

The Pricing  
Economics

# of Transportation Systems

FALL 2010  
SPECIAL ISSUE



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**UF** UNIVERSITY of  
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The Foundation for The Gator Nation

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## message from the **director**



Dear Colleagues,

Welcome to the special issue of the CMS Fall 2010 newsletter, which focuses on the pricing and economics of transportation systems. This was the topic of a conference for which the CMS was the major sponsor. The conference was held in May at the Royal Plaza hotel in Orlando, Fla. Other sponsors included the National Science Foundation (NSF), the Transportation Research Board (TRB) and the Office of Research at the University of Florida. Three CMS-affiliated faculty members organized the conference: Siriphong (Toi) Lawphongpanich, Ph.D., associate professor, Department of Industrial & Systems Engineering; Yafeng Yin, Ph.D., assistant professor, Department of Civil & Coastal Engineering; and Janet Degner, director, Florida Transportation Technology Transfer Center (T2). Conference participants included nearly 100 economists, engineers, planners, scientists, mathematicians, and students from 12 countries and various transportation-related fields. There were three parallel tracks of more than 80 presentations addressing various issues in transportation-system pricing. To commemorate this conference, the newsletter features several articles on congestion, pricing, economics and financing of transportation systems by conference participants.

I am delighted to report that we have officially closed our year-one projects and we are closely monitoring ongoing projects from 2009 and 2010. Year-one projects and the full reports are posted at [http://cms.ce.ufl.edu/research/completed\\_projects.php](http://cms.ce.ufl.edu/research/completed_projects.php). In September, the CMS issued its fourth call for pre-proposals, which yielded 23 submissions, the highest yet in the history of the CMS. Out of the 23 pre-proposals, evaluated by an independent project review committee (PRC), 10 were selected for the full proposal stage. Results will be announced in February 2011.

In August, the CMS, the Florida Department of Transportation (FDOT) and *McTrans* co-sponsored the 2010 Highway Capacity Manual Workshop. The workshop was held at the Royal Plaza hotel in Orlando, Fla., and was very well-attended by transportation professionals from Florida, several other states and as far away as Brazil, Honduras, and the Commonwealth of Puerto Rico. Our next workshop is being planned for August 2011, and it will focus on the use and applications of the CORSIM™ micro-simulator. Additional information will be posted soon on our website [http://cms.ce.ufl.edu/news\\_events/conferences.php](http://cms.ce.ufl.edu/news_events/conferences.php).

This academic year I am on sabbatical leave in Greece, and I have had the opportunity to visit colleagues in Europe and learn more about the transportation systems in various countries. Most recently, I visited the Regional Traffic Control Center in Madrid, Spain (**see picture**), which is a very impressive facility that operates several hundred kilometers of roadways around Madrid. Their tunnel facilities are remarkable, and their HOV lanes, which can operate in either direction depending on demand, are excellent freeway traffic management tools. I will be providing you with additional information regarding my visits of European transportation facilities in the next issue.

In the meantime, I hope you will enjoy reading this special issue on The Pricing & Economics of Transportation Systems.

Sincerely,  
Lily Eleftheriadou, Ph.D.  
Professor & CMS Director

# 2010 Highway Capacity Manual Workshop

 On Aug. 12, the University of Florida's Transportation Research Center (TRC), the Center for Multimodal Solutions for Congestion Mitigation (CMS) and McTrans, along with sponsorship support from the Florida Department of Transportation (FDOT), organized a workshop on the updated version of the extensively revised 2010 edition of the Highway Capacity Manual. The workshop was

held at the Royal Plaza hotel in Walt Disney World Resort in Orlando, Fla. More than 60 transportation professionals from academia, as well as the public and private sectors, attended the one-day workshop. Speakers included some of the most knowledgeable professionals in highway capacity analysis: Ken Courage, University of Florida; Janice Daniel, New Jersey Institute of Technology; Doug McLeod, Florida Department of Transportation; Bill Sampson, McTrans, University of Florida; Scott Washburn, University of Florida; and John Zegeer, Kittelson & Associates, Inc. Participants came from various states, and from as far away as Brazil, Honduras, and the Commonwealth of Puerto Rico. Participants with a Florida Professional Engineer's license received six professional development hours (PDHs) for attending.



## Clockwise |

Carmen Lafuente and Yilia Baucage Bou of the engineering firm Steer Davies Gleave, Puerto Rico Office

John Zegeer of Kittelson & Associates, Inc.

Participants during one of the workshop sessions

Transportation professionals from various engineering firms take time to network with colleagues

# Distinguished LECTURER

*Elizabeth Deakin*

Elizabeth Deakin, professor of city and regional planning and urban design at the University of California, Berkeley, was this semester's Distinguished Academic Lecturer for the CMS. Deakin's presentation was titled *California's New Initiatives to Manage Growth and Reduce Environmental Impacts*.

The seminar was held at the UF College of Design, Construction and Planning and offered as a live Web cast via Elluminate. CMS Associate Director Ruth Steiner, Ph.D., an associate professor in the Department of Urban & Regional Planning, and former

graduate student of Deakin, felt that faculty and, especially students, benefited from her talk.

"We were very excited about Professor Deakin's presentation on California's initiatives to manage environmental impacts of transportation," Steiner said. "Professor Deakin represents a tremendous knowledge base in planning research and education. The focus of her presentation on reducing greenhouse gas emission in California is a cautionary tale for states that are addressing these issues at the local level. Meeting this challenge will be of great relevance and importance in Florida and many other states in the next few decades."

Deakin spoke about the recently enacted legislation that mandates the reduction of greenhouse gasses, the creation of new transportation fuels and more efficient vehicles, and called upon metropolitan regions and local governments to develop "Sustainable Community Strategies." For an online video of Deakin's presentation and a bio, visit [http://cms.ce.ufl.edu/news\\_events/distinguished\\_lecturer\\_seminar\\_series.php](http://cms.ce.ufl.edu/news_events/distinguished_lecturer_seminar_series.php).

## UF Traffic Bowl Team

*wins third place*

University of Florida transportation students captured third place during the Grand Championship at the ITE International Collegiate Traffic Bowl, which was held Aug. 11 in Vancouver, British Columbia. The UF team, led by Brett Fuller, a graduate student in the transportation program, included Clark Letter, Philip Haas and Jorge Uy, also graduate students in the transportation program. They won the district-level competition, which in turn qualified them for participating in the Grand Championship held in Vancouver. The UF team performed diligently in the competition that tested their knowledge on topics related to transportation, engineering and planning.

"The Traffic Bowl is a jeopardy-style competition based on transportation knowledge," Fuller said. "Questions came from the Highway Capacity Manual, the Manual on Uniform Traffic Control Devices and various Institute of Transportation Engineers manuals."

Traffic Bowl participants included teams from Texas A&M, Georgia Tech, University of Manitoba, University of Purdue, University of Delaware, Portland State University, University of Wisconsin-Milwaukee and the University of Massachusetts-Amherst. The team from Texas A&M won the championship. Teams from the University of Manitoba and UF came in second and third place, respectively.

Fuller is credited with assembling the team from UF. As the UF ITE student chapter president, he thought participating in the traffic bowl competition would be a "fun" way to promote the student chapter. He said it also gave them a chance to network with transportation students and faculty from other universities.

In addition to considering the traffic bowl a learning experience, team member Jorge Uy made good use of the networking opportunities that the trip offered. "This even granted me an opportunity to be able to connect with transportation companies and learn to communicate as a professional in this field," Uy said.

Regarding the competition, team member Clark Letter said the UF team members' overall goal was to do their best and have a good time. He was glad the UF team won third place. "We did not have very high expectations going out there, so to win third place was a nice surprise," Letter said. "I think we raised the bar for the next year's team to go and win the competition."

Siva Srinivasan, an assistant professor in the Department of Civil & Coastal Engineering, is the current faculty adviser of the UF-ITE student chapter. Srinivasan is excited about the team's third place finish and looks forward to the chapters continued overall excellence.

"We have a great group of officers and members, and I expect the UF-ITE to be a very active student organization," Srinivasan said.

And as for Vancouver, the students were amazed with its beautiful scenery and local culture.

"British Columbia was amazing," Fuller said. "Everything was great: the food, the weather, the city. Especially the weather, after dealing with 90 degree temperatures all summer [in Florida] it was nice to have a week where it was in the 60s and 70s all day."



From left: Clark Letter, Brett Fuller and Jorge Uy

# CMS Project Status

## Now on the Web!

Final reports for the following projects are available at:  
[http://cms.ce.ufl.edu/research/completed\\_projects.php](http://cms.ce.ufl.edu/research/completed_projects.php).

### Central Data Warehouse Configuration, Data Analysis for Congestion Mitigation Studies (STEWARD)

CMS Project # 2008-001  
PI: Kenneth Courage, Professor Emeritus, CCE  
Date Completed: December 2009

### Development of Simulation Program for Two-Lane Highway Analysis

CMS Project #2008-002  
PI: Scott Washburn, Ph.D., P.E., Associate Professor, CCE  
Date Completed: August 2010

### Simulation-Based Robust Optimization for Actuated Signal Timing and Setting

CMS Project #2008-003  
PI: Yafeng Yin, Ph.D., Assistant Professor, CCE  
Date Completed: December 2009

### Characterizing the Tradeoffs and Costs Associated with Transportation Congestion in Supply Chains

CMS Project # 2008-004  
PI: Joseph Geunes, Ph.D., Professor, ISE  
Date Completed: December 2009

### Multimodal Solutions for Large-Scale Evacuations

CMS Project # 2008-005  
PI: Panos Pardalos, Ph.D., Distinguished Professor, ISE  
Date Completed: December 2009

### A Pricing Approach for Mitigating Congestion in Multimodal Transportation Systems

CMS Project # 2008-006  
PI: Siriphong (Toi) Lawphongpanich, Ph.D., Associate Professor, ISE  
Co-PI: Yafeng Yin, Ph.D., Assistant Professor, CCE  
Date Completed: December 2009

### Vehicle-Miles-of-Travel-Based Traffic Impact Assessment Methodology

CMS Project # 2008-007  
PI: Ruth Steiner, Ph.D., Associate Professor, URP  
Co-PI: Siva Srinivasan, Ph.D., Assistant Professor, CCE  
Date Completed: June 2010

### Implementation of the Statewide Traffic Engineering Warehouse for Regionally Archived Data (STEWARD)

FDOT Match Project # 72734  
PI: Kenneth Courage, Professor Emeritus, CCE  
Date Completed: December 2009

### Investigation of Freeway Capacity: A) Effective Capacity of Auxiliary Lanes and B) Segment Capacity as a Function of Number of Lanes and Merge/Diverge Activity

FDOT Match Project # 73157 & 74022  
PI: Scott Washburn, Ph.D., P.E., Associate Professor, CCE  
Date Completed: March 2010

### Field Data Collection and Analysis for Freeway Work Zone Capacity Estimation

FDOT Match Project # 67207  
Lily Elefteriadou, Ph.D., Professor, CCE  
Date Completed: June 2008

### Travel Time Reliability Modeling for Florida

FDOT Match Project # 77415  
PI: Lily Elefteriadou, Ph.D., Professor, CCE  
Date Completed: January 2010

### Multimodal Arterial LOS Modeling and Testing

FDOT Match Project # 76279 & 76293  
PI: Scott Washburn, Ph.D., P.E., Associate Professor, CCE  
Title: Date Completed: March 2009

### Trip Generation Characteristics of Special Generators

FDOT Match Project # 76173  
PI: Yafeng Yin, Ph.D., Assistant Professor, CCE  
Date Completed: March 2010

## New Projects

The CMS's Year 4 projects from the most recent RFP issued this fall will be posted on the center's website after the selection process has been completed in February 2011. Ongoing CMS projects, including match projects with the Florida Department of Transportation (FDOT) are listed at <http://cms.ce.ufl.edu/research/>. The following are FDOT-funded match projects, which were initiated this past year:

### Managed Lane Operations-Adjusted Time of Day Pricing vs. Near Real Time Dynamic Pricing (Supplement to FDOT Match #81551)

FDOT Match Project # 88583  
PI: Yafeng Yin, Ph.D., Assistant Professor, CCE  
Co-PIs: Lily Elefteriadou, Ph.D., Professor, CCE  
Scott Washburn, Ph.D., P.E., Associate Professor, CCE

### Variable Speed Limit (VSL) Best Management Practice

FDOT Match Project # 88592  
PI: Lily Elefteriadou, Ph.D., Professor, CCE  
Co-PIs: Yafeng Yin, Ph.D., Assistant Professor, CCE  
Scott Washburn, Ph.D., P.E., Associate Professor, CCE

### Arterial Highway Capacity and Level of Service Analysis for Florida

FDOT Match Project # 90337  
PI: Scott Washburn, Ph.D., P.E., Associate Professor, CCE

# CORSIM™ Workshop

**August 11, 2011**  
**8:30 a.m. to 4:30 p.m.**  
**Royal Plaza Hotel**  
**Orlando, Fla.**

The CMS, the Transportation Research Center (TRC), and McTrans at the University of Florida have developed this workshop for CORSIM™ users.

Participants will learn about:

- Recently added features for CORSIM™
- Lesser known features of CORSIM™ that can be used to model unusual scenarios and provide advanced analysis capabilities
- Methods for comparing CORSIM™ results to HCM results and guidelines on applying CORSIM™ to FDOT project analyses
- Future changes in CORSIM™

Six professional development hours (PDHs) will be offered for attending the workshop for transportation professionals holding a P.E. license.

Registration fees include conference materials and food and beverage services:

- Early-birds \$245
- Regular registration \$295
- Workshop sponsors \$175

Sponsorship opportunities are available! There are various sponsorship levels that will entitle your company to discounted workshop registration and more. Your generous contribution will help support this workshop and future technology transfer activities.

For more information, including sponsorship opportunities and hotel registration, visit Conference & Workshops at [http://cms.ce.ufl.edu/news\\_events/conferences.php](http://cms.ce.ufl.edu/news_events/conferences.php), or contact Ines Aviles-Spadoni at 352-392-9537, Ext. 1409 or [iaviles@ce.ufl.edu](mailto:iaviles@ce.ufl.edu).

## Save the Date CMS Annual Student Conference

**March 4, 2011**

Save the date! The CMS's Annual Student Conference will be held on March 4, 2011 at the Emerson Alumni Hall across from the University of Florida campus in Gainesville, Fla. The half-day conference will feature student presentations and posters related to projects funded by the CMS and research related to transportation. Discipline areas represented at the conference include Civil & Coastal Engineering (CCE), Industrial & Systems Engineering (ISE), Occupational Therapy (OT), and Urban & Regional Planning. The conference is free to UF students, faculty and transportation professionals. A conference program will be posted soon at [http://cms.ce.ufl.edu/news\\_events/conferences.php](http://cms.ce.ufl.edu/news_events/conferences.php). For more information, contact Ines Aviles-Spadoni at [iaviles@ce.ufl.edu](mailto:iaviles@ce.ufl.edu) or at 352-392-9537, Ext. 1409.





## Rethinking the Politics of Freeway Congestion Pricing

by Bob Poole

Director of Transportation Policy at the Reason Foundation



For several decades, using variable pricing to address freeway congestion has been a goal of transportation planners. Such pricing would reduce congestion by addressing the imbalance between capacity and rush-hour demand. It would also generate useful information about where new capacity was most needed, and it would provide funding to pay for that capacity.

Yet, despite the on-going federal efforts that began in the 1970s and continue now, no urban area has put congestion pricing onto its freeway system. Doing so is considered politically impossible, primarily due to the opposition of highway users — motorists and truckers. These groups argue that paying tolls to use existing freeways would amount to paying twice (or “double taxation”). Some doubt pricing would work; others think it would work so well that hardly anyone could afford to drive. And because nearly every adult of driving age is a motorist, it’s easy for elected officials to equate “motorist” with “voter.”

Even in huge metro areas overseas, congestion pricing has been implemented successfully only in three places over three decades: Singapore, London and Stockholm. It has been defeated in Hong Kong, Kuala Lumpur, the Netherlands and Manchester, among others. These overseas metro areas have much lower car ownership and much larger transit systems than typical large U.S. metro areas. This suggests that even where alternatives to driving are more viable, congestion pricing is still very tough to sell.

The underlying problem is that congestion pricing can easily produce more losers than winners. Those who pay the toll would be winners because the time they save would be worth what they had to pay. But a great many others would be “tolled off” the freeways, to already-congested arterials. And those already using the arterials would have an even worse situation by having extra vehicles diverted to them from the tolled freeways.

To solve this problem, we need to think creatively. All conventional freeway-pricing proposals make two unexamined assumptions: that everyone would be charged the same price and that all lanes would serve all vehicles. Let’s re-examine those assumptions.

Detailed research on the congestion-priced High Occupancy Toll (HOT) lanes on SR 91 in California by UC-Irvine economist Kenneth Small finds a very large distribution of values of time and values of trip-time reliability among all motorists in that congested corridor. Small and his colleagues modeled several pricing alternatives for that corridor, including the existing combination of priced and free lanes, the standard all-lanes-priced model of freeway pricing, and a dual-price model. The last of these produced the highest social welfare outcome, because it provided more total congestion relief without “tolling off” large numbers of users. Stephen Shmanske of California State University at Hayward first proposed this approach in 1991, and modeled a dual-price system for the Golden Gate Bridge in 1992.

The other unexamined assumption that needs a fresh look is that all lanes should be configured as “general purpose,” or GP, lanes. Highway engineers know that throughput is somewhat higher on two GP lanes than on two parallel, but separated, lanes. That’s because with multiple lanes, faster vehicles can pass slower ones. And transportation economists can point out that because of the “lumpiness” of traffic lanes, it’s difficult to provide the right amount of lane capacity restricted to a single use — say buses, High Occupancy Vehicles (HOVs) or trucks. Most of such specialized lanes are under-utilized.

But we now have more than 15 years’ experience with HOT lanes, most of them single-lane-per direction. Thanks to variable (congestion) pricing, these lanes can be filled to a target level of traffic (e.g., Level of Service C) and kept that way. In selected corridors, there may be enough truck traffic to justify truck-only lanes, and several such projects are under detailed study around the country.

My proposal for freeway pricing draws on these points to suggest that transportation planners should revise their goals. Instead of one-price-fits-all on GP lanes, we should be aiming at a three-part system: premium lanes (with premium pricing) for

Continued on page 18

# Enabling an Express Ridesharing Response to Decongestion Pricing

| by Paul Minett

Co-Founder, President and CEO of Trip Convergence Ltd.

## Introduction

*If the goal of decongestion pricing<sup>1</sup> is to reduce traffic on the road, then mechanisms that make it easier for users to switch between transport modes in response to the charge, and therefore maintain or increase person-throughput but with fewer vehicles, should come to the fore. Dynamic pricing signals, which change based on the traffic at the moment, create a choice between the paid-lane for a faster trip and the unpaid-lane to travel in slower traffic. This article suggests a mechanism by which regular travelers could respond by spontaneously forming express car pools<sup>2</sup> and thus enable dynamic mode shift in response to dynamic pricing signals.*

To build our case we make the following key assumptions and observations:

1. The purpose of decongestion pricing is primarily to reduce demand on a congested facility during the peak period. The goal is to shift the demand to different times of travel, different modes of travel, or non-travel alternatives (including cancelling the demand). Revenue from decongestion pricing is a secondary purpose
2. Successful introducing of decongestion pricing requires the simultaneous introduction of alternatives so that people have a choice if they do not want to pay the charge, or to minimize the impact of the charge. This could be an alternative time to travel, an alternative mode of travel, or an alternative to traveling
3. When thinking of work-related travel, 'mode choice' or being in a single occupant vehicle (SOV or not) is only a choice on the way to work. The mode alternatives (SOV or not) for the return journey are generally set by the 'to work' mode. If a person has driven SOV to work in the morning, it is somewhat unlikely that he or she would respond to decongestion pricing by taking transit home in the evening<sup>3</sup>

<sup>1</sup> Also called 'congestion pricing'. The author prefers the 'decongestion pricing' because it focuses on what those who pay are purchasing, decongestion, which has a positive connotation, rather than the penalty implied in 'congestion pricing'. No-one wants to buy 'congestion'.

<sup>2</sup> Express carpooling has previously been called 'flexible carpooling' by this author.

<sup>3</sup> It is unlikely though not unheard-of. Some people have a 'station car' that can be parked at the station at the destination-end to be picked up when

4. If public funds are to be used to fund introduction (capital and/or operating expenditure) of alternative modes in support of decongestion pricing, the community should select the lowest-cost alternative modes, all else being equal. Cost comparisons should be on a 'full life cycle' basis
5. It is less costly (for the transport system and the community) if people share rides in self-driven personal vehicles, than in driver-paid public vehicles
6. The main barriers to more carpooling are that it is difficult to find carpool partners, and it takes too much time to assemble the carpool
7. Casual carpooling (also called 'slug lines', see more information below) overcomes these two main barriers: carpoolers go to meeting places and either pick up the next rider or get in the next car that is going their way. They do not pre-arrange who they will ride with. Riders generally do not pay for the ride. Given that there is a desire to carpool, and assuming 'sufficient safety', assembling at a meeting place has a lower cost (effort) for both riders and drivers than any system with trip-by-trip pre-arrangement

## Casual Carpooling (also called 'slugging')

Many people are unaware of the scale of casual carpooling. An estimated 20,000 people participate daily in a system that has built up of its own accord in two main centers (San Francisco, Calif., and Washington, D.C.) and with smaller examples in at least one other center (Houston, TX). The system has never been implemented anywhere but started and then grew in response to local conditions. The meeting-places and destinations for the main systems are shown in **Figure 1**.

**Figure 1|**  
San Francisco and Washington, D.C., casual carpool meeting-places and destinations



An example of casual carpooling can be found at the North Berkeley BART station in Berkeley, Calif. (See **Figure 2**). The day the picture in **Figure 2** was taken, 116 carpools were formed in an hour, each with three people. That is, 116 people drove to this location and formed carpools with 232 people who had walked to or been dropped off at this location. We have estimated that casual carpooling saves the San Francisco community in excess of \$30 million per year in fuel, reduced emissions, and avoided public transport costs.

## Express Carpooling

We believe that it would be beneficial to establish casual carpooling in new locations, particularly in support of decongestion pricing. However because casual carpooling has never been implemented as a project, there is no implementation guide or

getting off the bus or train. There is limited capacity for this to be a significant part of the solution.

**Figure 2** | Casual Carpooling at North Berkeley BART, January 2009



best practise manual for the system. Key issues that arise include:

1. How would a transportation agency avoid liability if something went wrong?
2. If issue 1 could be overcome, what sort of a catalyst would be needed to kick-start a system in a new location?

***We have estimated that casual carpooling saves the San Francisco community in excess of \$30 million per year in fuel, reduced emissions, and avoided public transport costs.***

We have developed the concept of express carpooling as a system that overcomes these issues. The liability issue is resolved by an operator carrying insurance, obtaining disclaimers from participants, and managing membership. The system will be kick-started through conspicuous meeting-places and appropriate marketing. Express carpooling is a formalized version of casual carpooling. In addition to the meeting -places found in a casual carpooling system, express carpooling requires: pre-screened membership, technology for identification and to track participation, carpool accounting to transfer ride credits from riders to drivers, incentives, formal routes, conspicuous meeting places for inbound and outbound travel, consistent branding, marketing, and operator insurance. Importantly, it retains the 'no trip-by-trip pre-arrangement' feature of casual carpooling.

An animation of an express carpooling solution can be seen at [www.raspberryyexpress.com](http://www.raspberryyexpress.com). It shows members making their way to a meeting-place, lining up, getting rides with other members, and getting dropped at their destination.

Implementing express carpooling to support the introduction of decongestion pricing would involve:

- Setting targets for traffic reduction on the facility
- Agreeing the split of this target between time of travel, mode of travel, and alternative to travel
- Agreeing the portion of the mode-change that should come from carpooling
- Establishing sufficient express carpool parking upstream from the decongestion tolling point(s)
- Establishing express carpooling routes to major destinations
- Establishing destination-end pick-up points for the return journey

- Catalyzing participation through outreach, launch, branding, marketing, incentives, and other benefits such as high-occupancy vehicle (HOV) discounts (on the decongestion charge), dedicated carpool parking at the destination end, and other HOV benefits

An informal example of this system already exists, but it is not generally recognized to be such. It is the San Francisco Bay Bridge. There is a toll of \$4 to cross the bridge in a westerly direction, there is a 100 percent discount for HOV3+ vehicles, and the HOV3+s always get green at the ramp meter. Responding to this, and utilizing the HOV3+ lanes leading to the Bay Bridge, casual carpooling accounts for as many as 3,000 3-person carpools per day. [Author's Note: From 1 July 2010 the Bay Bridge toll was increased to \$6, and carpoolers now pay \$2.50. Casual carpooling continues to operate, and some riders (who used to pay nothing) now pay up to \$1.25 towards the toll].

## **A Worked Example**

Imagine solving the congestion problem on a busy bridge. The bridge is two lanes each way, 5 miles long including on-ramps, the traffic volumes are in balance in both directions, there are three hours of congestion during each peak, at each end of the bridge. Throughput on the bridge is 1,800 vehicles per lane hour, and the delay is an average of 20 minutes per vehicle.

- What if we could implement a variable decongestion charge to achieve free-flow, with no delay, at 40 mph
- We'd need to reduce the traffic by 1,370 vehicles, or 13 percent of current volumes, in each direction
- Let's assume the existing bus service has no spare capacity
- Let's assume a parallel alternative route will have decongestion pricing introduced at the same time to prevent spillage
- In this scenario 5 percent of the target vehicles are expected to shift to different times or cancel travel at the planned level of decongestion charge
- So an alternative mode is needed to serve the balance, 1,300 people, in each direction

We consider two alternative mode options: increased bus capacity; and express carpooling. The key factors for each direction are:

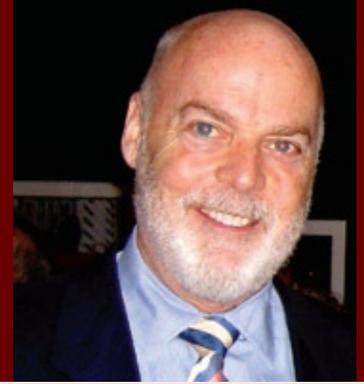
- We could get the city to increase bus capacity by 1,300, including developing park-and-ride (PNR) capacity. We would expect the PNR to have a capital cost of \$20,000 per space. We assume interest on the capital will be 7 percent per annum. We expect buses cost about \$300,000 for 40 seats, and that we will require an operating subsidy per boarding of \$3 after fares of \$2. We expect that buses will be able to complete three round trips per peak, and will average 75 percent occupancy. The annualized cost including parking, bus acquisition, operating subsidies, and fares comes to \$6.05 million
- We could introduce express carpooling, also including park-and-rideshare (PNR) capacity. In this case the capital cost of parking is expected to be 20 percent greater due to a different layout for the PNR. Our analysis suggests that a subsidy is required of 20 cents per boarding after user fees of \$1. The annualized cost including parking, operating subsidies, and fees comes to \$3.56 million, or 40 percent lower than the bus alternative

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# Efficient Vehicle Assessor

Leveraging Non-Transportation Goals to Make Innovative Transportation Pricing a Reality

by Kevin J. Condon, Managing Partner of Verdeva LLC & Managing Partner of Core Computer Group



Given the nearly universal consensus among experts that the flat gas needs to be replaced, what could possibly stop adoption of an alternative approach? In a word: politics. Yet, this is too vital a national priority to let politics jeopardize solutions, leading the National Surface Transportation Infrastructure Financing Commission to include political viability as a main criterion in evaluating funding alternatives.

Vehicle Miles Traveled (VMT) is being developed with politics in mind. VMT already faces fierce opposition because its proponents have focused more on the technical merit of the system and less on how to build support for it. Avoiding this risk is why our platform Efficient Vehicle Assessor (EVA, patent pending) is being developed. This has led to applications with technical merit that the political class and policymakers are responding to positively.

EVA is an at-the-pump software platform that uses existing technology — such as RFID, barcode decals, transponders and Bluetooth — to capture vehicle data such as the Vehicle Identification Number, registration data or any data mandated by policymakers. EVA matches that data with existing government databases, such as from the DMV, to allow differential pricing or fee assessment.

Essentially, EVA turns the gas pump into a policy tool, which is used to address national and state priorities. These include: environmental (carbon emissions and incenting greener driving habits), energy/geopolitics (reducing reliance on foreign oil by rewarding fuel efficiency), transportation funding and state/local fiscal crises (by capturing millions of dollars in lost revenues in delinquent fees and fines). It's important to note that EVA is the enabling tool, not the policy itself. It's "variable-agnostic." The variables used in calculating the tax are whatever the state chooses.

Used as a policy instrument, EVA could serve in several areas. In addition to an alternative transportation funding solution that meets the National Surface Transportation Infrastructure Financing Commission's five evaluation criteria more completely than a basic VMT, EVA's outcomes could include:

## Beyond Transportation: Other Challenges and Political Allies

- *Local and state budget crisis:* By linking to relevant government databases, EVA could:
  - Capture lost revenues as much as \$4 billion in parking tickets
  - Reduce delinquent collection costs substantially
  - Capture state revenues currently lost due to unregistered vehicles. As many as 25 percent of vehicles on the road in some states are unregistered
  - Save insured drivers billions in higher premiums due to uninsured vehicles (In Texas alone, that pass-along cost is \$1 billion)
  - Allies: States and local governments that need revenues;

- unions for public employees laid off including police, firefighters and teachers, and insurance companies
- *Law Enforcement:* In addition to enforcing insurance and registration requirements, same vehicle data EVA can:
  - Prevent stolen vehicles from refueling
  - Reduce use of uninsured and unregistered vehicles
  - Allies: Law enforcement groups and insurance companies
- *Consumer Protection:* Using aggregate data, EVA could replace inaccurate "manufacturer's estimated MPG" with much richer actual MPG data, including region, season and vehicle age.
  - Allies: Consumer advocacy organizations such as Better Business Bureau, Consumer Advocacy Group and Consumer Action and others supporting consumer access to information supporting informed purchases

## Reducing Opposition to Alternative Transportation Funding

EVA's versatility makes it possible to win over (or at least disarm) many opponents to VMT:

- Environmentalists believe VMT offers no incentive to drive more fuel-efficient vehicles. EVA enables fuel efficiency as a variable. Using EPA algorithms for carbon emissions, EVA could be a tool for assessing the carbon tax
- Rural advocates criticize VMT as unfair to rural drivers. EVA can incorporate "rural location" as a variable
- Remote commuters: Opposition to the congestion pricing proposal in New York City was based in part on the lack of mass transit choices to commuters in the outer boroughs. One EVA approach could use commuters' access to mass transit as a variable in determining tolls/fees paid by motorists so those commuters who have no mass transit alternative to driving are not unfairly impacted by congestion pricing, such as was proposed in NYC
- Social advocates: Mitigating socio-economic impact of new funding systems is one of the main goals set by the NSTSFC. Policy-makers could mandate socio-economic variables
- Privacy advocates. Across the political spectrum, people recoil when GPS tracking devices are mentioned. But the time and location is needed primarily for congestion pricing, not transportation funding in general. This important goal, however, could be more achievable if states could initially choose a non-GPS system, capturing just mileage without tracking time and location. As the public gets more comfortable with this simpler VMT, later use of GPS might not be as objectionable. Applying the EVA concept makes such a staged transition not only more politically plausible, but more technologically and, therefore, financially plausible

Kevin Condon is the managing partner of Verdeva LLC and managing partner of Core

**Continued on page 18**

# International Scan

## Reducing Congestion and Funding Transportation Using Variable Road Pricing

by John Q. Doan

Senior Associate, SRF Consulting Group  
Report Facilitator for the Road Pricing  
International Scan Team



Road pricing has a long history in the form of tolled bridges, tunnels and turnpikes, designed to generate revenue to pay for the construction, operations and maintenance of these facilities.

More recent innovations in road pricing in the U.S. have been limited to price-managed lanes due to political, institutional and public-acceptance concerns. However, variable charges have been used successfully by many U.S. industries — including hospitality, air travel, utilities and telecommunications.

Internationally, road pricing has been instituted on a broader basis in other countries, notably Singapore, Germany, the Czech Republic, the United Kingdom, and Sweden (Figure 1). In December 2009, a team of 10 U.S. transportation officials met road-pricing experts under the sponsorship of the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA) and the Transportation Research Board (TRB). The team and the experts met in Europe and Singapore to learn first-hand about their approaches and best practices.

Overall, the experience in each host country showed that road pricing is an effective tool to manage demand and raise revenue. Based on discussions and observations made during and after the scan, the team found the following:

**Figure 1**  
Example of charging points in Singapore and Stockholm



### 1. Host countries and regions with clearly defined and well-understood policy goals were able to achieve their targeted outcomes most effectively.

While there are a number of basic goals underlying a road-pricing program, two primary purposes of road pricing emerged: to manage demand and to generate revenue. Figure 2 illustrates the fact that there are some programs that emphasize one objective or another, and others that seek to blend the two objectives into one harmonious program. Looking through this lens, Stockholm, London, and Singapore are in the demand-management circle, while Germany and the Czech Republic fall solidly in the revenue-generation circle. The Netherlands, whose national road-pricing program was discontinued in mid-2010, would be placed in the overlapping area of the two circles. A clear understanding of the primary policy objectives behind the implementation of road pricing, and consistent decision-making aligned with the objectives, were essential elements for all successful projects.



**Figure 2**  
Purposes of Road Pricing

### 2. Thorough planning and setting of appropriate performance measures ensures achievement of overall goals, manages the pricing program as an element of overall transportation system performance, and helps to guide implementation and operations.

Comprehensive network planning was integral to the pre-implementation efforts for the road-pricing systems examined on this scan. In planning the Stockholm system, internationally recognized traffic experts were retained to measure network effects of various alternative configurations of the charging zone to ensure there were no unintended effects outside of the congestion charging zone. Meanwhile, Singapore is using advanced analytics and traffic models to better understand the network impacts of pricing on parking and transit.

### 3. Linking the pricing structure to the benefits received by the user contributes to public acceptance and helps to avoid the potential negative impacts from traffic diversion.

To maintain support for road pricing, some of the sites visited attempt to connect the pricing structure to the benefits received by the toll payer. In Singapore, charges are set at levels to ensure that targeted “optimal” speeds can be maintained for at least 85 percent of all vehicles. All net funds collected via Singapore’s Electronic Road Pricing (ERP) initiative are placed in the general fund and redistributed to road users in the form of vehicle

Continued on page 18-19

# Tool for Estimating Managed Lanes Traffic and Variable Toll Rates

by Jack Klodzinski, Tom Adler & William T. Olsen

Regional models provide reliable estimates of overall corridor volumes and the distribution of traffic on a network. However, current regional traffic forecasting models do not efficiently forecast hour-by-hour traffic volumes and most forecast only total daily traffic. Since toll rates and apportionment of traffic between express lanes and general use lanes can depend heavily on hour-by-hour traffic conditions, detailed analysis is necessary to properly represent these conditions. In addition, express lane toll rates vary based on traffic levels and thus the supply-demand equilibration process needs to include supply functions that allow both time and cost to vary dynamically. While hourly traffic forecasting with dynamic tolling could be done with a regional network model, the required computing time would be substantial and makes production of multiple scenarios cumbersome.

The post-demand model application described in this article provides the user with a tool to quickly produce multiple hourly toll and traffic forecasts for a managed lanes project with a short turnaround time. The Express Lane Time-of-Day ("ELTOD") procedure's primary inputs are total daily corridor traffic from a regional travel forecasting model, geometric configuration of the facility, and tolling policy. ELTOD estimates the traffic on both general use and toll lanes in the corridor by solving for supply/demand equilibrium for each hour and a suggested hourly toll rate.

The supply side relationship between traffic volume and travel times is represented by Akcelik curves that estimate the section travel times separately for the general use and express lanes in each direction<sup>1</sup>. These curves were developed based on queuing theory to more accurately represent congestion levels in over-capacity conditions. Toll rates are computed for each hour and direction based on the express lane's volume to capacity ratio using power curves (Power curves rather than splines or other piecewise linear forms are used to avoid discontinuities that could prevent convergence of the equilibration process). The rates are set so that they fall within a specified minimum to maximum toll range, with a shape determined by a specified power curve exponent. These rates can be used as computed, manually adjusted or a special optimization procedure can be used to determine the toll rate that maximizes revenue, express lane volume or any objective function subject to the max/min rate limits and level-of-service conditions.

The demand side is presented by a binary logit-based toll route choice model. The model determines the hourly toll (express lane) share based on the difference in travel times between the general use and express lanes and on the toll

1 Akcelik, Rahmi, "Travel Time Functions for Transport Planning Purposes: Davidson's Function, its Time-Dependent Form and an Alternative Travel Time Function, Australian Road Research, 21(3), September 1991, pp 49-59.

amount. Coefficients for the logit equation were taken from a 2006 stated preference survey and choice model estimation project conducted in Lee and Collier Counties. The time and cost coefficients from that study reflect a value-of-time of just over \$17/hour. The logit model scale ( $\theta$ ) was adjusted so that it replicated the observed 1999 time-of-day distribution on the SR-91 facility in southern California. For the choice between general use and express lanes, the variance is likely quite low because travel time differences can be easily discerned and there is little else other than time and cost that distinguishes the two types of lanes. A higher scale parameter implies lower variance and results in higher shares being allocated to the alternative with the highest utility. This is reflected in the ELTOD model by a scale parameter of 15, which results in relatively low shares being allocated to the express lanes during off-peak periods, consistent with the SR-91 experience.

Because the supply and demand functions are both highly non-linear, the simultaneous solution of these functions is most conveniently found using an iterative method.

Changing ELTOD parameters can test variable pricing strategies for demand management to preserve a desired level of service in the express lanes when there is an adjacent non-tolled facility as an alternative. This ELTOD application was used on a managed lanes project in southwest Florida on Interstate 75. The procedure for estimating hourly Express Toll Lane volumes and rates successfully produced results that were reasonable compared to the daily toll rates concluded from the daily travel demand model. The rates increased in the peak hours of the day and dropped to the specified minimum or near minimum rates during off-peak hours. Continued development and experimentation is anticipated to produce an analytical procedure that has even more versatility and detailed results for toll facility project analyses.

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# Transportation Lending

by Robena Reid, Financial Economist, Federal Transit Administration (FTA)

## Introduction

Surface transportation infrastructure funding levels are finite and must compete for local funding with many other types of public projects and services. As a result of the unmet demand for credit toward surface transportation programs at the state, local and private level, the U.S. Department of Transportation (U.S. DOT) sponsors several programs, including the Transportation Infrastructure Finance and Innovation Act (TIFIA) program, State Infrastructure Banks, Section 129 Loans, and the Railroad Rehabilitation and Improvement Financing Program.

Although most project sponsors prefer to receive grant funds instead of loans or other forms of credit assistance, lending programs offer distinct advantages that appeal to governments or private companies. First, lending enables project acceleration by avoiding uncertain grant funding that may not materialize for many years in the future. Second, credit assistance supports cost efficient project delivery by speeding construction and avoiding construction cost increases due to inflation. For maintenance projects, borrowing funds to perform rehabilitation activities may decrease overall costs by protecting the infrastructure asset before additional deterioration significantly compromises it.

## The Transportation Infrastructure Finance and Innovation Act (TIFIA) Program

The U.S. DOT's TIFIA program offers applicants direct loans, loan guarantees, or lines of credit for projects with more than \$50 million of eligible construction project costs and more than \$15 million of eligible intelligent transportation system project costs.

The program imposes an investment ceiling on the U.S. DOT of no more than one third (33 percent) of the total project costs. By remaining a minority investor, U.S. DOT simultaneously limits its risk exposure and encourages significant non-federal public and private participation. Loan terms are negotiated among the U.S. DOT and other participating parties. For direct loans, the interest rate is set at closing to equal to a U.S. Treasury instrument with a similar maturity.

As of October 2010, 22 projects in have received \$7.9 billion in TIFIA credit assistance. These projects represent a diverse modal investment portfolio and include public transportation, highways, intermodal hubs, ferry terminals, rail, and marine cargo assets.

## State Infrastructure Banks

State Infrastructure Banks (SIBs) provide revolving loans and

other types of credit assistance to highway and transit projects. First developed as a pilot program in 1995 with ten participating states, the program has expanded to include 39 states and the Commonwealth of Puerto Rico. SIBs enhance the lending capacity available to transportation projects under the auspices of the U.S. DOT by providing financing to smaller dollar projects that are not eligible for TIFIA assistance.

In contrast with the U.S. DOT-managed TIFIA program, State Infrastructure Banks are operated individually within each state, which establishes the application criteria, loan terms and management structure of their program. In order to transfer federal funds to capitalize a SIB, a cooperative agreement is required between the federal government and the SIB. Despite the more rigorous and intricate steps involved in SIB establishment, SIBs offer greater lending flexibility and are able to tailor their programs to the specific needs of the state. For example, SIBs have the ability to offer various forms of credit enhancements such as credit guarantees, interest rate subsidies, bond insurance, and capital reserve funds.

As of June 2007, the SIB program has supported 596 loan agreements and has provided more than \$6 billion of project support in 33 states. Loans have included many different types of transportation projects, including public transportation assets, intermodal facilities, roads, and airport facilities.

## Section 129 Loans

Section 129 loans allow states to use regular federal-aid highway apportionments to fund direct loans to projects with dedicated revenue streams including tolls, property taxes, sales taxes and other beneficiary fees. The loan provisions, as amended, are codified at Section 129(a)(7) of Title 23, and for this reason, loans under this program are commonly referred to as "Section 129" loans. Loans must begin repayment within five years after the project is opened to traffic, and must be fully repaid within 30 years from the date federal funds are authorized for the loan.

The number of completed Section 129 loans has been limited, due in part to the availability of TIFIA credit assistance for similar types of projects. However, for projects unable to meet the cost threshold or other application criteria required for TIFIA assistance, Section 129 loans are a good alternative. Section 129 loans complement the SIB program by providing the opportunity to lend funds external to a formal bank loan process. This feature is important to states unable to utilize or participate in the SIB program.

## Railroad Financing

The Railroad Rehabilitation and Improvement Financing Program offers direct loans and other credit assistance to eligible freight rail transportation projects. Unlike the TIFIA program, direct loans may fund 100 percent of a project, with up to 25 years for loan repayment. As of October 2010, the program has completed 28 loans, with loan amounts totaling more than \$1 billion.

*Robena Reid joined the Federal Transit Administration (FTA) Office of Policy Development in 1999 as a financial economist. She has performed a variety of financial management roles including credit analysis, lending program oversight and loan negotiation for the Transportation Infrastructure Finance and Innovation Act (TIFIA) Credit Program and the State Infrastructure Bank program.*



# Spotlight on Noranne Downs

*District Five Secretary, Florida Department of Transportation*



## **To the beat of her own drum**

Before rising to the position of District Five Secretary of the Florida Department of Transportation— even before she became the first woman to earn a civil engineering degree from the University of Massachusetts, (formerly Southeastern Massachusetts University at North Dartmouth) — Noranne Downs just wanted to follow in the footsteps of her dad.

“My dad was a draftsman and a window engineer, he designed windows,” Downs said. “I was a child who was interested in what he did, and my dad said ‘You are so smart in math, why don’t you be an engineer? You get to do designing, and you could do your art on the side.’ I actually listened to him!”

As the middle child, she grew up in Kingston, Mass. — a quaint town filled with childhood adventures, clambakes and swimming lessons. “Plymouth” and “Cape Cod” were household names. She favored drums over the flute, played ice hockey instead of taking ballet lessons and was good in math but also had an artistic gift.

Two weeks out of college, Downs moved to Florida. “The weather brought me to Florida,” she said. “I loved Massachusetts, I loved the sun and I loved the ocean, but I hated the cold.”

## **The pathway to success**

A job opening in Florida carved a path for Downs that led to the City of Daytona Beach, where she began approving drainage permits and conducting land development reviews. But the Sunshine State’s draw would soon be overtaken by an urge to move west to work for a private land development firm in California. There, she designed a 5-mile quarry access road and learned about the environment. Then Downs was once again beckoned to the Sunshine State, and she and her family moved back where she once again worked in a land development firm. But this time, Downs wanted to dedicate time to her children.

“I asked God for five years to stay home with my kids — and five years, three weeks later, [the Department of Transportation] calls me up and they were looking for engineers,” Downs said. She needed good health insurance, so she applied for a structures job and didn’t land it. “But through that,” she says, “I found that there was a whole section in project management, which was my favorite class in college. How cool was that!”

In this way, Downs found her way to transportation, taking a non-professional engineer job — though she had earned a P.E. — managing projects related to resurfacing and intersections. Shortly after, she was appointed head of the project management section and then to the district design engineer. She rose to the position as director and eventually to her current job as secretary of FDOT District Five.

## **Thoughts on congestion pricing**

“As a visionary, I can see that this could be in the future,” Downs said of congestion pricing. “People are smart, and they will make wise decisions whether it is saving time and saving money. And so we believe that it is another “tool in the toolbox” as it would give people an option.

Downs said, however, it’s not the Department’s role to establish funding mechanisms.

She says many people want to use Interstate 4, a highway that runs from Tampa to Orlando and continues to Daytona Beach. The use of variable toll congestion pricing could be an option for four new lanes down the middle of general use lanes on I-4. “As District Five secretary, my role is to go over with the residents, and also the politicians, all the options that are out there,” Downs said. “My job is to continue to look at all the research to help all the politicians, counties, cities and citizens figure out what the options are and how much they will cost, so that they can come up with the funding mechanisms.”

## **Professional accomplishments**

If you ask Downs about her major professional accomplishments in life, she will describe two important events: receiving her P.E. license and being a public servant. Downs excelled in her classes while in college, but when it came to taking standardized tests, her scores did not meet her expectations. In fact, this was true of most standardized tests.

“I almost flunked the driver license test; I over-think and I have a fear of test taking,” Downs said. “But I am good in class. I was diligent in class.”

That made passing the P.E. exam one of her major accomplishments, and it allowed her to do what she loved as a public servant.

## **Personal accomplishments and hobbies**

Downs teaches Sunday school for 3- to 5-year-olds and uses her painting skills to create murals at her church. On the side, she remembers several hobbies as a child — and she never lost interest in the drums. Her mom wanted her to play the flute and her teacher once told her, “Chicks don’t play drums.” But she stood firmly by her enthusiasm for the instrument, played triple tom toms in marching band, tympani in concert band, and is currently learning to play the drum set.

For another thrill, Downs likes fast cars and bought herself a Fiat Spider convertible. She eventually moved from that ride to a VW and then a Mustang — saving the best for last, she said. Her husband bought her a Porsche Boxter, and with it came a day of learning to drive like a professional racecar driver at a driving track in Gainesville, Fla. “That was a really fun day,” Downs said.

Although Downs enjoys spending time taking a spin in her car and working on her musical talents, she remains undistracted from what truly drives her to success.

“I love being an engineer and doing all the calculations, but my bigger passion is helping people,” she said. “I think that with this job, I can help multitudes of people, I understand them. These are the things that I would say that if I died tomorrow, I would say I’m glad I did.”

# TRIP

## Interns Summer 2010

### Sam Budzyna (Missouri State University)

Sam Budzyna is a senior majoring in civil engineering at Missouri State University. Sam is not new to internships. By the time he was accepted into TRIP, he had already interned three times with the Missouri Department of Transportation. He applied to TRIP because he wanted to experience something different. His TRIP adviser was Ruth Steiner, an associate professor in the Department of Urban & Regional Planning at UF. The project he participated in was *Impact of Parking Supply and Demand Management on Central Business District (CBD): Traffic Congestion, Transit Performance Measures and Sustainable Land Use*. The topic was of much interest to Budzyna because back home, he is a bicycle enthusiast. "I was lucky enough to work on something I am passionate about," Budzyna said. "In Missouri, I am a bicycle mechanic, and I commute by bicycle daily. I got to spend the summer researching bicycle parking." Budzyna enjoyed meeting the other TRIP interns and the graduate students working for Steiner. "They're all really amazing people, and I had tons of fun," he said. As for now, Budzyna does not know if graduate school is in his future. He is still undecided. "I'm ready for the real world, but I'm not sure if it's ready for me," Budzyna said.



### David Champoux (Clarkson University)

David Champoux is a senior at Clarkson University. He is majoring in civil engineering with concentrations in water resources and transportation engineering. He is also pursuing a minor in mathematics. From childhood, Champoux recalls having a very real interest in transportation. "When I was younger, I loved building different public infrastructure (e.g. buildings, bridges and culverts) out of Legos," Champoux said. "I even planned a longer-term project when I was 10 years old. I built an entire highway interchange. It included an on/off ramp, beam-bridge, toll booth structure, six-lane highway and an approach city road to the interchange." He says he remembers having a tough time figuring out the best traffic lights to install because setting up the proper timing patterns for the electronic signals was hard; he simply did not have the knowledge. "The only materials used were cardboard, tape and construction paper," he said. "I also used to enjoy playing with those 'stop-slow' signs that work zone flagmen use to direct traffic. I've envisioned being a transportation engineer for many years now." This time around, however, Champoux got to work on a real-world project with his TRIP adviser, Associate Professor Scott Washburn. The title of the project was *Analysis of Two-Lane, Two-Way Roadway Lane Closure Operations under General Flagging Control*. Champoux enjoyed working with Washburn and felt that this experience increased his knowledge base. "Dr. Washburn was a terrific professor, advisor and mentor," he said. "I learned many tips from him that expanded beyond the actual technical subject material. Thanks for a great experience!"



### Corey Hill (University of Florida)

Corey Hill is also a senior at UF majoring in civil engineering. Before applying to TRIP, he was not completely sold on transportation engineering. "After reading the flier for TRIP, I thought it sounded like a great opportunity to gain some experience and start deciding which direction to take my career," Hill said. He wasn't sure what to expect when he was accepted, but he says that in retrospect, he had a productive summer and he is now definitely more interested in transportation engineering. Hill's internship adviser was Professor Lily Elefteriadou. The topic he worked on was *Variable Speed Limits*. "I liked how I got to jump in the middle of an ongoing actual real-life project that FDOT requested UF do a study on," Hill said. "In another internship I did two years ago, I felt as though I was a nuisance, and that my supervisor had to think hard of what I could work on. This was not the case with this internship." Hill said he liked the program because it was structured as if he were in graduate school, which meant he had to manage his time and be self-motivated. He also enjoyed working with the other interns and graduate students. "The people and friends I met through the program were an added bonus," Hill said. "I had no idea there would be four other interns, and that we would do so many fun things like field trips and other activities outside of working."



### Ashlie Kerr (University of Florida)

Ashlie Kerr is a senior majoring in civil engineering at UF. She applied for the TRIP program because she was interested in gaining some research experience before applying to graduate school. Her internship advisers were Assistant Professor Yafeng Yin and doctoral student Dimitra Michalaka. Kerr's internship project was on *High Occupancy Toll Lanes and Value of Travel Time*. What she enjoyed most about the internship program was its self-paced nature and that she was able to make her own schedule. Kerr is quite active in civil engineering at UF. She has been a member of the UF Steel Bridge Team for the past two years and will be a co-captain in 2011.



### Austin Mattus (Villanova University)

Austin Mattus is from Villanova University. He is currently a senior majoring in civil engineering. He has always been interested in the transportation aspect of his chosen field of study. "So it was natural for me to look for an internship in the field of transportation research," Mattus said. "The TRIP program was the perfect opportunity for this, and I'm very glad I did it." Mattus worked on *Ordinal Regression Analysis on the Use of Public Transit Featuring the 2009 NHTS Data*. His TRIP adviser was Assistant Professor Siva Srinivasan. "My favorite part about the project was learning the program SPSS, which was very new to me but something I can definitely see myself using in the future, maybe for my senior capstone project," Mattus said. Graduate school is in his future plans and believes that UF would be his choice.





**Heather Hammtree**  
**Country/State of Origin:** U.S.A. (Ohio)  
**Degree Goal:** M.E.  
**Research Topic:** Testing of, and enhancements to, Two-Lane Highway Modeling in CORSIM™.  
**Adviser:** Scott Washburn, Ph.D., P.E., Associate Professor, Civil & Coastal Engineering



**Russel Provost**  
**Country/State of Origin:** U.S.A. (Massachusetts)  
**Degree Goal:** Masters of Urban and Regional Planning with a Certificate in Environmental Policy and Management  
**Research Topic:** Understanding the role of the built environment on travel behavior through a time series analysis  
**Adviser:** Ruth Steiner, Ph.D., Associate Professor, Urban & Regional Planning



**Roosbeh Nowrouzia**  
**Country/State of Origin:** U.S.A. (California)  
**Degree Goal:** Ph.D.  
**Research Topic:** Activity-based Modeling Using Spatial-Analysis Methods  
**Adviser:** Siva Srinivasan, Ph.D., Assistant Professor, Civil & Coastal Engineering



**Miguel A. Lugo Ortiz**  
**Country/State of Origin:** (U.S.A.) Puerto Rico  
**Degree Goal:** Ph.D.  
**Research Topic:** Urban Transportation Planning  
**Adviser:** Lily Elefteriadou, Ph.D., Professor, Civil & Coastal Engineering



**Barbara Martin**  
**Country/State of Origin:** Brazil  
**Degree Goal:** M.S.  
**Research Topic:** Evaluating The Impacts Of Advanced Driver Assistance Systems Using A Driving Simulator – An Explanatory Analysis  
**Adviser:** Lily Elefteriadou, Ph.D., Professor, Civil & Coastal Engineering



# Our Students from Around the World

The CMS students constitute a very diverse, international group. They are the key to the success of the center, and we expect them to continue to grow. Here are some of our students a



**Vagelis Mintsis**  
**Country/State of Origin:** Greece  
**Degree Goal:** M.S.  
**Research Topic:** Driver Behavior Modeling Using Fuzzy Logic  
**Adviser:** Lily Elefteriadou, Ph.D., Professor, Civil & Coastal Engineering



**Naser Arafat**  
**Country/State of Origin:** Palestinian Territory, West Bank  
**Degree Goal:** Ph.D.  
**Research Topic:** Evaluating Accessibility and Travel Cost as Suitability Components in Identifying and Preserving Affordable Housing — Case Study for Three Counties in Florida  
**Adviser:** Ruth Steiner, Ph.D., Associate Professor, Urban & Regional Planning



**Ziqi Song**  
**Country/State of Origin:** China  
**Degree Goal:** Ph.D.  
**Research Topic:** Pareto-Improving Pricing for Transportation Networks  
**Adviser:** Yafeng Yin, Ph.D., Assistant Professor, Civil & Coastal Engineering



**Md. Shahid Mamun**  
**Country/State of Origin:** Bangladesh  
**Degree Goal:** Ph.D.  
**Research Topic:** Traffic Impact Analysis  
**Adviser:** Yafeng Yin, Ph.D., Assistant Professor, Civil & Coastal Engineering



**Nagendra S Dhakar**  
**Country/State of Origin:** India, Rajasthan  
**Degree Goal:** Ph.D.  
**Research Topic:** Modeling Route Choice using GPS Data  
**Adviser:** Siva Srinivasan, Ph.D., Assistant Professor, Civil & Coastal Engineering

**George Debrah**  
**Country/State of Origin:** Ghana  
**Degree Goal:** M.S.  
**Research Topic:** Pedestrian Injury Severity  
**Adviser:** Siva Srinivasan, Ph.D., Assistant Professor, Civil & Coastal Engineering

# Students of the World

Intelligent, hard-working and highly motivated group.  
 They will be strong assets to the transportation industry in the very near future.  
 They will grow along with their countries of origin.

## ► Congestion Pricing— Continued from page 07

cars, light delivery vehicles and commuter buses; regular lanes with modest peak-period pricing; and in selected corridors, truck-only lanes. This approach should produce more winners than losers and therefore be politically feasible.

Moreover, it can be phased in over time, beginning with a network of premium-priced lanes, as currently planned for Atlanta, Dallas, Houston, San Diego, San Francisco and Seattle. Only after that network is operational should planners suggest the added benefits of modest peak-only pricing on the remaining GP lanes.

Freeway congestion pricing is still a worthwhile goal. But we are more likely to reach it by working harder on the details.

*Robert Poole is Director of Transportation Policy at the Reason Foundation. He is a member of the board of the Public-Private Ventures division of ARTBA and a member of the Transportation Research Board's Congestion Pricing Committee. He received his bachelor's and master's degrees in mechanical engineering at MIT and did graduate work in operations research at New York University. The New York Times has called Poole "the chief theorist for private solutions to gridlock." He writes a monthly column on transportation policy issues for Public Works Financing and publishes the monthly e-newsletter, Surface Transportation Innovations.*

## ► Enabling an Express Ridesharing Response to Decongestion Pricing — Continued from page 09

### Conclusion

This is a thumbnail sketch of the relative costs of two alternative mode options. Assuming each can be as successful as the other at reducing the traffic, at an annualized cost potentially 40 percent lower than the bus alternative, express carpooling should be carefully considered as a mechanism to support mode-shift in response to decongestion pricing.

*Paul Minett is the Co-Founder, President, and CEO of Trip Convergence Ltd, a New Zealand-based start-up that offers an express carpooling solution. He argues that for more carpooling we need meeting-places rather than databases. He is seeking funding and locations to beta-test the company's solutions. He lives in Auckland with his wife Ingrid. He travelled to Orlando, Fla. for the recent Conference on Innovations in Pricing of Transportation Systems. Paul can be contacted at [paulminett@tripconvergence.co.nz](mailto:paulminett@tripconvergence.co.nz).*

## ► Efficient Vehicle Assessor— Continued from page 10

*Computer Group, specialists in designing and developing transportation databases. He is also a member of the Steering Committee for the Mileage-Based User Fee Alliance. Earlier projects have included the creation of the first digital global database of hotels for Expedia.com, launching the Retail Data Security Conference; publishing the first technical publication covering CGI, and the first publication covering the Internet; and managing a data company that included data from more than 40 industry segments. He was chief operating officer of Reed Elsevier's Entertainment / Media / Communications division and ran the operations for the launch of Variety Gotham, a daily newspaper in New York City. Politically active in New York during a nationally covered desegregation crisis, he was described by the press as instrumental in the negotiations of an affordable housing solution that was the basis for what was later approved by federal courts. He also helped lead successful efforts to change the form of Yonkers' city government via a city charter revision, and helped lead a successful political reform effort.*

## ► International Scan— Continued from page 11

ownership tax rebates. These rebates reinforces with the public that the purpose of ERP is not to generate revenue but to improve service levels during peak hours.

### 4. Public outreach and communication was a key component of the program at every stage of the implementation process.

Both London and Stockholm had years of public debate about congestion charging before the political decision to implement was made. London's program benefited from promotion by business groups concerned about congestion, while environmental groups spearheaded the Stockholm program. After the decision to implement road pricing was made, both programs were carefully designed to address public concerns, and included a number of exemptions and discounts to mitigate negative impacts on particular segments of the public.

Over the past two years, staff and leadership at the Dutch Ministry of Transport have invested heavily in public outreach and education. They engaged in a thorough planning and public-involvement process and developed clear, salient timely messages about the purpose and benefits of pricing. A key message for the Dutch is: drive less, pay less.

### 5. Interoperability among states and countries is recognized as a critical issue that needs to be addressed at high levels.

The EU has adopted Directive 2004/52/EC, which outlines requirements for member countries to adopt interoperable standards for electronic tolling, thus allowing a vehicle to pay road user fees anywhere in the EU via one contract and with one onboard unit.

Intergovernmental coordination in sharing national vehicle registry information between agencies is essential for current operations and enforcement, as well as for interoperable systems. More agreements to share vehicle registry information across borders are still needed.

All sites visited have procedures in place between agencies within their own country to share vehicle registry data for easy applications of license plate imaging for invoicing and violation processing.



Figure 3|

Singapore's ERP on-board unit and smart card

**6. Host countries address equity and privacy concerns through exemptions, revenue use, technology and business rules.**

Exemptions are used in London and Stockholm to help address issues of equity. In addition, their emphasis on using toll revenues to fund transit sends a strong, clear message about equity and the project purpose.

Privacy was elegantly handled by Singapore's use of a "smart cash card" that is inserted into an onboard unit (Figure 3). Since the primary data on the smart card is the account balance (i.e. stored value), no personal user data is required for the pricing transaction.

**7. The urban area pricing projects integrated public transit investments and land use planning in order to manage congestion.**

Road pricing policy and public transportation investments are best coordinated by a single entity. In London, Transport for London (TfL) is responsible for implementing the Mayor's Transport Strategy and for managing transportation services for all modes of transportation throughout the city. In Singapore, the Land Transport Authority plans the long-term transportation needs of Singapore for those who drive as well as those who take public transportation. The Swedish government is in the process of consolidating its transportation agencies to bring all modes under one umbrella.

Based on the key findings, the FHWA/AASHTO/TRB scan team recommended that additional resources and effort be focused on the following three areas:

- 1. Enhanced outreach and communications.** In order to advance the use of road pricing in the U.S., it is paramount that transportation leaders, policymakers, key stakeholders and a larger cross-section of the public understand the benefits and implications of broader road pricing.
- 2. Additional research.** There is continued need for additional research to better comprehend issues related to public perception, implementation barriers, behavioral effects and integration of road pricing with multimodal land use and transit options.
- 3. Road-pricing toolkit.** The transportation profession lacks a comprehensive decision-analysis tool to assess the merits of various road-pricing options. The toolkit would include a module to assist in making design decisions, development of a guidebook or primer to assist technical managers in developing financing and procurement strategies, development of comprehensive and synergistic transportation plans that incorporate road pricing, development of concepts applicable in the U.S. context, and analytical tools to estimate performance and costs of alternative concepts in comparison with conventional tax-based approaches. These tools would help transportation leaders make informed decisions regarding the relevance and feasibility of road pricing to address specific mobility and revenue needs.

**Note:** A 20-page summary report of the International Road Pricing Scan is available at <http://international.fhwa.dot.gov/pubs/roadpricing/roadpricing.pdf> or by contacting John Doan at [jdoan@srfconsulting.com](mailto:jdoan@srfconsulting.com) or 763-355-8746.

As the report facilitator for the scan team, I authorize the CMS at the University of Florida the right to publish this excerpt from the scan summary report. R/John Doan

# CMS Students Win Awards at TEAMFL

On October 20-21, CMS students **Ashish Kulshrestha, Dimitra Michalaka, Evangelos Mintsis** and **Di Wu** attended a meeting of the Transportation and Expressway Authority Membership of Florida (TEAMFL) in Miami. The students participated in this meeting by entering research posters in TEAMFL's inaugural poster session. Michalaka's poster on *Enhancing CORSIM™ for Simulating High Occupancy/Toll Lane Operations* won first place, and Wu and Kulshrestha won third place for their work on *Impacts of Dynamic Pricing on Managed Lane Operations*. Congratulations to our students!

TEAMFL is a joint effort between the State of Florida's Expressway Authorities System and the Florida Turnpike District. This partnership serves to bring innovation to the operation and design of toll roads and booths, marketing and financing options.



From left: Di Wu, Dimitra Michalaka, and Ashish Kulshrestha

# Ziqi Song Wins Award at the 2010 UF NSF Research Day

**Ziqi Song**, a transportation doctoral student won the Research in Science award for his poster on *Comparison of Capacities of High-Occupancy-Vehicle and General Purpose Lanes* during the University of Florida's National Science Foundation Research Day on October 26. Congratulations!



Ziqi Song



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