). Although the average driver cruises only half a mile before parking, cruising around the 15 blocks in the Village creates almost 4,000 VMT every weekday (8,000 x 0.5). Over a year, cruising in Westwood Village creates 950,000 excess VMT—equivalent to 38 trips around the earth, or four trips to the moon. Cruising 950,000 miles wastes 47,000 gallons of gasoline and produces 730 tons of CO₂ emissions in a small business district.

4. Implications, Applications, and Recommendations:

The right price for curb parking can eliminate cruising. The right price is the lowest price that will produce a few vacant spaces. Drivers have no reason to cruise because they can always find a vacant curb space near their destination, and the search time is therefore zero. The city can adjust the prices of curb parking in response to demand to keep roughly one out of every eight spaces vacant throughout the day.

5. Next Steps:

Some cities have begun to charge performance-based prices for curb parking and return the meter revenue to its source. Redwood City, California, sets meter rates to achieve an 85 percent occupancy rate for curb parking downtown; the rates differ both by location and time of day, depending on demand. The city returns the revenue to pay for added public services in the metered district, and downtown Redwood City will receive an extra \$1 million a year to pay for increased police protection and clean sidewalks.

6. References and Links to Research Products:

Donald Shoup. 2006. "Cruising for Parking," *Transport Policy*, Vol. 13, No. 3, pp. 479-488.

<http://shoup.bol.ucla.edu/Cruising.pdf>

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Research Title: New Corridor Operations Strategies

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PATH/UTC Conference Fact Sheet

From Research to Practice

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Research Summary

We present recently completed and ongoing work on traffic management strategies for corridors, i.e., highway facilities that consist of freeways and adjoining surface street networks controlled by traffic signals. Improved ramp metering algorithms were developed and tested. The proposed algorithms reduce the spatial and temporal extent of the congestion on the freeway mainline, while maintaining on-ramp queue lengths within prescribed constraints. Also, an integrated corridor control scheme has been proposed to coordinate ramp meters and adjacent traffic signals that can further reduce delays, especially under incident conditions.

On arterial networks, an analytical model is developed to estimate travel times on arterial streets based on data commonly provided by system detectors (flow and occupancy) and the signal settings (cycle length, green times and offsets) at each traffic signal. This work leads to the pilot implementation of an arterial performance measurement system in the city of Los Angeles. Also, findings from ongoing research using the downtown San Francisco network as a case study show that we can reliably estimate traffic conditions in large urban networks from link measurements without knowing details on origin-destination patterns. This allows dynamic prediction of congestion patterns and the development and evaluation of dynamic traffic management schemes such as perimeter control (gating) and pricing.

References and links to research products

“Integrated Corridor Management: Analysis, Modeling and Simulation (AMS) Methodology,” Report prepared for US DOT, Cambridge Systematics, California PATH and University of Arizona, April 2007.

Horowitz R., X. Sun, L. Munoz, A. Skabardonis, P. Varaiya, M. Zhang, and J. Ma, “Design, Field Implementation and Evaluation of Ramp Metering Algorithms,” PATH Research Report UCB-ITS-PRR-2006-21, Institute of Transportation Studies, University of California, Berkeley, October 2006.

Skabardonis, A., and N. Geroliminis, “Real-Time Estimation of Travel Times on Signalized Arterials,” 16th International Symposium in Transportation and Traffic Theory, University of Maryland, Elsevier, 2005.

Geroliminis N., and C.F. Daganzo "Macroscopic Modeling of Traffic in Cities," 86th Annual Meeting Transportation Research Board, Washington D.C, January 2007.

Research Title: AB32 and the Transformation of Transportation

Name: Daniel Sperling

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PATH/UTC Conference Fact Sheet

From Research to Practice

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Research Summary:

A wide variety of countries and regions have adopted climate policy goals, including many in the US. California passed the Global Warming Solutions Act in 2006 (AB 32), requiring greenhouse gas emissions to be reduced to 1990 levels by 2020. This requires about a 25% reduction from forecasted levels. The State also has a target of 80% reduction by 2050. There are essentially three sets of strategies to pursue: improve vehicle energy efficiency, decarbonize fuels, and reduce motorized travel.

California passed a law (AB 1493) in 2002 to reduce GHGs emitted from vehicles and the Air Resources Board adopted the low carbon fuel standard in June 2007. The vehicle law is being contested in court and awaits a waiver from the US EPA. The low carbon fuel standard is in a rule-making process and is scheduled to take effect in January 2010 (and is under consideration in many other states and in Washington DC by US EPA and Congress). Nothing has been done about reducing travel. To achieve the 25% reduction, it is conceivable that most of the reductions could be achieved through changes to vehicles and fuels. To achieve larger reductions, reductions in VMT (below forecasted levels) would be necessary.

Research on all three activities will be reported. The overarching questions are:

- 1) Should the transport sector be expected to reduce emissions roughly in accordance to its share of the total (transport accounts for over 40% of GHG emissions in California)?
- 2) How might large reductions, in line with the 2020 and 2050 targets, be achieved?
- 3) How should California coordinate and integrate its policies and strategies with others?
- 4) What should be done to reduce VMT, the one area largely ignored until now?

References:

Lutsey, Nic and D. Sperling, "America's Bottom-Up Climate Change Mitigation Policy," *Energy Policy*, in press

Hughes, Jonathan, Chris Knittel, and D. Sperling, "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand," *Energy Journal*, 29:1 (2008), in press

Lutsey, Nic and D. Sperling. "Canada's Voluntary Agreement on Vehicle Greenhouse Gas Emissions: When the Details Matter." *Transportation Research Part D* 12: 474-487, 2007.

Farrell, Alex, D. Sperling, and others. A Low-Carbon Fuel Standard for California, Part 2: Policy Analysis. Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-07-08, 2007.

Research Title: Evaluating Equity in Transportation Finance: Comparing Congestion Pricing and Sales Taxes in Southern California

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PATH/UTC Conference Fact Sheet

From Research to Practice

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Those who oppose congestion pricing on highways frequently argue that such tolls are unfair to low-income, urban residents. Specifically, concerns are raised that low incomes will force some travelers to pay higher tolls that they cannot afford, or will cause such travelers to disproportionately divert, delay, or discontinue necessary peak-hour trips.

Too often, however, such assertions are made in the abstract, without considering: (1) how much low-income residents currently pay for transportation in fuel and sales taxes, or (2) how much residents would pay for highway infrastructure under an alternative revenue-generating scheme, such as an increased sales tax for transportation. Accordingly, this paper compares the cost burden of an existing toll facility on State Route 91 (SR91) in Orange County, California under its current congestion-pricing approach with the likely cost burden had the capacity been funded by Orange County's local option transportation sales tax, Measure M. We find that although the sales tax spreads the costs of transportation facilities across a large number of people inside and outside Orange County – which helps to explain why such taxes have proven popular politically – it would have redistributed about \$3 million in revenues per year from less affluent residents to those with higher incomes in comparison to the current congestion-priced facility.

These results call into question the validity of objecting to congestion pricing on social equity grounds, absent some comparison with alternative means of finance. Further, our findings suggest that the increasingly popular trend of using general consumption taxes to fund transportation improvements should receive far more scrutiny on equity grounds than they have to date.

Research Title: Tools for Operations Planning (TOPL)

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TOPL provides tools to specify actions for operational improvements (ramp metering, demand management) in freeway corridors and quickly estimate the benefits of such actions.

The freeway component of TOPL is complete and has been demonstrated in the study of I-210 and I-880. The macro-simulation freeway model that underlies TOPL is automatically calibrated using data from PeMS. The arterial component of TOPL is under development.

Whereas a Paramics or VISSIM micro-simulation model of a freeway corridor takes more than one year to develop, a TOPL model takes less than one month to develop and it is orders of magnitude faster to execute. TOPL is much more suited to the study of corridor management policies, which form a significant element in California's Strategic Growth Plan.

Documents and software of this effort are available at <http://path.berkeley.edu/topl/>

Research Title: Choice of Contracts in Project Delivery

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PATH/UTC Conference Fact Sheet

From Research to Practice

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This research compares design-build to traditional project delivery. Design-build, in which design and construction services are bundled together, is an alternative form of public contract recently adopted by transportation departments in 31 states (Nossaman 2006). While growing in popularity, this seemingly innocuous, small-scale form of privatization is controversial. The arguments for and against design-build are as varied and complex as the projects themselves. Systemic problems with cost estimating in the transportation sector (Flyvbjerg 2002) limit valid research designs to the comparison of outcomes from projects delivered one way or another.

A national online survey of owner opinions and selected facts about design-build projects suggests that there are few cost differences between the two forms of contract (SAIC, 2006). The current study reveals how the elements of cost and schedule on the two forms of contract can differ. Knowledge of this breakdown is critical to reducing cost, as contractual safeguards in future projects can be used to target elements for cost reduction. Research techniques included the collection of details of cost and schedule on pairs of comparable projects, supported by semi-structured interviews and the review of documents and archival records.

Findings suggest that cost to complete ancillary studies (e.g. environmental, geotechnical), to administer projects, and to deliver change orders can be comparatively high on traditional projects. Attempts to use design-build to capture savings in these areas, however, can be lost in payments to private firms. Design-build requires higher expenses to administer bid processes, and lump sum payments to contractors can be higher than anticipated. While design-build projects are governed by closed-book contracts, it will be difficult for owners to ascertain the value of these elevated payments.

On the other hand, the time it takes to complete projects using traditional forms of delivery can be considerably long in comparison to design-build. Although it is reasonable to expect savings from concurrent engineering, results suggest that reductions to schedule accrue from the forced complete financing of projects prior to detailed design. If, using traditional methods of delivery, funds are allocated and expended in ways that require owners to start and stop design (e.g. lack of funds, lack of personnel, or staged process of approvals) the design-build method can cut time to deliver by simply hiring private firms to continuously dedicate personnel to these projects, perhaps also reducing time to acquire approvals accorded traditional delivery.

Other issues, for labor and the environment, stem from the fact that private firms are completing anywhere from 70 to 100 percent of engineering on design-build jobs at a relatively rapid pace. Less labor is required from public engineers. Project labor agreements can stipulate the details of contract desired during project delivery, though care should be exercised in their use, because case law may allow the project labor agreement to supersede statewide collective bargaining agreements. The incentive structure determined by private design as well as the pace of design can be problematic for projects in environmentally sensitive locations, including places of importance for citizen participation. The National Environmental Policy Act (NEPA) and its state-level equivalents were designed to fit a design-bid-build process. The efficient management of design-build relies on performance standards, but our environmental institutions rarely have the capacity to manage (or monitor) contracts for project delivery in this way.

References

Flyvbjerg, Bent, Mette Skamris Holm, et al. (2002). "Underestimating Costs in Public Works Projects: Error or Lie?" *Journal of the American Planning Association* 68(3): 279-295.

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SAIC, AECOM Consult, et al. (2006). *Design-Build Effectiveness Study: As Required by TEA-21 Section 1307(f)*. Washington, D.C., US Department of Transportation, Federal Highway Administration.