NATIONAL CENTER FOR METROPOLITAN TRANSPORTATION RESEARCH

ANNUAL REPORT
FISCAL YEAR ENDING JUNE 30, 2006
SEPTEMBER 2006

Sections
Management Structure
&
Research Programs

Table of Contents

MESSAGE FROM THE DIRECTOR

We are pleased to present this 2005-06 report of our accomplishments. It is hard to believe that it has been eight years since METRANS was launched. In those eight years our faculty researchers grew from 9 to 60, the number of annual PhD transportation dissertations grew from 1 to 14, and the number of annual masters level graduates grew from 69 to 186.

As has been our practice each year, major new activities were initiated. This year we held the National Urban Freight Conference, attracting 280 attendees from throughout the US. The conference addressed freight issues in an urban context, and featured research papers on modeling, port operations, transport economics, environmental impacts, policy and institutions, and security and vulnerability. Two best practices sessions were also held. Response was overwhelmingly positive, and we have therefore decided to make this our signature annual conference event.

We also completed a long overdue redesign of our METRANS website. The new website is visually attractive, user friendly, and takes advantage of new technology that allows easy updating, registration for newsletters, email messages, and other interactive features. The new website is a great success, as website traffic has more than doubled since the site was activated in October.

This fiscal year ended on a sad note. Our METRANS Administrator, Ms. Jacquette Givens, passed away on July 3, 2006, after a short illness. Jacquette served as METRANS Administrator for five years. In that capacity she maintained all research and project accounts, administered the research proposal process, fulfilled all federal and state reporting requirements, processed all research reports and other publications, maintained the METRANS website, arranged meetings, conferences and workshops, and provided administrative support for the Director. She managed these many tasks with both efficiency and grace. She is greatly missed by the entire METRANS community.

Genevieve Giuliano
METRANS Director

A. CENTER THEME

The theme of the National Center for Metropolitan Transportation Research (METRANS) is transportation within large metropolitan areas. METRANS works on developing and examining solutions to the transportation problems of major metropolitan areas using an integrated approach that blends engineering, policy, planning, business administration, and public administration expertise. Within the context of large metropolitan areas, METRANS addresses national transportation issues such as advanced transportation technologies, urban transportation research, transportation infrastructure technologies, intermodal efficiency, and transportation and the environment. METRANS also has become a national resource for information on solutions to metropolitan transportation problems.

The Center addresses problems related to all five of DOT's Strategic Science and Technology Goals, with focus on the types of problems that occur within the Southern California region:

Provide a Safer Transportation System

- Enhanced safety for the transportation infrastructure, public transit patrons, drivers and passengers, and pedestrians

Achieve a High Level of Transportation System Security

- Safety, security, productivity and survivability of the transportation infrastructure under natural disasters, such as earthquakes and floods

Improve Environmental Quality and Energy Efficiency

- Reduced air pollution impacts of transportation
- Upgrading United States Immigration and Naturalization Service (INS) and United States Customs Service (Customs) border operations to enhance and expedite passenger and cargo processing, thereby reducing air pollution
- More energy efficient transportation systems

Foster Economic Growth and Productivity

- Reduced congestion on highways, rail, shipping, and air transport systems
- Development of the infrastructure and processes to better support international trade and transportation industries

Ensure Improved Access and Increased Mobility

- Mobility and accessibility for immigrant, disadvantaged, aged, and minority populations
- Improved logistics through ports and the transportation corridors serving them

METRANS also directs its work at several of DOT's Strategic Partnership Initiatives, with research focused in the following areas:

- Enhanced Goods and Freight Movement at Domestic and International Gateways

- Accessibility for Aging and Transportation-Disadvantaged Populations
- Monitoring, Maintenance, and Rapid Renewal of the Physical Infrastructure
- Environmental Sustainability of Transportation Systems
- Smart Vehicles and Operators
- Physical Infrastructure

Our research directed at these initiatives also crosses into several other DOT initiatives, such as National Intelligent Transportation Infrastructure, and Next Generation Motor Vehicles. Research is conducted in these areas as a means to solve problems in metropolitan areas.

METRANS also serves DOT's needs in International and Multidisciplinary Education, and in Mid-Career Training. USC and CSULB are uniquely positioned in these areas because of their highly diverse and international student bodies, diverse faculty, excellent facilities, location in the center of the nation's dominant region for international trade with Asia, and unique course offerings and degree programs. For example, USC has graduate degree programs with transportation field concentrations in civil engineering, industrial and systems engineering, urban planning, public policy, and public administration. CSULB has an established reputation for professional education in international trade and port operations, with the Global Logistics Specialist program which is celebrating its 10th year anniversary this year. In March 2001, CSULB began instruction in the new MA in Global Logistics program to train professionals to deal with the complexities of supplier relations, supplier selection, purchasing negotiations, operations, transportation, inventory, warehousing, third-party vendors, electronic commerce, and customer relations.

METRANS complements the two other University Transportation Centers in California by placing special emphasis on transportation issues in Southern California, home to more than 5 percent of the nation's population and nearly 2/3 of California's population, and in GNP equivalent the 10th largest economy in the world. This includes study of Southern California's major investments in transportation (e.g., goods movement and public transport) as well as the prominent problems of congestion, air pollution, and limited mobility for disadvantaged populations. In addition, METRANS' emphasis on blending technology and policy research, and on technology transfer, is unique.

METRANS is committed to focusing on high-priority topics and issues in metropolitan regions. In its first two calls for proposals, METRANS requested research on methods for improving public transport and goods movement and logistics. In its third call for proposals, METRANS added the area of infrastructure renewal. A fourth area, safety and security, was added in the fifth year. Using Southern California as our laboratory, our goal is to improve the efficiency and effectiveness of the urban transportation system, while simultaneously building the human resource capacity to improve transportation in the United States.

Summary of Accomplishments

This Annual Report covers the eighth year of METRANS. We have expanded existing activities and launched new activities. Our 1999 Strategic Plan objectives have been largely achieved. In anticipation of being successful in the 2006 Tier 1 competition, we look forward to launching a strategic planning process in the fall of 2006.

Highlights of the 2005-2006 year include:

- METRANS issued two RFPs, one in the fall (18 proposals requesting a total of $1,530, 168), and one in the spring (25 proposals requesting $3,117,710). The second round was intended to return to a fall start schedule, more consistent with the academic year.

- The applied research program, *Monitoring the Ports*, entered its third year. The applied research program funds data collection and short-term research at CSULB that supports outreach and technology transfer in goods movement and international trade. Six projects were funded for the 2006-07 academic year.

- METRANS held the National Urban Freight Conference in Long Beach February 1-3, 2006. The purpose of the conference was to examine impacts of goods movement and international trade in metropolitan areas and featured 65 papers from the public and private sectors and academia. Caltrans, the USDOT and AASHTO were sponsoring partners.

- The Eighth Annual Center for International Trade and Transportation (CITT) State of the Trade and Transportation Industry Town Hall Meeting was held in March 2006. Titled *Evolving Goods Movement Solutions: Balancing the Economy and the Environment,* the Town Hall addressed how trade growth and economic opportunities can be balanced against existing and future health impacts. A video documentary produced for the Town Hall event won an award from the Alliance for Community Media. The video, *Lessons Learned — Peak Seasons 2004,* won in the category of Community Issues in the Western region.

- Graduate students continue to win awards and recognition. **Mr. Ajay Agarwal,** USC Urban Planning PhD candidate, won three dissertation research awards: the Lincoln Institute of Land Policy Dissertation Fellowship, the USC Urban Initiative Dissertation Fellowship, and the SPPD Doctoral Student Fellowship. **Ms. Jennifer Cohen,** USC Master of Public Policy graduate, received the Presidential Management Fellowship. **Alison Linder**, USC Urban Planning Ph.D. student, won the Annual METRANS Outstanding Student Award. **Ms. Elif Karsi,** USC Urban Planning Ph.D. candidate, and **Sing-Yee Lin,** USC Master of Planning candidate received the 2006 WTS Orange County Scholarship. **Mr. Josh Rohmer**, USC, was awarded the Master of Planning Comprehensive Examination Prize for Outstanding Achievement.

In the summer of 2006, the Paramount City Council formally recognized METRANS for its contribution to the community through the MESA Program, an outreach program to attract young disadvantaged students into engineering professions with an emphasis on infrastructure-related engineering.

The quality of METRANS leadership and research was again demonstrated with awards. **Genevieve Giuliano**, METRANS Director, received the Transportation Research Board's W. N. Carey Distinguished Service Award, and was promoted to Senior Associate Dean, Research and Technology, in the School of Policy, Planning and Development.. **Maria Yang**, USC Assistant Professor of Industrial and Systems Engineering, won a National Science Foundation Career Award. **Petros Ioannou**, Professor, Electrical Engineering-Systems, USC and member of METRANS Executive Committee, was named a Fellow of the International Federation of Automatic Control(IFAC) **Paul Ronney**, Professor, Mechanical Engineering, USC, is the first recipient of the Bernard Lewis Lectureship of the Combustion Institute. As recipient of the lectureship, he presented a week long series of lectures to the Taiwan section of the Combustion Institute). **Maria Yang**, Assistant Professor, Industrial and Systems Engineering, USC, received the NSF Career Award for junior faculty.

The online version of the Global Logistics Certificate (GLS®) program, a professional training program in logistics and supply chain management, completed its second round of classes. The online version was developed to meet an ever increasing demand for logistics training outside the Southern California region.

- For the second consecutive year, METRANS designed and conducted two three-day Goods Movement/Logistics seminars for Caltrans. METRANS also conducted a half-day introductory training session in goods movement for elected officials, Planning Commissioners and City Managers for the South Bay Cities Council of Governments in south Los Angeles County.

- Our new website went live in October 2005, and is averaging about 10,000 visitors per month, more than double the rate of the previous year.

We are proud of our many accomplishments over the past year. We are now positioned to take the next steps to grow our national recognition in the coming years.

B. DESCRIPTION OF MANAGEMENT STRUCTURE

University of Southern California holds the prime grants that fund METRANS from the US DOT and CALTRANS. Center administration is the responsibility of the USC Principal Investigator, but all policy matters are jointly decided by USC and CSULB through the METRANS Executive Committee. A full-time staff member serves as METRANS Administrator. Staffing for CSULB activities is allocated on a task specific basis. A 25% time research program coordinator position promotes and manages transportation research on the CSULB campus.

Executive Committee

The Executive Committee is responsible for all METRANS project selections (research, education, and technology transfer) and for setting METRANS policies. Current membership is:

- Anastasios Chassiakos, Professor of Electrical Engineering and Associate Dean of Research and Administration, School of Engineering, CSULB
- Maged Dessouky, Professor of Industrial & Systems Design, School of Engineering, USC
- Genevieve Giuliano, Professor of Policy, Planning, and Development, and Senior Associate Dean, Research and Technology, School of Policy Planning and Development, USC
- Petros Ioannou, Professor of Electrical Engineering-Systems and Director, Center for Advanced Transportation Technologies, USC
- Joe Magaddino, Professor of Economics and Chair, Department of Economics, CSULB
- Michael Mahoney, Professor of Computer Science and Dean, School of Engineering, CSULB
- James E. Moore II, Professor of Industrial and Systems Engineering, and Public Policy and Management and Chair, Department of Industrial and Systems Engineering, USC
- Marianne Venieris, Executive Director, Center for International Trade and Transportation, CSULB

.

Executive committee membership is a voluntary (unpaid) service activity. The level of leadership, expertise and dedication of the METRANS Executive committee is exemplary. Not only are these faculty leaders in their respective fields of research, all have significant administrative responsibilities.

Director

Genevieve Giuliano, Professor and Senior Associate Dean of Research and Technology in the School of Policy, Planning, and Development (SPPD) is Director of METRANS. The Director is responsible for the overall management of METRANS, including reporting, matching fund solicitation, outreach, publications, education, supervision of the METRANS Administrator, project management and development of the center research agenda, and requests for proposals/qualifications. The center director is responsible for chairing meetings of the Executive Committee (joint USC/CSULB) and the Advisory Committee.

Deputy Director

Marianne Venieris serves as METRANS Deputy Director. Ms. Venieris has been responsible for the CSULB technology transfer activities since METRANS' inception. She is an experienced manager and the leading force behind METRANS' goods movement outreach activities. Ms. Venieris is Executive Director of CITT.

The Deputy Director is responsible for collecting performance statistics related to CSULB activities, distributing information to CSULB faculty and students and overseeing the METRANS technology transfer program. The Deputy Director works under the direction of the METRANS Director.

Center Administrator

Until her untimely death in July 2006, Ms. Jacquette Givens served as METRANS Administrator. The position was full-time, and included responsibility for all aspects of Center administration. The METRANS Administrator is now split into two 50% positions. The new METRANS Administrator will be responsible for all Center administration except budgeting and accounting. A METRANS Account Coordinator will take on budgeting and accounting responsibilities. The Account Coordinator will be part of the SPPD Business Office.

CSULB Administrator

Alix Traver serves as CSULB Administrator. The position is responsible for the collection of performance data at CSULB, and for communicating METRANS information to CSULB faculty, staff, and students. The position is also responsible for assisting with the METRANS Annual Conference, and for developing center promotions. The CSULB Administrator works under the guidance of the Deputy Director and the Center Administrator.

Applied Research Program Coordinator

Dr. Thomas O'Brien serves as Applied Research Program Coordinator. In addition to performing research, this 25% position is responsible for the day-to-day operation of the

Monitoring the Ports applied research program. This includes outreach to faculty, coordination with goods movement stakeholders, assisting with the proposal review process, and reporting requirements.

Promotion Manager

Marianne Venieris, METRANS Deputy Director and Executive Director of the CITT at CSULB, has served as the Promotion Manager. This position is responsible for developing outreach materials and managing the development of the website. Ms. Venieris managed the development of new promotional materials and the METRANS News.

Webmaster

We have restructured the management of our website. The website is now hosted by Urban Insights, the firm that redesigned the website. Our administrative staff now has capability to update the website, making changes and updates much more efficient and timely.

Advisory Committee

The Director has formed an Advisory Committee composed of representatives from agencies and companies that participate in center activities. The Advisory Committee is used to solicit suggestions for research, to assist in student job placements, and to assist in outreach and technology transfer activities. The Advisory Committee met once during the 2005-06 fiscal year. In anticipation of engaging in a second strategic planning exercise and launching new initiatives, Advisory Committee membership was reviewed in July 2006. The Advisory Committee will be renamed the Advisory Board to better reflect the purpose of this group, and new members are being solicited. Table 2 lists Advisory Board Membership as of August 2006.

Faculty Members

METRANS has funded a total of 60 faculty at USC and CSULB, 56 of which are members of the METRANS Center (the remaining 4 either retired or are no longer at USC or CSULB). This number includes faculty receiving funds either through the regular research program or the applied research program. Keeping to the METRANS interdisciplinary theme, faculty are drawn from four branches of engineering (civil, electrical, industrial, and mechanical), computer science, as well as business, economics, geography, health science, public policy, planning, and public administration. These faculty act as principal investigators on METRANS-funded projects, and have responsibility for overseeing individual research projects. METRANS faculty are listed in Table 3.

Table 2. METRANS Advisory Board

Name	Title	Organization
Sandra Balmir	Transportation Planner	Federal Highway Administration
Dan Beal	Manager, Public Policy and Programs	Auto Club of Southern California
Susan Collette	Supervising Transportation Planner	Los Angeles World Airport
Doug Failing	Director, District 7	California Department of Transportation
John Ficker	President	National Industrial Transportation League
Richard Hollingsworth	President and CEO	Gateway Cities Partnership, Inc.
Fran Inman	Sr. Vice President	Majestic Realty
Randell Iwasaki	Chief Deputy Director	California Department of Transportation
Gloria Jeff	Director	Los Angeles Dept. of Transportation
Geraldine Knatz	Executive Director	Port of Long Beach
Stephen Lantz	Director, Communication and Development	Metrolink (Southern California Regional Rail Authority)
Jack Levis	Portfolio Project Manager	United Parcel Service
Domenick Miretti	ILWU Senior Liaison	Ports of Long Beach and Los Angeles
Eugene Pentemonti	Vice President, Government Affairs	Maersk Sealand
Mark Pisano	Executive Director	Southern California Association of Governments
Richard Powers	Executive Director	Gateway Cities COG
Cindy Quon	Director, District 12	California Department of Transportation
Roger Snobel	Chief Executive Director	Los Angeles County Metropolitan Transportation Authority
Barry Wallerstein	Executive Officer	South Coast Air Quality Management District

Table 3: METRANS Affiliated Research Faculty

Tridib Banerjee	Policy, Planning, and Development	USC
Satish Bukkapatnam	Industrial & Systems Engineering	USC
Burkhard Englert	Computer Science & Engineering	CSULB
Anastasios Chassiakos	Electrical Engineering	CSULB
Robert Chi	Business Administration	CSULB
Maged Dessouky	Industrial & Systems Engineering	USC
Michael Driver	Business Administration	USC
Mohammed Fourozesh	Health Science	CSULB
Robert Friis	Health Science	CSULB
Genevieve Giuliano	Policy, Planning, and Development	USC
Darin Goldstein	Computer Engineering and Computer Science	CSULB
Peter Gordon	Policy, Planning, and Development	USC
Lisa Grobar	Economics	CSULB
Karl H. Grote	Mechanical and Aerospace Engineering	CSULB
Randolph Hall	Industrial and Systems Engineering	USC
Le Dam Hanh	Civil Engineering	USC
John Heidemann	Information Sciences Institute	USC
Petros Ioannou	Electrical Engineering Systems	USC
Clara Irazabal	Policy, Planning, and Development	USC
Kenneth James	Electrical Engineering	CSULB
Christine Jocoy	Geography	CSULB
Erik Johnson	Civil Engineering	USC
Tim Jordanides	Electrical Engineering	CSULB
Behrokh Khoshnevis	Industrial & Systems Engineering	USC
Melody Kiang	Business Administration	CSULB
Ilias Kosmatopoulos	Electrical Engineering Systems	USC
John Kuprenas	Civil Engineering	USC
Shui Lam	Computer Engineering and Computer Science	CSULB

Christopher Lee	Geography	CSULB
Bei Lu	Mechanical & Aerospace Engineering	CSULB
Joe Maggadino	Economics	CSULB
Najmedin Meshkati	Civil Engineering	USC
Kristen Monaco	Economics	CSULB
James E. Moore II	Industrial and Systems Engineering and Policy, Planning, and Development	USC
Dowell Myers	Policy, Planning, and Development	USC
Tom O'Brien	CITT	CSULB
Fernando Ordonez	Industrial and Systems Engineering	USC
Kurt Palmer	Industrial and Systems Engineering	USC
Emily Parentela	Civil Engineering	CSULB
Hamid Rahai	Mechanical Engineering	CSULB
Mansour Rahimi	Industrial and Systems Engineering	USC
Christian Redfearn	Policy, Planning, and Development	USC
Harry Richardson	Policy, Planning, and Development	USC
Paul Ronney	Mechanical Engineering	USC
Antonella Sciortino	Civil Engineering	CSULB
Jeffrey Sellers	Political Science	USC
Tariq Shehab	Civil Engineering	CSULB
Seiji Steimetz	Economics	CSULB
Maria Todorovska	Civil Engineering	USC
Reza Toossi	Mechanical Engineering	CSULB
Jalal Torabzadeh	Mechanical and Aerospace Engineering	CSULB
Mihailo Trifunac	Civil & Environmental Engineering	USC
Niraj Verma	Policy, Planning, and Development	USC
Suzanne Wechsler	Geography	CSULB
Chris Williamson	Geography	USC
Hung Leung Wong	Civil Engineering	USC
Maria Yang	Industrial and Systems Engineering	USC

Henry Yeh	Electrical Engineering	CSULB
Hsien-Yang Yeh	Mechanical and Aerospace Engineering	CSULB

C. DESCRIPTION OF RESEARCH PROGRAMS

The funding delays of past years shifted the METRANS RFP and project award schedule. In addition, the continuing uncertainties regarding federal reauthorization made it necessary to retain some funds from prior years to cover possible future interruptions in funding. The consequence has been a one year delay in funding projects. For example, our 2004-05 RFP issued in August 2004 was for the 2004-05 year. This year we issued two RFPs in an effort to realign research projects and funding cycles.

.

Table 4 gives the chronology of all completed research rounds. The bottom row gives the chronology for the first 2005-06 round. The RFP was issued in August. Proposals were due October 17, 2005, and selections were made by the Executive Committee in early January. Selections were sent to Caltrans, and all were endorsed. Because selections were made early in the Spring semester, many PIs were unable to start their projects mid-semester. Projects were therefore started on a rolling schedule, depending on availability of students and faculty.

.

Table 4: Timing of METRANS Requests for Proposals and Project Selection

Fiscal Year	RFP Issued	Due Date	Selections	Start Date
98/99	3/19/1999	4/28/1999	6/1/1999	7/1999 to 9/1999
99/00	7/7/1999	8/11/1999	9/27/1999	1/1/2000
00/01	2/11/2000	3/17/2000	5/8/2000	8/2000
01/02	12/12/2000	2/23/2001	4/24/2001	8/15/2001
02/03	8/16/2002	10/15/2002	1/12/2002	07/01/2003
03/04	9/5/2003	10/15/2003	12/27/2003	01/05/2004
04/05	8/24/2004	10/15/2004	12/17/2004	2/1/2005 to 6/1/2005
05/06	8/25/2005	10/17/2005	1/10/2006	2/1/2006 to 7/1/2006

METRANS' goal has been to make selections within three months after the RFP is issued. This allows about 5 weeks for proposal preparation, 4 weeks for peer review, and 3 weeks for compilation of results and communication with the METRANS Executive Committee. METRANS conducts a rigorous and comprehensive review process. In order to assure that proposal evaluation is as neutral as possible, academic peer reviewers are drawn from outside USC and CSULB. In addition we solicit reviews from USDOT, Caltrans, and practitioners.

The first two METRANS RFPs restricted proposals to the two focus areas of goods movement and public transit. For the third and fourth RFP, infrastructure renewal was added as a third focus area. For the fifth RFP, four focus areas were identified: 1) commercial goods movement and international trade, 2) mobility of urban populations, 3) highway infrastructure and infrastructure renewal, 4) safety, security and vulnerability. These focus areas remain unchanged. A total of 18 proposals were submitted. A summary of the submitted proposals by focus area is provided in Table 5. As in previous years the largest number of proposals falls into the goods movement category. The second largest number of proposals was received in the Safety focus area. Growth in

proposal activity by CSULB faculty continues; of the 18 proposals, 8 were from USC and 10 from CSULB.

Table 5: Summary of Proposals Submitted to METRANS

			Number of Proposals by Focus Area				
FY	Proposals	Requested	Goods	Mobility	Infra-structure	Safety	Multiple
98/99	15	$808,497	6	8	0	0	1
99/00	12	451,335	6	5	0	0	1
00/01	17	906,370	10	6	1	0	0
01/02	16	882,261	7	2	5	0	2
02/03	29	2,696,136	10	8	6	5	0
03/04	18	1,440,565	7	4	1	6	0
04/05	20	1,579,336	7	5	5	3	0
05/06	18	1,530,368	7	3	2	5	1
Total	145	10,294,868	60	41	20	19	5

The selection process was competitive. The Executive Committee selected 8 projects for funding in the 2005-6 fiscal year, a selection rate of 44%. A total of $570,174 was awarded.

Funded projects for the past eight years are summarized in Table 6. We have now funded a total of 69 projects totaling about $4.7 million. As of June 30, 2006, we had 19 projects in progress, representing about $1.4 million

The awards retain the center's strength in goods movement and freight (5 awards), and the second primary focus area remains urban mobility, receiving two awards. One infrastructure project was awarded; none was awarded in safety. Our priority is to fund the best projects, rather than to achieve balance across our thematic areas. Selections are made based on the outside peer reviews. Again reflecting increased activity and interest at CSULB, 5 projects were awarded to CSULB, and the remainder was awarded to USC.

Table 6: Summary of Proposals Awarded by METRANS

			Number of Awards by Area				
FY	Awards	Amount	Goods	Mobility	Infra-structure	Safety	Multiple
98/99	6	$294,299	3	2	0	0	1
99/00	7	324,898	4	3	0	0	0
00/01	11	580,882	5	6	0	0	0
01/02	7	446,602	3	1	1	0	2
02/03	12	1,079,721	5	4	3	0	0
03/04	9	667,271	4	3	0	2	0
04/05	9	798,077	6	1	0	2	
05/06	8	540,174	5	2	1	0	0
Total	69	$4,731,924	35	22	5	4	3

In reference to DOT subject areas (Table 4b), 7 of the new projects are in the Transportation System Performance area: two in Transportation and Logistics System Operation ($166,673); one in Behavioral Sciences and Human Performance ($81,673); and four in Transportation Planning, Economics and Institutional Issues ($219,525). The remaining project is in Vehicles: Technologies involved in inspection, maintenance and repair ($72,303).

With respect to goals, our greatest emphasis this year is on Mobility (4 projects and $266,198), followed by Economic Growth (2 projects and $120,000) and Human and Natural Environment (2 projects and $153,976). In terms of enabling research, three projects fall under Human Performance and Behavior ($231, 803); two under Energy and Environment ($153,976) and three under Tools for Modeling and Design ($154,395). For modal emphasis, highways are the most prominent in six of the new projects ($386,198), reflecting our research on highway infrastructure and trucking. The remaining two projects have a transit orientation. However three of these projects are multi-modal also having either a maritime or rail orientation as well.

As intended, all projects selected by METRANS are directed toward DOT's strategic initiatives. The following list is cumulative, covering all funding rounds to date:

Enhanced Goods and Freight Movement at Domestic and International Gateways

- Monaco: Incentivizing Truck Retrofitting in Port Drayage (05/06)
- Shehab: An Adaptive System for the Transportation of Commercial Goods (05/06)
- Steimetz: Evaluation the Efficiency of Traffic Mitigation Fee at the San Pedro Bay Ports in a Congestion-Pricing Framework (05/06)
- Ordonez and Dessouky: Better Delivery/Pick Up Routes in the Presence of Uncertainty (05/06)
- Monaco: Ports and Highway Infrastructure Investment and Inter-state Spatial Spillovers (04/05)

- Hall: Improving Trucking Safety: Effects of Driver Hours of Service Regulations (04/05)
- Ioannou and Chassiakos: Simulation Test Bed and Evaluation of Truck Movement Concepts on Terminal Efficiency and Traffic Flow (04/05)
- Giuliano and Magaddino: Evaluation of Extended Gate Operations at the Ports of Los Angeles and Long Beach (04/05)
- Verma: Institutional Considerations in Freight Movement in port of Los Angeles/Long Beach (04/05)
- Hanh and Moore: Landside Surface Transportation Impact of Short Sea Shipping in Southern California (03/04)
- Ioannou and Chassiakos: Development of Methods for Handling Empty Containers with Applications in the Los Angeles/Long Beach Port Areas (03/04)
- Giuliano and Magaddino: Evaluation of the Terminal Gate Appointment System at the Los Angeles/Long Beach Ports (03/04)
- Dessouky and Ioannou: A Novel Approach to Routing and Dispatching Trucks based on Partial Information in a Dynamic Environment (02/03)
- Hall: Freight Routing and Containerization (02/03)
- Ioannou and Chassiakos: Cooperative Optimum Time Window Generation for Cargo Delivery/Pick-up with Application to Container Terminals (02/03)
- Richardson, Gordon and Moore: Measuring California's Role in Supporting Interstate Goods Movement: Comprehensive Assessment of Interstate Freight Flows (02/03)
- Hanh: Re-engineering the Logistics of Empty Cargo Containers in the SCAG Region (01/02)
- Gordon and Williamson: Development and Test Methodology for the Evaluation of Highway Widening Plans to Facilitate Freight Flows Throughout a Major Metropolitan Area (01/02)
- Ioannou and Chassiakos: Dynamic Optimization of Cargo Movement by Trucks in Metropolitan Areas (01/02)
- Grobar and Barber: An Integrated Approach to Managing Local Container Traffic Growth in the Long Beach/Los Angeles Port Complex Phase II (00/01)
- Hall: Alternative Access and Locations for Air Cargo (00/01)
- Ioannou and Chassiakos: Dynamic Optimization of Cargo Movements by Trucks in Metropolitan Areas with Adjacent Ports (00/01)
- Kosmatopoulos: Design and Optimization of a Conceptual Automated Yard Using Overhead Rail Systems (00/01)
- Parentela: Developing Risk Model for Commercial Goods Transport (00/01)
- Bukkapatnam: Dynamic Coordination Framework for Resource Allocation in Trucking Operations (99/00)
- Gordon: Assembling and Processing Freight Shipment Data: Developing a GIS-Based Origin-Destination Matrix for Southern California Freight Flows (99/00)
- James: Non-Invasive Means of Investigating Container Contents for Customs Agents at Ports (99/00)
- Jordanides: Use of Robotics and Expert Systems in Improving the Handling of Containers at the Port Terminals (99/00)

- Grobar and Barber: Implementing a Statewide Goods Movement Strategy and Performance Measurement of Goods Movement in California (98/99)
- Ioannou and Chassiakos: Modeling and Route Guidance of Trucks in Metropolitan Areas (98/99)
- Khoshnevis: 3D Virtual and Physical Simulation of Automated Container Terminal Facilities and Analysis of Impact on In-land Transportation (98/99)

Accessibility for Aging and Transportation-Disadvantaged Populations

- Sellers: Sources of Electoral Support for Transportation Funding (05/06)
- Jacoy: The Mobility of Homeless People and their Use of Public Transit in Long Beach (05/06
- Friis and Forouzesh: Cambodian Access to Transportation: Impact on Senior Nutrition and Congregate Meal Service Program (04/05)
- Meshkati, Rahimi and Torabzadeh: Study of the Exposition Light-Rail's Safety for Pedestrians and Drivers (04/05)
- Giuliano: Travel Patterns of the Elderly (00/01)
- Dessouky and Rahimi: A Task Decomposition Model for Dispatchers in Dynamic Scheduling of Demand Responsive Transit Systems (98/99)
- Giuliano: The Role of Public Transit in Mobility of Low Income Households (98/99)

Environmental Sustainability of Transportation Systems

- Rahai and Lu: Reducing Diesel Nox and PM Emissions of Diesel Buses and Trucks (05/06)
- Kuprenas: Reduction of Construction Project Risk to Pedestrians, Drivers and Transit Passengers through Analysis of Historical Accident Records (03/04)
- Richardson and Gordon: What Can We Learn from CTPP 2000? (03/04)
- Ordonez and Palmer: Confidence Intervals for Estimated Traffic Demand (03/04)
- Redfearn: Transit Investment and the Capitalization of Access into Land Values (03/04)
- Moore: Improved Modeling of Transportation Network Flows Including Land Use Transportation Interactions: A Research Collaboration between METRANS and Caltrans District 7 (02/03)
- Toossi: Hydrogen Storage System for Transportation Applications (02/03)
- Gordon: Neighborhood Attributes and Commuting Behavior: A Comparative Study of California's Major Metropolitan Areas (02/03)
- Banerjee, Myers, and Irazabal: Increasing Bus Transit Ridershop: Dynamics of Density, Land Use, and Population Growth (02/03)
- Rahai: Reducing Pollutants from Mobile Sources (01/02)
- Rahimi and Dessouky: A Methodology for Joint Optimization of Service and Life Cycle Environmental Assessment of Transportation Systems (01/02)
- Toossi: Assessment of Hybrid Vehicle Control Strategies in Planning Future Metropolitan/Urban Transit Systems (00/01)

- Williams: Solid State Sorption Air Conditioner System for Containerships and Vehicles (99/00) (Phase 2, 00/01)
- Ronney: Improving Fuel Economy and Emissions Performance of Commercial Goods Transportation and Mass Transit Vehicles Using Throttleless Engines (98/99)

Physical Infrastructure

- Redfearn and Giuliano: Network Accessibility and the Evolution of Urban Employment (05/06)
- Todorovska and Trifunac: Methodology for Probabilistic Assessment of Permanent Ground Displacement Across Earthquake Faults for the Transportation System (02/03)
- Johnson: Innovative Bridge Structural Health Monitoring Using Variable Stiffness and Damping Devices (02/03)
- Ordonez: Robust Investment Decisions for Highway Capacity Expansion
- Wong: Analysis of Vibrations as Infrastructure Caused by High-speed Rail Transit (01/02)
- Johnson: Smart Damping Devices for Monitoring the Health of Bridge Structures (01/02)
- Banerjee: Freeway Bus Station Area Development: Critical Evaluation and Design Guidelines (00/01)
- Banerjee: Highway Oriented Transit System (HOTS): A Comprehensive Land Use-Transportation Strategy to Improve Transit Service Delivery (99/00)
- Kuprenas: Identification and Analysis of Local Agency Transit Project Performance Criteria (99/00)

Smart Vehicles and Operators

- Grote and Yang: Validation of Sensory Systems for Intelligent Vehicles (04/05)
- Heidemann and Giuliano: SURE-FT: Sensor for Unexpected Roadway Events: Field Trials (04/05)
- Grote: Evolution of Collective Sensory Systems for Intelligent Vehicles (03/04)
- Giuliano and Heidemann: SURE-SE: Sensors for Unexpected Roadway Events: Simulation and Evaluation (03/04)
- Parentela: Development of an Artificial Intelligence Based Traffic Simulation Model Using the Discrete Element Method (02/03)
- Ioannou and Chassiakos: Dynamic Optimization of Cargo Movement by Trucks in Metropolitan Areas (01/02)
- Bukkapatnam and Dessouky: Distributed Architecture for Real-time Coordination in Transit Networks (00/01)
- Meshkati, Rahimi and Driver: Investigating the Role of Driver Decision Styles in Highway-Rail Crossing Accidents (00/01)

METRANS has the goal of supporting cooperative research that involves transportation agencies and meets the transportation needs of metropolitan agencies. Nearly all projects

have received financial support from Caltrans, and many others have cooperated with local and regional agencies. Cooperating agencies are shown below for the 04-05 and 05-06 projects:

Friis and Forouzesh
Cambodian Access to Transportation: Impact on Senior Nutrition and Congregate Meal Service Program
Cambodian Association of America

Giuliano and Magaddino
Evaluation of Extended Gate Operations at the Ports of Los Angeles and Long Beach
Port of Long Beach, Port of Los Angeles, Pacific Merchant Shipping Association

Heidemann and Giuliano
SURE-FT: Sensor for Unexpected Roadway Events: Field Trials
Los Angeles Department of Transportation

Ioannou and Chassiakos
Simulation Test Bed and Evaluation of Truck Movement Concepts on Terminal Efficiency and Traffic Flow
Port of Long Beach

Jocoy
The Mobility of Homeless People and their Use of Public Transit in Long Beach CA
City of Long Beach Bureau of Human and Social Services

Meshkati, Rahimi and Torabzadeh
Study of the Exposition Light-Rail's Safety for Pedestrians and Drivers
Los Angeles County Metropolitan Transportation Authority

Ordonez
Better Delivery/Pick Up Routes in the Presence of Uncertainty
UPS

Rahai and Lu
Reducing Diesel NOx and PM Emissions of Diesel Buses and Trucks
Long Beach Transit

Sellers
Sources of Electoral Support for Transportation Funding
French Ministry of Research

Verma
Institutional Considerations in Freight Movement in port of Los Angeles/Long Beach
Port of Long Beach, Port of Los Angeles

Selection Process

METRANS follows a peer-reviewed proposal selection process in which each proposal is submitted to a minimum of five people for review, drawn from the following groups:

- University expert (usually two people in category)
- Local transportation agency expert or private practitioner expert
- Caltrans expert
- US DOT expert

In the most recent RFP (05/06), the following DOT employees (or their designated representatives) reviewed proposals:

- Dennis Judycki, FHWA
- Anthony Furst, FHWA
- Cynthia Burbank, FHWA
- Mike Savonis, FHWA
- Gary Henderson, FHWA
- Justin Oberman, TSA
- Barbara Sisson, FTA

These DOT representatives were selected because of their expertise and leadership in goods movement, transit, policy, advanced technology, safety or infrastructure.

We use an outside review process in order to assure neutral evaluation of all proposals; with few exceptions, academic reviewers were from outside USC or CSULB. We also used a mix of public and private sector local experts. The outside review process is more time consuming, but we feel it is worth the effort. This year a USC graduate research assistant helped to manage the proposal review process. A total of 55 reviewers participated in the process (not counting reviewers within Caltrans or USDOT). Summarized results of the evaluations are presented to the METRANS Executive Committee, which makes final selections.

As noted earlier, the schedule for METRANS research activities has shifted as a result of funding delays in prior years. The 05-06 round of projects was awarded on a rolling schedule, from February to June 2006. These will be completed sometime between February and June 2007.

Research Results

As of this writing, 39 research projects have been completed (6 this year), and 11 more are in the peer review/revision process.[1] Nineteen projects are in progress, including the new 2005-06 projects.

The Director reviews all final reports and manages the revision process. In cases of research outside the Director's area of expertise, another member of the USC or CSULB faculty is asked to review the report. Per Caltrans request, we continue to send final reports to Caltrans for review, but we limit the time allowed for comments to two months. Final report abstracts are provided below for all projects completed this year.

03-13 Hydrogen Storage Systems for Transportation Applications, *Reza Toosi Ted Yu, David Chang*

Hydrogen can be stored as compressed gas, liquid, and reversible chemical and metal hydrides. Liquid hydrogen is usable but not practical for commercial applications; compressed hydrogen does not have sufficient volume density; and metal and chemical hydrides have potential but are bulky and heavy at this time. There has been much discussion recently about the use of carbon nanostructures as an efficient hydrogen storage mechanism. The nanostructures take various forms, but have the feature that the stronger binding of hydrogen occurs in nanostructures that contain stacks of graphite. Depending on how the samples were prepared and experimental procedure use, hydrogen uptake as much as 60% by weight were reported. The data are, however, very different from one investigator to another, and many cases are nonreproducible.

The purpose of the proposed research is to attempt to improve the state of understanding of the adsorption/desorption mechanism for hydrogen in carbon nanostructures, and thereby to improve the estimate of the hydrogen storage capacity of carbon nanostructures. The proposed program can be divided into three sections: the first addressing the hydrogen binding energies, the second applying the hydrogen binding energies to adsorption/desorption dynamics, and the third using the results to begin an engineering design of a practical storage device.

03-24 Increasing Bus Transit Ridership: Dynamics of Density, *Tridib Banerjee, Clara Irazabal, Dowell Myers*

Los Angeles region has a large network of bus transit system covering an area of 1,400 sq. miles with 1,433 of road miles of local transit and commuter lines, and 96 miles of Rapid Transit lines. The integrated network currently serves a transit dependent population of 1.4 million daily. The Southern California Association of Governments (SCAG) estimates a continued growth in population, housing, and employment density in the region. Rapid immigration, increase in youth and senior population, and the addition of lower income workers are contributing to an increase in the transit dependent population. This trend is expected to continue as congestion costs and the cost of auto

[1] One project (99-20) was cancelled last year for lack of completion.

ownership continue to escalate, driven largely by Southern California's sprawling development patterns. With current levels of utilization of bus transit (seat miles) at 34% in Los Angeles there is room for increasing ridership with the promotion of more compact developments. We introduce the concept of Transit Corridor Development (TCD) to channel population growth and density along the existing transit network. We find that most transit corridors have underutilized commercial land use, vacant lots, or low density residential developments that present a viable alternative to accommodate new growth. TCD focuses on developing the underutilized properties and grey fields to their full potential. The introduction of several ordinances such as Residential Accessories Services (RAS), Location Efficient Mortgages (LEMs) and density bonuses in Los Angeles provides scope for increasing density. Further the introduction of mixed use, infill development, adaptive reuse, grey field development along the corridor present positive opportunity to enhance the physical environment without affecting the surrounding residential areas or existing community character. Our analysis shows that there is an increase in transit ridership with increase in density and land use mix, thereby increasing the likelihood of TCDs becoming locations for new housing thus increasing transit ridership.

03-27 Methodology for Probalistic Assessment of Permanent Ground Displacement Across Earthquake Faults for the Transportation System, *Maria Todorovska, Mihailo Trifunac*

A methodology for probabilistic hazard assessment of permanent displacement across faults caused by earthquake rupture is presented, with region specific models for ground shaking hazard in California, developed earlier by the authors and coworkers. Assessment of permanent dislocations across faults is important for the design and retrofit of highway bridges and tunnels crossing faults, as well as for other lifelines crossing faults, such as aqueducts, water and gas lines, etc. The methodology is illustrated for two strike-slip faults (prototypes of Class A and Class B faults in California), for 50 years exposure. The illustrations show that, for given seismic moment rate, the hazard estimates are quite sensitive to how the seismic moment is distributed over earthquake magnitudes. They also show that the hazard is small even for very small levels of displacement, in contrast to ground shaking hazard, which is due to the fact that only one fault contributes to the hazard and not every event on that fault necessarily affects the site.

04-05 Development of Methods for Handling Empty Containers with Applications in the Los Angeles/Long Beach Port Area, *Anastasios Chassiakos, Petros Ioannou*

The Los Angeles/Long Beach (LA/LB) port complex is the intermodal gateway to Pacific Rim trade and the busiest container port complex in the United States. Comprised of fourteen individually gated terminals, during 1999 alone, the combined ports handled 8.2 million 20-foot equivalent units (TEUs) containers. This figure implies that almost 4.43 million full containers were handled during 1999 in the LA/LB port complex (at the rate of 1.85 TEU/container).

Usually the arriving loaded containers at ports are picked up and transported by trucks to their destinations. Having been unloaded at the importers, the emptied containers are returned to the port. At the same time, empties are picked up by trucks from the ports and brought to the export firms, where they are loaded with export goods. The loaded containers are then transported to the port to be loaded on the ship for export. In this procedure the empty containers are handled twice at marine terminals i.e. the first time when they are recycled from importers, and the second time when they are trucked to exporters. It is clear that a system which facilitates the interchange of empties outside the ports is not only desirable but also necessary. This system will reduce the truck trips to and from container terminals, and as a consequence, will reduce the traffic congestion around the ports. In addition to saving time for both truckers and port operators, the system will significantly reduce noise and emissions around container terminals.

In this report, the empty container interchange problem is investigated in both deterministic and stochastic transportation environments. In stochastic networks the problem is modeled analytically and optimization techniques are developed. In deterministic environments, the empty container substitution problem, in which the request of one type of containers could be fulfilled with another type, is investigated. The simulation experiments are used to demonstrate the efficiency of the developed optimization techniques and approach.

04-13 What Can We Learn from CTPP 2000? Neighborhood Attributes, *Harry Richardson*

Can generic neighborhood types for California's major metropolitan areas be defined? To what extent do neighborhood differences affect commuting times? Using census data, including TIGER file variables that describe street patterns and transit and highway accessibility, we found that there are identifiable residential as well as workplace neighborhood types observable throughout the four major California metropolitan areas. We also found that many of these had consistent effects on commuting durations across the four areas. In most cases, neighborhood effects helped to explain a longer commute than could be explained by a generalized accessibility index. Many households trade off desirable neighborhood characteristics (at work and/or at home) for a longer commute. All things considered, jobs-housing "balance" is, apparently, not high on most people's agenda.

05-10 Bounds on Effectiveness, Costs and Benefits of Driver Hours of Service Regulations for Freight Carriers, *Randolph W. Hall*

Crash rates for trucks depend in part on the length of time drivers have been operating their vehicles. This paper investigates bounds on the reduction in crash rates due to the imposition of hours-of-service regulations, which limit the number of hours drivers operate their vehicles. Methods for analyzing probability distributions for trip lengths, and odds ratios for crashes (as a function of hours driven) are developed. These then are applied to economic statistics for truck crashes to compute bounds on the benefits of hours-of-service restrictions. We also analyze costs of restrictions through use of a linear

programming model that optimizes trucking operations in the presence of constraints on driver tour lengths.

Applied Research Program

In 2003, we launched an applied research program under a new initiative, *Monitoring the Ports.* Its main purpose is to increase the participation of CSULB faculty and students in METRANS research. It also seeks to fund research in support of METRANS technology transfer activities, and develop an information base of seaport operations and goods movement that will contribute to our research program.

Applied research projects are relatively small scale (up to $40,000), must be completed within one year, and are oriented to data gathering, description, and documentation. The proposal submission requires a short preliminary proposal. The most promising and relevant pre-proposals are selected; Principal Investigators are then asked to submit a full proposal. Proposals are reviewed and approved by the METRANS Executive Committee. The day-to-day operation of the Monitoring the Ports program is the responsibility of the METRANS Applied Research Program Coordinator.

The applied research program is intended to generate more CSULB faculty participation in the regular METRANS research program; and we have met that goal. Five of the eight projects funded as part of the 2005-06 METRANS RFP were submitted by CSULB faculty, two of whom had previously received Applied Research grants. The involvement of more CSULB faculty in the regular research program has resulted in a shift in the start date for the Applied Research proposal process. The due date for pre-proposals was timed so that it came after the announcement of awards for the regular 05-06 METRANS RFP. This allowed CSULB faculty to attempt to secure regular grant funding first; it also allowed the METRANS Executive Committee to recommend the Monitoring the Ports program for certain projects where an applied research grant was more appropriate.

Applied Research Selection Process

Table 7 shows the schedule for the applied research RFP process. The RFP was issued by inviting faculty to a lunch meeting to introduce faculty to the Applied Research program. Invitations were sent through the CSULB Office of University Research (OUR), the various Deans, and key faculty members who either previously submitted proposals to METRANS or expressed an interest in doing so.

Table 7: Timing of METRANS Requests for Proposals and Project Selection, Applied Research Program

Fiscal Year	Issue RFP	Pre-proposal Due	Selection	Full Proposal Due	Start Date
2003-04	5/15/03	7/1/03	7/30/03	9/19/03	10/15/03
2004-05	12/2/04	1/28/05	2/14/05	3/18/05	6/1/05-7/1/05
2005-06	1/13/06	2/10/06	3/15/06	4/14/06	7/1/06

Table 8 shows proposals submitted and awarded for the applied research program. Fifteen pre-proposals were received on February 10; six were selected by the METRANS Executive Committee to submit complete proposals. All six were ultimately deemed acceptable by the METRANS Executive Committee for funding. Total funding this year is $239,995. The applied research projects are included in the list of projects in Section F as a separate section; they are not included in the performance indicators of this annual report, as they are not fully peer-reviewed.

Table 8: Applied Research Proposals and Awards

Fiscal Year	Pre-proposals Submitted	Number of Awards	Amount
2003-04	7	2	$ 69,338
2004-05	9	6*	$ 239,836
2005-06	15	6	$ 239,995

* Includes one project solicited outside of the RFP

Applied Research Results

Both of the applied research projects approved in 2003-04 were completed. A draft report for one of the projects approved last year has been submitted. The title and abstract is given below.

AR 05-05 Survey and Identify the Needs of Port Communication Equipment for Safety, Security, and Interoperability
Principal Investigator: Hen-Geul (Henry) Yeh, Department of Electrical Engineering, California State University Long Beach

This report identifies the communication system needs of the Los Angeles and Long Beach port public safety agencies with regard to safety, security, and interoperability. It also serves as a useful baseline for future needs.

The technical data include information on the radio networks used by local public safety agencies. Specific equipment used by these agencies exhibit limited compatibility, primarily since all agencies have repeaters and radios operating on the UHF band. Findings suggest that interoperability issues are present, not only between agencies but within agencies. For example, on scene radio communication using portable simplex communication would not be possible between users with radios on the UHF and VHF bands. The repeater network used by the LA Fire Department and LA Port Police operate on the UHF and 800 MHz bands, which do not support the VHF radios used by the City of Long Beach.

Another incompatibility issue involves the channels used within the radio frequency bands. For interoperability within an agency, the system of repeaters must receive any and all channel frequencies used by radios within the system. Additionally, this requirement holds for any other agency that may need to operate on the system.

Vendor incompatibility occurs because of fundamental design differences in communication systems as well as proprietary technology. The introduction of digital communication systems increases the possibility of incompatibilities in features such as encryption and vocoder algorithms. These are overcome by defining standards for the blocks of the communication system covered by common air interface.

Many agencies are migrating to equipment using new standards for interoperable two-way digital wireless communication systems. This should ensure compatibility between future and legacy systems, compatibility between different vendors, and a course for future changes.

Other Research Activities

- **National Urban Freight Conference**: In response to the need to better understand the impacts of goods movement on metropolitan areas, METRANS organized the National Urban Freight Conference. The Conference was held in Long Beach from February 1-3, 2006. Both the Conference and a summit on goods movement and air quality called “Faster Freight - Cleaner Air,” were part of “Freight Week” in Long Beach.

The Conference attracted researchers from throughout the US and other parts of the world where maritime ports, airports, and rail hubs are located. These facilities all contribute to the economic vitality of larger metropolitan regions but also add to the congestion on an already stressed network of roads and railroads.

The National Urban Freight Conference organized presentations into one of seven different tracks: (1) Models for transportation, port, air, intermodal operations, impact analysis; (2) Port operations, productivity; (3) Trucking, air, rail economics, productivity, labor issues; (4) Local and regional environmental externalities: congestion, air quality, etc.; (5) Policy and institutional issues in urban goods movement; (6) Security/vulnerability of goods movement infrastructure; (7) Best Practices and lessons learned.

These tracks reflect the wide range of issues confronting metropolitan areas as they address the increase in freight flows. They also reflect the multi-disciplinary nature of goods movement research which draws upon engineering, economics, systems analysis, health, planning, and public policy among others. The Conference offered a unique opportunity to bridge the gap between these often disparate research areas.

In addition to the 65 papers presented in the various track sessions, the Conference featured a keynote address given by Lillian C. Borrone, the Chair of the Board of Directors of the Eno Transportation Foundation. Plenary sessions addressed overarching themes tied to the movement of goods in urban areas. These include future freight transportation demand and the ways in which we identify possible solutions to metropolitan-wide problems. They also include the development of a national freight policy framework.

The Conference received sponsorships and contributions from AASHTO, FHWA, FRA, HDR One Company, the Ports of Long Beach, the Port of Los Angeles, the Journal of Commerce, CH2MHill, AAA of Southern California, Union Pacific Railroad, Majestic Reality, Parsons Brinckerhoff, and the Southern California Association of Governments (SCAG).

Conference papers are available on the METRANS website. A small number of papers was selected for consideration of publication in a special issue of *Transportation Research E: Logistics and Transportation*. Genevieve Giuliano, Maged Dessouky and James Moore are guest editors of the special issue.

In response to the overwhelmingly positive response to this conference, we will hold this event each year as our signature conference. The Second National Urban Freight Conference will take place in December 2007.

- **Publications and Presentations:** An important measure of the quality of the METRANS research program is the number of peer-reviewed publications generated. As more research projects are completed, academic publications follow. This year 11 of our METRANS faculty have 41 peer reviewed articles, books or chapters published or forthcoming.

- **Leveraging METRANS Funds**: Additional transportation funding generated by METRANS research is another important measure of quality. This year METRANS researchers have received additional Caltrans funding for research on a Virtual Weight and Compliance Station (VWCS). This is a joint project with University of California, Berkeley and the Partners for Advanced Transit and Highways (PATH) research program.

- The METRANS Administrator continues to identify transportation funding sources, and has advertised these to faculty at CSULB and USC. In addition, the METRANS web page has been designed to link to 24 agencies that fund transportation research.

Faculty Awards and Promotions

The quality and reputation of METRANS research faculty continue to be demonstrated by awards and promotions.

Genevieve Giuliano received the W.J. Carey Distinguished Service Award, from the Transportation Research Board. This award recognizes individuals who have given outstanding leadership and service to transportation research and the Transportation Research Board. Giuliano has also been promoted to Senior Associate Dean, Research and Technology for the School of Policy, Planning and Development.

Petros Ioannou, Professor, Electrical Engineering-Systems, USC and member of METRANS Executive Committee, was named a Fellow of the International Federation of Automatic Control(IFAC)

Melody Kiang, Professor, Computer Information Systems, CSULB, won the Distinguished Faculty Scholarly and Achievement Award, California State University, Long Beach, 2006.

Paul Ronney, Professor, Mechanical Engineering, USC, is the first recipient of the Bernard Lewis Lectureship of the Combustion Institute. As recipient of the lectureship, he presented a week long series of lectures to the Taiwan section of the Combustion Institute).

Maria Yang, Assistant Professor, Industrial and Systems Engineering, USC, received the NSF Career Award for junior faculty.

D. DESCRIPTION OF EDUCATION ACCOMPLISHMENTS

The METRANS education program emphasizes student involvement in research projects. METRANS continues to make graduate student involvement an explicit criterion in making research awards in our RFP. Involvement of undergraduate students in METRANS funded research is encouraged. As a result, all projects have had significant student participation (some undergraduate, some graduate, and some both). Investigators are strongly encouraged to budget for student presentations at conferences, such as the Transportation Research Board annual meeting.

National Student Competitions

In 2005, METRANS again participated in the USDOT UTC "Outstanding Student Award" program. The METRANS student of the 2005-06 academic year is **Ms. Alison Linder**, Urban Planning Ph.D. student in the School of Policy, Planning, and Development at USC. Ms. Linder worked on the joint METRANS/Caltrans/MTA study of the 2002 West Coast Port Shutdown. Her research interests focus on relationships between transportation, land use and the environment. She was awarded a USC Urban Initiative Fellowship, and she will be pursuing a minor in urban studies as part of her PhD. Ms. Linder received her award at the Transportation Research Board Annual meeting in Washington, D.C. in January 2006.

Internal and External Awards

The following USC students received awards:

- **Jennifer Cohen** —Master of Public Policy, was awarded the Presidential Management Fellowship. The fellowship was created to employ new graduates in the federal government. She has worked extensively with disaster recovery efforts in Thailand and New Orleans.
- **Elif Karsi** —Ph.D. candidate, received the 2006 Helene Overly Memorial Scholarship from WTS Orange County Chapter.
- **Sing-Yee Lin** — Master of Planning student, also won the WTS Orange County Scholarship
- **G. Pilar Rosario**, Master of Planning student, received the 2006 Helene M. Overly Scholarship from WTS Inland Empire Chapter
- **Josh Rohmer —**Master of Planning student, was awarded the Master of Planning (MPL) Comprehensive Examination Prize for Outstanding Achievement. The award recognizes those who have earned honors on the MPL Comprehensive Examination. Selection is made by the MPL Degree Committee.

In addition, **Annie Chang**, **Elizabeth Cheung**, **Tomokazu Kitamura**, and **Frank Robles** were runners up in the Bob Biller award for excellence in the Master of Public Policy Practicum for their project entitled, "Southern California Goods Movement Air Pollution Mitigation," prepared for the Southern California Association of Governments.

Two USC students received dissertation scholarships. **Ajay Agarwal,** USC Urban Planning PhD Candidate, won three dissertation research awards: Lincoln Institute of Land Policy Dissertation Fellowship, USC Urban Initiative Dissertation Fellowship, and the SPPD Doctoral Student Fellowship. **Jiyoung Park**, Urban Planning PhD Candidate, won the SPPD Doctoral Student Fellowship.

Two MAGL students received scholarships: **Daniel Lee** and **Raymond Corbell**.

The METRANS Administrator compiles opportunities for student competitions and advertises them both by email to identified students and by advertisement on the METRANS web site.

Student Conference Participation

California Transportation Foundation's Transportation Education Symposium

USC civil engineering and urban planning undergraduates consistently participate in the California Transportation Foundation's (CTF) annual Transportation Education Symposium. The symposium gives upper-division undergraduates a unique opportunity to collaborate with senior industry and agency professionals as they prepare competing team responses to a mock request for project proposals. The CFT makes this experience available to outstanding student participants at no cost to these students. Civil Engineering seniors **Carl Miller, Susan Reyes**, and **Kelly Pilarski** attended the November 2005 Symposium at the Asilomar Conference Center in Monterey, California. METRANS provides the travel funding for symposium attendance.

CALSTART 2020 Conference, December , 2005

On Thursday, December 1, 2005, USC graduate students in planning, public policy, and transportation engineering attended *CALSTART 2020: California's Transportation Energy Future Conference* in Downtown Los Angeles. The event served as a forum to discuss California's actions to become the first state to establish a petroleum reduction goal and plan.

To encourage students to register for the conference, METRANS subsidized the student attendance fee in full, enabling students who could not otherwise afford the event to attend. This year METRANS helped 14 students attend the conference. In addition, CALSTART organizers invited students to travel to the conference from the USC campus via a hybrid bus, free of charge. Several students took advantage of this opportunity.

At the one-day conference, students learned about the need, technologies, methods, and modes for reducing California petroleum consumption and increasing the use of non-petroleum fuels by the year 2020. In the context of rising oil prices, increasing global oil demand, geopolitical instability, and global warming concerns, the conference focused on a number of questions: Is California's transportation energy system sustainable? Are the economy and environment at risk? Can conventional, hybrid, and advanced vehicle technologies reduce the state's reliance on oil? How can transit and smart growth contribute to a more sustainable transportation energy future? Beyond petroleum, what other fuels can play a role in California over the next 15-20 years?

Students returning from the conference acknowledged the importance of the issues discussed, expressing that it was a productive learning experience overall.

Other Student Activities

Student Participation in Research

METRANS is committed to student involvement in research. It is the best way for students to acquire research skills, and it is an important source of student support. Students are often attracted to transportation as a result of working on a research project.

Student involvement in transportation research projects is difficult to compare across years. The number of students supported on METRANS research projects reflects year-to-year differences in the number of ongoing projects. METRANS student involvement also includes research projects funded from other sources and reflects the variability of university-wide extramural funding levels. The general trend is toward increased student support, as total research funding in transportation has significantly increased at USC.

The current METRANS projects (all projects in progress at any time during 2005-06) together are supporting 70 graduate students,. METRANS projects account for only part of the funded research support of graduate students. At USC, the School of Policy, Planning and Development and the Viterbi School of Engineering provide match funding for tuition. In addition, funding from the National Science Foundation, federal, state and local government, and foundations and industry support a wide spectrum of transportation research beyond that funded by METRANS.

Internships

Students have many opportunities for paid internships to gain professional experience before graduation. The USC MPL program requires 400 hours of professional experience; the USC MSCE program encourages such experience. USC students have interned at the Los Angeles County Metropolitan Transportation Authority, Southern California Association of Government, cities of Los Angeles, Pasadena, and Long Beach, and several major consulting firms.

Student and Faculty Transportation Field Experience

Field experiences are a routine part of transportation engineering courses offered at USC and CSULB. There are many opportunities for unique site visits in Southern California, including technology facilities such as Caltrans District 7's Transportation Management Center (TMC) and the Caltrans District 12 TMC; the Los Angeles County Department of Transportation (LADoT) Automated Traffic Surveillance and Control (ATSAC) Center; the Orange County Transportation Authority's (OCTA) fully electronic State Route 91 Express lanes and the Transportation Corridor Agencies' (TCA) system of Orange County toll roads; and the Partnership for Advanced Transit and Highways' (PATH) technology test bed facilities at UC Irvine, the City of Irvine, the City of Anaheim, and Santa Ana. Southern California also includes specialized transportation facilities such as commuter, heavy, and light rail systems; the El Monte bus way and the Harbor transit way; the Ports of Los Angeles and Long Beach; and the Alameda corridor.

Opportunities to visit these facilities and to discuss problems and objectives with associated professionals and officials contribute considerable depth to transportation education and research. METRANS serves as clearinghouse for field experiences associated with USC and CSULB classes and research and local transportation organizations such as WTS, providing van transportation when demand justifies it. This past year, student-centered field trips were organized to Caltrans District 7's Transportation Management Center (TMC) and the Los Angeles County Department of Transportation's (LADoT) Automated Traffic Surveillance and Control (ATSAC) Center, the Ports of Long Beach and Los Angeles, and the Alameda Corridor.

Institute for Transportation Engineers Student

Professor Emelinda Parentela continues to serve as the advisor to the Southern California Chapter (District 6) of ITE (Institute of Transportation Engineers). Three students attended the CTF symposium held in November 2005.

MERIT Research Program/McNair Scholars Program

Every year, a select group of promising incoming freshmen are invited by the USC School of Engineering faculty to work on projects in their research laboratories or in the field. These student researchers actively participate in the development of new technology throughout their undergraduate years. In addition to giving students excellent first-hand research experience, this program can help offset the cost of education. Each participant earns an annual stipend for their work. The School of Engineering currently provides a stipend of $2000; $1500 as wages and $500 for research expenditures. This renewable award is separate from other financial assistance offered by the University.

These undergraduate Merit Research Scholars are brought to the attention of USC faculty based on the student's interests and the faculty member's willingness to participate in the Merit research program. USC engineering faculty funded by METRANS are encouraged to participate in the Merit Research Program. Funded METRANS projects and lists of investigators are forwarded to the Office of Student Affairs in the School of Engineering to ensure that prospective students know these research projects are available to them. Prof. James Moore acts as a liaison to encourage placement of MERIT Scholars in transportation projects, and for students participating in the McNair Scholars program.

Mesa Program

METRANS has partnered with the Gateway Cities Partnership, Inc. (GCPI), Paramount Unified School District, and CSULB's College of Engineering Math, Engineering and Science Achievement (MESA) program in an effort to attract more young disadvantaged students into engineering professions, with a particular emphasis on infrastructure-related engineering. MESA's programs include five Saturday mornings at CSULB College of Engineering, three site visits to organizations with a large engineering staff, and weekly meetings with an advisor/instructor at the school site. Students are eligible to take part in the program over a three-year period.

In October 2005, 222 underprivleged Latino students, grades 6–12, enrolled in MESA's supplementary educational programs. The program concluded in May 2006 with a competition among MESA participants from different school districts. Among the winners, eleven students from the Gateway Cities MESA project won third place, three received second place; one student secured first place recognition. Student retention within the Paramount School district was 41%, significantly higher than MESA participants from other school districts partnering with CSULB. This success is the result of the outreach efforts GCPI provided which included three information meetings for parents.

For best results from the MESA program, students must remain involved over the three-year period. However, MESA tends to lose students at the high school level. METRANS is exploring programs with established community learning centers in order to sustain the students' interest. One option is to establish an Engineering Club with the purpose of providing selected high school students an opportunity to interact with engineering professionals and to explore career opportunities in construction engineering. Weekly meeting with students will engage them in projects; competition winners will be rewarded with scholarships.

In addition, the Paramount City Council formally recognized METRANS for its contribution to the community through the MESA Program.

DARPA Competition

METRANS faculty has been assisting Palos Verdes High School with their participation in the DARPA Challenge I and II competition. This year their involvement is expected to

involve graduate and undergraduate students from USC working closely with high school students for the Urban DARPA Challenge III competition.

Degree Programs, Courses, and Seminars

Student involvement in transportation education and research continues to be strong at both USC and CSULB. Ongoing changes in transportation-related course offerings make year-to-year comparisons difficult. Civil engineering enrollments (a large source of transportation-related course enrollments) at USC have remained steady over the past year, but transportation engineering enrollments have increased substantially, approximately doubling. Enrollment in the MPL continues to increase, as does the number of MPL students concentrating in transportation. With the transportation field concentration now available in public policy and public administration, additional students are concentrating in transportation. Graduate student numbers are growing at CSULB as a result of the MAGL degree program. There were no changes in degree programs or courses this year.

Transportation Programs at USC

METRANS funded the design and publication of a new brochure that provides information to prospective students on all of the graduate degree programs at USC that include a transportation field specialization. Students interested in transportation sometimes do not know what degree program has the type of program they are seeking. Given the interdisciplinary nature of transportation, students frequently move between engineering and planning or public administration. At USC we have pooled our efforts, offering a series of elective transportation courses that are available in both engineering and policy, planning and development. The brochure is another step in integrating transportation education across the entire campus.

USC Transportation Students

In the USC School of Policy, Planning, and Development (SPPD), four students completed the comprehensive examination in the Master of Planning "Transportation and Land Use" field specialization in 2005-06 This is no longer a good measure of students seeking careers in transportation; some take the "Land use and sustainable regional growth" comprehensive exam. There are currently about 10 Master of Planning, 2 Master of Public Administration, and 3 Master of Public Policy students in the transportation field concentration in SPPD. Approximately 8 urban planning students and 1 public administration student are pursuing transportation-related PhD degrees.

In the USC School of Engineering, 13 students were enrolled in the MSCE-Transportation Engineering program in the fall of 2005. Two students completed the PhD in Industrial and Systems Engineering.

Thirteen new USC doctoral dissertations in transportation were either defended or filed by the Spring of 2006. PhDs were granted in Urban Planning, Industrial and Systems

Engineering, Electrical Engineering, and Computer Science. Dissertation titles are listed below.

- The Cross-Border Metropolis Fallacy: Intra-Urban Structure of Neighboring Cities, Tijuana (Mexico and San Diego (USA), *Tito Alejandro Alegria Olazabal*, PhD in Planning
- Travel Patterns, Land-Use and the Elderly, *His-Hwa Hu*, Doctor of Planning
- Vehicle Routing with Time Windows and Driver Learning, *Boontariga Kasemsontitum*, PhD in Industrial and Systems Engineering
- A New Approach to Measuring the Effects of Infrastructure on Regional Economic Performance: U.S. States vs. Metropolitan Areas, *Soojung Kim,* PhD in Planning
- Emerging Urban Spatial Structure and Commuting in U.S. Metropolitan Areas, *Bumsoo Lee*, PhD in Planning
- Energy-Latency Tradeoffs for Medium Access in Sleep Scheduling in Wireless Sensor Networks, *Gang Lu,* PhD in Electrical Engineering
- Energy-Efficient Deployment and Resource Allocation in Wireless Sensor Networks, *Malaki Morteza,* PhD in Electrical Engineering or computer science??
- Measurement and Methods of Assessing the Impact of Prevalent Particulate Matter Sources on Air Quality in Southern California, *Harish Chandra Phuleria,* PhD in Electrical Engineering
- Robustness of Geographic Protocols in Multi-Hop Wireless Networks, *Karim Maher Seada,* PhD in Computer Engineering
- Reliability, Efficiency and Timeliness as Selectable Services in Wireless Sensor Networks, *Frederic John Stann,* PhD in Computer Science
- Algorithms for Solving the Train Dispatching Problem for General Networks, *Worawan Suteewong*, PhD in Industrial and Systems Engineering
- Practical Adaptive Control: Theory and Applications, *Jianlong Zhang*, PhD in Electrical Engineering-Systems.
- Getting Humans Back Into Nature: A Scale-Hierarchic Ecosystem Approach to Integrative Ecological Planning, *Ashwani Vasishth,* PhD in Planning

His-Hwa Hu is Manager, Planning and Policy, Southern California Association of Governments.
Boomsoo Lee is Postdoctoral Researcher with the Center for Risk and Economic Analysis of Terrorist Events.
Jianglong Zhang is employed at advertising.com, a subsidiary company of AOL.
Luca Quadrifoglio (ISE, 2005) is assistant professor, civil engineering, Texas A&M University.
Ashwani Vasishth is Assistant Professor, Dept. of Urban Studies and Planning, California State University, Northridge.
Boontariga Kasemsontitum is Assistant Professor on the Engineering faculty of Chiang Mai University in Chiang Mai, Thailand.

CSULB Students

In 2005-06, 24 students completed the MSCE program. CSULB's Master of Arts in Global Logistics (MAGL) debuted in spring 2002 with the first cohort. In spring 2003 and 2004 two additional cohorts were admitted. Eleven students completed the program in December 2004, and the third cohort completed the program in December 2005. In 2005, the admission of new cohorts occurred in the fall, in line with CSULB admission practices. There are currently 16 students enrolled in the fourth cohort.

The MAGL degree is interdisciplinary, combining the analytical skills of a traditional MBA with a strong emphasis on logistics in a global setting. It is a 30-unit accelerated graduate program that can be completed in less than two years (21 months. It is offered through CSULB's Department of Economics and administrated though the Center for International Trade and Transportation (CITT) and the University College Extension Services. It developed in response to increasing demand for broad training in global logistics and supply chain management. The program prepares professionals to deal with the complexities of supplier relations/selection, purchasing negotiations, operations, e-commerce and many other dimensions of supply chain management. Graduates hold positions in various senior management positions and are employed by companies as diverse as Sony Logistics, Toyota Motor Sales, Boeing and the LA Unified School District. The Port of Long Beach offered scholarships to each of two carefully selected students, Daniel Lee and Raymond Corbell.

In 2005-06, 50 students completed the CITT certificate program leading to the Professional Designation as a Global Logistics Specialist. This is a professional training program. See details in Section E.

Transportation and Location Research Seminar

This seminar series serves to 1) provide speaking experience for advanced graduate students, 2) remind faculty of interdisciplinary transportation research opportunities, 3) provide a focus for transportation teaching and research, 4) provide a speaking forum for external visitors, and 5) increase the visibility of transportation research at USC and CSULB. The seminars are typically scheduled on Wednesdays throughout the academic year. In some cases external visitors are jointly sponsored with other groups in order to provide wider opportunities for seminar participation. The seminar resulted in excellent cooperation between faculty and students in several USC departments. During the Spring 2005 semester, the seminar series was held jointly with an ISE graduate seminar course. USC and CSULB faculty and graduate students, local alumni, and local agency

representatives are invited to the seminar. As a practical matter, the distance between USC and CSULB has proven to be a significant barrier to participation from CSULB. In an effort to remedy this situation, METRANS repeated one of the seminars at the Long Beach campus. Response was favorable and the presentation was well attended by faculty members and goods movement stakeholders. We will look to schedule other seminars in Long Beach in the future. The 2005-06 seminars are listed below.

.

METRANS Speaker Series, 2005-2006

USC Transportation and Location Research Seminar
Fall 2005

Date	Speaker	Location	Topic
September 7	Kristen Monaco Professor of Economics, California State University, Long Beach	RGL 209	The Labor Market for Port Truckers in Southern California
September 28	Martin Wachs Professor of Civil & Environmental Engineering University of California, Berkeley	RGL 101	A Quiet Revolution in Transportation Finance (Joint sponsorship with Keston Infrastructure Institute)
October 19	Anastasios Chassiakos Professor of Mechanical Engineering, California State University, Long Beach	RGL 209	Mitigating Problems Caused by Increasing Container Traffic Through Ports and Adjacent Traffic Networks
November 11	Sandra Rosenbloom Professor of Geography, University of Arizona	RGL 209	The Planning Challenge of An Aging Society; If You're Not Part of the Solution, You're Part of the Problem
November 15	Donald Shoup Professor of Urban Planning University of California, Los Angeles	RGL 215	The High Cost of Free Parking (Joint sponsorship with Urban Growth Seminar)
November 30	Anne Goodchild Assistant Professor of Civil &Environmental Engineering University of Washington	RGL 209	Operational Improvements to Port Productivity: The Challenge of Many Players

USC Transportation and Location Research Seminar
Spring 2006

Date	Speaker	Location	Topic
February 8	Bent Flyvbjerg, Professor, Department of Development and Planning, Aalborg University, Denmark	RGL 215	Improving Demand Forecasting for Transportation Infrastructure (Joint sponsorship with Keston Infrastructure Institute)
March 8	Robert Cervero, Professor, Department of City and Regional Planning, University of California, Berkeley	RGL 215	Balanced Growth: Comparative Impacts of Linking Housing to Jobs Versus Retail
March 22	Marlon Boarnet, Professor, Planning, Policy, and Design and Economics, University of California, Irvine	RGL 215	Public Health, Transportation and the Built Environment: What is Planning's Role?
April 5	James Dunn, Professor, Political Science, Rutgers University	RGL 215	Politics and the Future of the Automobile (Joint sponsorship with Bedrosian Center for Governance and the Public Enterprise)
April 19	Robert Leachman, Professor, Department of Industrial Engineering and Operations Research, University of California, Berkeley	RGL 215	Port and Modal Elasticity Study

Continuing Education Programs

These are described in the technology transfer section under professional training.

E. DESCRIPTION OF TECHNOLOGY TRANSFER ACCOMPLISHMENTS

METRANS technology transfer activities are conducted primarily at CSULB through the University College and Extension Services and the Center for International Trade and Transportation, under the direction of Marianne Venieris. The CITT has a Policy Committee that plans and approves all outreach events. The METRANS Director is a member of the CITT Policy Committee. The METRANS Executive Committee reviews and approves all major technology transfer activities. Technology transfer at METRANS is more appropriately described as professional training and information dissemination. The topical focus of METRANS technology transfer is goods movement and international trade.

Professional Training

CSULB offers a series of industry driven training programs through the University College and Extension Services and the Center for International Trade and Transportation (CITT).

Global Logistics Specialist

The Global Logistics Specialist (GLS®) professional designation is the foundation of a spectrum of programs to cover the industry's training/education needs. It is designed to set a professional standard for the international trade logistics industry and, as such, is aimed at foreign traders and all stakeholders involved in the movement of cargo around the world. This includes both asset-based companies (ocean carriers, rail, trucking, and warehousing) and non-asset-based companies (freight forwarders, customs house broker, consolidators, etc.). In an industry/university partnership, the curriculum is designed to provide broad based, hands-on training for individuals involved in, or entering any part of the logistics chain. Carefully selected topics have been grouped into six core modules that are offered within a one-year time frame one night class per week. Each module contains up-to-date, practical information delivered through innovative hands-on instruction and site visits, making the program a unique training concept in this industry. After successfully completing all six modules and submission of a capstone project on integrated logistics planning, the participant will earn a professional designation and be a Global Logistics Specialist.

In 2005-2006, 50 students were awarded the Global Logistics Specialist (GLS®) professional designation. Since its inauguration in January 1997, over 1200 people have attended classes in the program and to date over 500 have earned the GLS® professional designation.

GLS Online

The online version of the GLS® certificate program makes available throughout the US the courses taught by top practitioners from every facet of the industry. The inaugural

class started June 9th 2004 and as of July 1, 2006 more than 40 students have enrolled in various modules of the GLS Online.

The online version follows the same format as the regular program; it is organized in five modules plus a module that focuses on the capstone project. To earn the GLS® professional designation, students must work synchronously through each module and work in virtual teams to complete the capstone project. The latter is a problem solving case study involving a fictitious national retailer. The project is designed to test the conceptual, analytical, teamwork, and presentation skills the students have developed throughout the program. Deliverables for this project include a written Strategic Supply Chain Management Plan and an oral presentation, using virtual meeting software, given in real time over the Internet.

As of July 2006, 13 students have completed the entire online program. The course has done remarkably well; program evaluation surveys collected from students, the facilitator, and industry experts have been very positive. A thorough assessment followed the first round of classes and various changes and improvements have already been implemented. These include a "New to Logistics" folder, refined benchmarks and rubrics for various lessons, and the creation of "Virtual Office Hours" set for each Monday afternoon. During the office hour, the industry expert on the material taught during the week is available to communicate with students in real time via chat session. Students post questions and comments in the "office hour chat room" and the industry expert responds with answers and additional up-to-date information pertinent to his/her industry segment.

The online program continues to extend the reach of the GLS. Students have come from New York, Florida, Montana, Wisconsin, Maryland, North Carolina, Texas, Washington, Arizona and Utah and from the Dominican Republic, Canada and Vietnam.

Workshop: Caltrans Goods Movement/Logistics Seminars

For the second consecutive year METRANS, through CITT, designed and implemented two three-day Goods Movement/Logistics seminars for Caltrans. The intent of the seminars was to introduce planners and engineers to what is involved in moving international freight effectively from source to destination, and to engage them in a broader discussion of goods movement and logistics planning.

The workshops were held on April 5-7 in Long Beach and on April 26-28 in Oakland. This year there were a total of fifty engineers and planners who took part, representing ten different Caltrans districts: District 3 (Sacramento), District 4 (Bay Area), District 5 (Central Coast), District 6 (Kern/Fresno/Tulare), District 7 (Los Angeles), District 8 (San Bernardino/Riverside), District 9 (Inyo), District 10 (Stockton), District 11 (San Diego), and District 12 (Orange County). Over the course of the two year program, 110 people received training.

The curriculum maximized the participation of industry professionals to help establish relationships between planners and industry experts. In the process, the planner identified him/herself as a goods movement stakeholder and came to recognize potential partners for planning and implementation activities. Toward this end a Best Practices approach was used that allowed participants to see how various projects have developed, been funded, and involved unique partnerships.

The workshop included an overview of the supply chain and goods movement stakeholders, a discussion of the role of Caltrans and its partner agencies in planning for goods movement, a series of best practices presentations, and site visits to a marine terminal and intermodal facility. Representatives from the Office of Freight and Logistics at the US Department of Transportation were invited to discuss the development of a national freight policy framework and its relevance to Caltrans,

Workshop: Goods Movement/Logistics Seminar for Elected Officials

City council members and other elected officials, city managers, planners, and planning commissioners are all in a position to make decisions about issues tied to the movement of freight and its impact on quality of life in local communities. Few however have had a formal introduction the industry and the issues they should be considering. METRANS, again through CITT, developed a half-day program on goods movement and logistics for elected officials. The first class was held on December 2, 2005 for 30 council members, city managers and planning commissioners from the South Bay Cities Council of Governments in Southern Los Angeles County. This is the first-ever workshop of its type for policymakers in Southern California. Topics addressed in the workshop included the language of the supply chain, institutional roles and responsibilities, and key trends in international trade.

Response to the class was very favorable and METRANS is currently developing a second half-day workshop, also for the South Bay Cities Council of Governments. This second training will focus on air cargo and is likely to be offered in the spring of 2007.

Applied Research Program

To both address the continuing challenge of involving CSULB faculty in METRANS research and better support our outreach efforts, in 2003 we launched a program in applied research, Monitoring the Ports. The applied research program is directly linked with our goods movement and international trade outreach activities. See Section C for details.

Outreach Events

The port complex, like other major transportation complexes, generates significant public benefits but also significant localized costs. Increasingly communities bearing these costs are seeking to limit the growth of these transportation complexes. These efforts may limit overall economic growth of the region and the nation.

The region and the industry are deeply divided on how growth can be absorbed over the next several years. The I-710 expansion project, together with some high visibility lawsuits by environmental groups over port expansion projects, have placed increasing pressure on port and international trade interests to broaden their perspective. The Annual State of the Trade and Transportation Industry Town Hall Meetings, sponsored by METRANS over the past seven years, have consequently evolved to focus more on the larger impacts and less on the operational issues of the ports. The challenge for METRANS and CITT is to maintain their role as neutral forum while fostering education, research and information exchange that positively contribute to resolution of these conflicts.

Town Hall Meeting

The Annual Town Hall meetings offer goods movement stakeholders, particularly longshore labor, an opportunity to discuss the issues most critical to the industry. Port congestion was the most critical issue beginning in the late summer of 2004 and continuing throughout fall and the Christmas season. While there was a fear that these events would be repeated in 2005, this was not the case. A number of actions taken by industry stakeholders, including new labor hiring procedures and the implementation of off-peak gates (PierPass), improved the flow of goods and allowed the combined Ports of Los Angeles and Long Beach to handle an increase of approximately 14% of container moves. However, short-term solutions alone will not allow the goods movement industry to accommodate continued double-digit growth and to mitigate the impacts of that growth.

As a result, the Eighth Annual Town Hall addressed "Evolving Goods Movement Solutions: Balancing the Economy and the Environment." It was held on March 15, 2006 at the Carpenter Center on the CSULB campus. This year's panelists represented the port/marine terminals, trucking, retailers/shippers, ILWU labor, state and local government, and environmental groups. The objective was to discuss the positive response of goods movement stakeholders to industry growth and environmental pressures, and the changes that still need to be made. The forum explored a range of options including industry-sponsored efforts, as well as legislative and regulatory proposals.

To begin the evening's discussion and set the framework for issues debated, an overview was provided by John Doherty, CEO of the Alameda Corridor Transportation Authority. Following was a video produced by CSULB's Advanced Media Production unit. The video focused on the industry's response to the 2004 congestion crisis and included interviews with key stakeholders to capture their view on how to accommodate continued

doubled-digit growth. It will have a shelf life after the meeting as an informational resource for governmental agencies and concerned community groups.

The video produced for the 7th Annual Town Hall won a prestigious award from the national Alliance for Community Media, the Western Access Video Excellence award for best *Community Issues* production in the ACM's Western Region. The Western Region comprises six states: California, Arizona, Colorado, Nevada, New Mexico and Hawaii. Alliance for Community Media is a national organization of television producers working in the governmental, educational and community sectors.

The 2006 Town Hall attracted more than 1000 industry and community stakeholders. The event received support and financial sponsorships from the Ports of Los Angeles and Long Beach, the Pacific Maritime Association, International Longshore and Warehouse Union (Locals 13, 63, and 94), Alameda Corridor Transportation Authority, and Long Beach City College Office of Economic Resource Development. The event also received formal endorsement by the board of directors of 21 trade associations. The Town Hall was open to anyone and free of charge. The event was webcast and is available for viewing at http://www.uces.csulb.edu/citt.

Town Hall White Paper

A main objective of the annual Town Hall meetings is to explore opportunities and policy options to further common goals, and to establish a means for on-going communication among port stakeholders. One of the ways of doing this is through a Town Hall White Paper. The White Paper provides a context for the discussion and sets the stage for future steps to be taken by the participants. The 2006 White Paper will provide an overview of the issues surrounding the Town Hall debate and summarize the proceedings. It will be released in the summer of 2006 and will be posted on the METRANS and CITT websites. A companion piece outlining the themes to be addressed at the Ninth Annual Town Hall Meeting in 2007 will be released in the fall of 2006.

National Urban Freight Conference

The National Urban Freight Conference is described in Section C.

Other Outreach Activities

Members of the METRANS management team are active in a variety of outreach and professional service activities.

METRANS Director Genevieve Giuliano will complete her service on the TRB Executive Committee and as chair of the Sub-Committee on Planning, Programming and Research in January 2007. She is also a member of the Executive Committee of the Council of University Transportation Centers. Over the past year she has given presentations at Caltrans Research Connection, American Collegiate Schools of Planning,

Transportation Research Board Annual Meeting, Digital Government conference, and Women in International Trade – Orange County. She is currently participating in a study, Global Climate Change and Transportation, jointly sponsored by the Board on Atmospheric Sciences and Climate and the Transportation Research Board.

METRANS Deputy Director Marianne Venieris is a member of several local business associations. She serves on the Transportation Research Board (TRB) Education & Training Committee, ABG20, the Board of the California Marine and Intermodal Transportation System Advisory Council (CALMITSAC), and on the Board of Directors of the Gateway Cities Partnership, Inc. a regional, nonprofit economic collaborative comprising twenty-seven cities in Los Angeles County. She has given speeches and moderated panels and meetings of the Transportation Clubs International Conference, Harbor Transportation Club, and the Carson Chamber of Commerce. She also moderated a Port Security Town Hall Meeting for California Assemblywoman Betty Karnette.

METRANS Executive Committee member James Moore is a director at large and an active member of the Los Angeles Chapter of WTS (formerly Women's Transportation Seminar).

METRANS Applied Research Coordinator Thomas O'Brien contributes a regular column to the *Perspectives* section of the *Long Beach Business Journal*, a bi-weekly publication. The column appears on a monthly basis and highlights important issues in goods movement and international trade and features CITT and METRANS activities, including research. The first article appeared in August 2005 and addressed the language of goods movement. Subsequent articles have been written on emergency preparedness in the wake of Hurricane Katrina (September 2005), the Statewide Goods Movement Action Plan (October 2005) Best Practices for goods movement (November 2005), the National Urban Freight Conference (January and February 2006), National Freight Policy Framework (April 2006) and the Transportation Worker ID Credential (June 2006). A guest article on port productivity by METRANS researcher Hahn Dam Le-Griffin appeared in November 2005.

Publications

Building Bridges

A bi-monthly newsletter, *Building Bridges*, began publication in January 2001. The newsletter is a briefing document to inform and promote dialogue within the maritime/logistics industry community. 3250 hard copies and about 200 electronic versions of each issue are distributed to ILWU local members, industry leaders, government agencies, and METRANS Advisory Committee Members. In addition, the newsletters are made available at the Town Hall meetings, trade association meetings, to the distribution list of the Marine Exchange of Southern California and via the METRANS and CITT websites. As of June 2006, 17 issues have been published. Issues were published in August of 2005 and in January, March and May of 2006.

The objectives of *Building Bridges* are:

- To provide a neutral communications channel on industry issues
- To lead to fruitful and open dialogue
- To encourage closer cooperation among all industry stakeholders

The newsletter is formulated, edited, and distributed by an Editor-in-chief selected by the CITT Engagement Subcommittee. An Editorial Board that includes members of the subcommittee and the METRANS Director provides oversight.

METRANS News

The first issue of the *METRANS News* was published in February 2003. This newsletter summarizes METRANS research, education and information dissemination activities. It compliments the METRANS website and broadens our exposure to the research community, government, and industry. The newsletter features METRANS researchers, conferences and other events, recent publications, interviews with key individuals involved in METRANS, and other newsworthy activities and events. With a three issues per year publication schedule, it is distributed electronically to the national research community, federal, state and local leaders, industry leaders, and federal, state and local transportation agencies. 800 printed copies and 500 electronic copies are distributed to the METRANS Advisory Committee, public agency managers, and elected officials. The newsletter is also circulated to the distribution list of the Marine Exchange of Southern California and is available on the METRANS website. As of June 2006, ten issues have been published. Issues were published in October of 2005 and in March and June 2006.

Outreach - Website

The METRANS website is the primary source for dissemination of information on METRANS activities. The METRANS Strategic Plan, Annual Reports, and Semi-Annual Reports are available in downloadable form. All research project final reports, conference summaries, and technology transfer reports are also available. The *Building*

Bridges newsletter and *Metrans NEWS* are available, as well as information on CSULB's Master of Arts in Global Logistics and the new GLS® Online. An in depth program description including a list of core courses and options of specialization courses is provided. The website also identifies educational programs in transportation and links to 120 sources of transportation information. In particular, we have sought out organizations that find funding for transportation research, student internships, student awards and professional organizations, and provided links to their webpages. The UTC search engine locates documents on all other UTC websites by keyword.

The METRANS website was originally developed in 1999 and did not take advantage of recent Internet technologies. A complete overhaul of the website began in the spring of 2005. The goal was to enhance the visual presentation of the site, the ability to find and use METRANS research, and to streamline the process of adding new and upgrading existing content. Additional features include web-based marketing and outreach.

The new website was officially launched in November 2005. The home page features the latest METRANS announcements, news and events; visitors may also opt-in to receive electronic updates and newsletters from this page. The graphic design includes attractive and alternating photographs depicting different transportation modes. Easy-to-navigate drop down menus allow users to access "News and Events" including copies of *METRANS News* and *Building Bridges*, information "About the Center," "Research," links to "Education" programs, "Outreach" activities, "Resources," and a multi-site "Search" engine for the various University Transportation Centers in the US. Researchers can find information by UTC, topic, website, or keyword. The database of METRANS research projects provides access to many years' worth of studies and reports with a simple click. The Macromedia Contribute software package allows the METRANS administrators to make changes directly.

METRANS website statistics show an impressive level of website traffic Between its debut in November and the end of 2005, the site received over 369,000 hits with visitors spending, on average, more than 3 minutes during each visit. Total number of visits for 2005-06 is 82,190, with about 10,000 visits per month since the new site was launched. Visitors represent numerous countries; and the largest percentage goes directly to the site, i.e. they are not referred from another Internet location. This suggests a prior awareness of the METRANS center. The goal of facilitating access to research appears to have been met. Of the 10 METRANS pages most downloaded, 7 are METRANS-funded research reports.

The new METRANS website was launched in time for the National Urban Freight Conference. It was used to promote the conference and provide up-to-date information on the event. Event and hotel registration, and corporate sponsorships were also coordinated through the website.

The new METRANS website is fully accessible, conforming to federal guidelines.

Project Reports

Project reports are distributed through the METRANS website. The Research page of the site provides a convenient mechanism for downloading and viewing reports. All completed reports are available online. All Final Reports completed after May 2003 are available in print form by request.

F. LIST OF PROJECTS

The following lists ongoing and completed research projects in METRANS. Complete project descriptions can be found on the METRANS web site at www.metrans.org..

ONGOING PROJECTS:

Draft Report Submitted

Project Number 01-3
Research Project Analysis of Vibrations as Infrastructure Deterioration Caused by High-speed Rail Transit

Project Number 03-18
Research Project Cooperative Optimum Time Window Generation for Cargo Delivery/Pick Up with Application to Container Terminals

Project Number 03-19
Research Project Measuring California's Role in Supporting Interstate Goods Movement: Comprehensive Assessment of Interstate Freight Flows

Project Number 03-24
Research Project Increasing Bus Transit Ridership: Dynamics of Density, Land Use and Population Growth

Project Number: 03-25
Research Project: Development of an Artificial Intelligence Based Traffic Simulation Model Using the Discrete Element Method

Project Number 04-03
Research Project Evolution of Collective Sensory Systems for Intelligent Vehicles

Project Number 04-04
Research Project Landside Surface Transportation Impact of Short Sea Shipping in Southern California

Project Number 04-06
Research Project Evaluation of the Terminal Gate Appointment System at the Los Angeles/Long Beach Ports

Project Number 04-08
Research Project SURE-SE: Sensors for Unexpected Roadway Events: Simulation and Evaluation

Project Number 04-15
Research Project Confidence Intervals for Estimated Traffic Demand

Project Number 05-04
Research Project Ports and Highways Infrastructure Investment and Inter-State Spatial Spillovers

Research in Progress

Project Number 03-17

Research Project Innovative Bridge Structural Health Monitoring Using Variable Stiffness and Damping Devices

Project Number: 03-23
Research Project: Improved Modeling of Network Transportation Flows, Including Land Use-Transportation Interactions: A Research Collaboration Between USC (METRANS) and Caltrans District 7 (Office of Advance Planning)

Project Number 04-09
Research Project Reduction of Construction Project Risks to Pedestrians, Drivers, and Transit Passengers through Analysis of Historical Accident Records

Project Number 04-18
Research Project Transit Investment and the Capitalization of Access into Land Values

Project Number 05-01
Research Project Validation of Sensory Systems for Intelligent Vehicles

Project Number 05-06
Research Project Cambodian Access to Transportation: Impact on Senior Nutrition and Congregate Meal Service Programs

Project Number 05-11
Research Project Simulation Test Bed and Evaluation of Truck Movement Concepts on Terminal Efficiency and Traffic Flow

Project Number 05-12
Research Project Evaluation of Extended Gate Operations at the Ports of Los Angeles and Long Beach

Project Number 05-13
Research Project Study of the Exposition Light-Rail's Safety for Pedestrians and Drivers

Project Number 05-14
Research Project SURE-FT: Sensors for Unexpected Roadway Events: Field Trials

Project Number 05-17
Research Project Institutional Considerations in Freight Movement in Port of Los Angeles/Long Beach

Project Number 06-02
Research Project Incentivizing Truck Retrofitting in Port Drayage

Project Number 06-03
Research Project An Adaptive System for the Transportation of Commercial Goods

Project Number 06-04
Research Project Reducing Diesel Nox and PM Emissions of Diesel Buses and Trucks

Project Number 06-07
Research Project Evaluating the Efficiency of Traffic Mitigation Fees at the San Pedro Bay Ports in a Congestion-Pricing Framework

Project Number 06-10

Research Project Sources of Electoral Support for Transportation Funding

Project Number 06-11
Research Project Better Delivery/Pick Up Routes in the Presence of Uncertainty

Project Number 06-13
Research Project The Mobility of Homeless People and Their Use of Public Transit in Long Beach, CA

Project Number 06-16
Research Project Network Accessibility and the Evolution of Urban Employment

COMPLETED PROJECTS:

Project Number: 99-3
Research Project: A Task Decomposition Model for Dispatchers in Dynamic Scheduling of Demand Responsive Transit Systems

Project Number: 99-5
Research Project: Improving Fuel Economy and Emissions Performance of Commercial Goods Transportation and Mass Transit Vehicles Using Throttleless Engines

Project Number: 99-7
Research Project: Modeling and Route Guidance of Trucks in Metropolitan Area

Project Number: 99-10
Research Project: Implementing a Statewide Goods Movement Strategy and Performance Measurement of Goods Movement in California

Project Number: 99-11
Research Project: The Role of Public Transit in Mobility of Low Income Households

Project Number: 99-14
Research Project: 2D Virtual and Physical Simulation of Automated Container Terminal Facilities and Analysis of Impact on In-Land Transportation

Project Number: 99-18
Research Project: Identification and Analysis of Local Agency Transit Project Performance Criteria

Project Number: 99-19
Research Project: Solid State Sorption Air Condition System for Containerships and Vehicles – Phase I

Project Number: 99-22
Research Project: Highway Oriented Transit System (HOTS): A Comprehensive Land Use-Transportation Strategy to Improve Transit Service Delivery

Project Number: 99-23
Research Project: Non-Invasive Means of Investigating Container Contents for Customs Agents at Port

Project Number: 99-25
Research Project: Assembling and Processing Freight Shipment Data: Developing a GIS-Based Origin-Destination Matrix for Southern California Freight Flows

Project Number: 99-27
Research Project: Dynamic Coordination Framework for Resource Allocation in Trucking Operations

Project Number: 00-3
Research Project: Alternative Access and Locations for Air Cargo

Project Number: 00-5
Research Project: Developing Risk Model for Commercial Goods Transport

Project Number: 00-6
Research Project: Assessment of Hybrid Vehicle Control Strategies in Planning Future Metropolitan/Urban Transit Systems

Project Number: 00-7
Research Project: Solid State Sorption Air Conditioner System for Containerships and Vehicles - II

Project Number: 00-8
Research Project: Travel Patterns of the Elderly

Project Number: 00-11
Research Project: Investigating the Role of Driver Decision Styles in Highway-Rail Crossing Accidents

Project Number: 00-12
Research Project: Freeway Bus Station Area Development: Critical Evaluation and Design Guidelines

Project Number: 00-13
Research Project: Distributed Architecture for Real-Time Coordination in Transit Networks

Project Number: 00-15
Research Project: Dynamic Optimization of Cargo Movement by Trucks in Metropolitan Area with Adjacent Ports

Project Number: 00-16
Research Project: Design and Optimization of a Conceptual Automated Yard Using Overhead Grid Rail System

Project Number: 00-17
Research Project: An Integrated Approach to Managing Local Container Traffic Growth in the Long Beach/Los Angeles Port Complex Phase II

Project Number: 01-2
Research Project: Reducing Pollutants from Mobile Sources

Project Number 01-5
Research Project Re-engineering the Logistics of Empty Cargo Containers in the SCAG Region

Project Number: 01-6
Research Project: A Methodology for Joint Optimization of Service and Life Cycle Environment Impact Assessment of Transport Systems

Project Number: 01-10

Research Project: Smart Damping for Monitoring the Health of Bridge Structures

Project Number: 01-14
Research Project: Developing and Testing Methodologies for the Evaluation of Highway Widening Plans to Facilitate Freight Flows

Project Number: 01-16
Research Project: Automated Trucks on Dedicated Lanes for Cargo Movement

Project Number 03-01
Research Project A Novel Approach to Routing and Dispatching Trucks Based on Partial Information in a Dynamic Environment

Project Number 03-06
Research Project Robust Investment Decisions for Highway Capacity Expansions

Project Number 03-07
Research Project Freight Routing and Containerization

Project Number 03-13
Research Project Hydrogen Storage System for Transportation Applications

Project Number 03-20
Research Project Neighborhood Attributes and Commuting Behavior: A Comparative Study of California's Major Metropolitan Areas

Project Number 03-24
Research Project Increasing Bus Transit Ridership: Dynamics of Density, Land Use and Population Growth

Project Number 03-27
Research Project Methodology for Probabilistic Assessment of Permanent Ground Displacement Across Earthquake Faults for the Transportation System

Project Number 04-05
Research Project Development Methods for Handling Empty Containers with Applications in the Los Angeles/Long Beach Port Areas

Project Number 04-13
Research Project What Can We Learn from CTPP 2000? Neighborhood Attributes, Commuting Behavior and Jobs-Housing Balance: A comparative 1990-2000 Study Across California's Major Metropolitan Areas.

Project Number 05-10
Research Project Improving Trucking Safety: Effects of Driver Hours of Service Regulations

APPLIED RESEARCH PROJECTS

ONGOING

Draft Report Submitted

Project Number AR 05-05

Research Project Survey and Identify the Needs of Port Communication Equipment for Safety, Security, and Interoperability

Research in Progress

Project Number AR 05-01
Research Project An Accurate Monitoring of Truck Waiting and Flow Times

Project Number AR 05-02
Research Project Feature Extraction from High Resolution Satellite Imagery as an Input to the Development and Rapid Update of a METRANS Geographic Information System (GIS)

Project Number AR 05-03
Research Project Development of an Exposure Model for Diesel Locomotive Emissions near the Alameda Corridor

Project Number AR 05-04
Research Project Development of a LIDAR Derived Digital Elevation Model (DEM) as Input to a METRANS Geographic Information System (GIS)

Project Number AR 05-05
Research Project Survey and Identify the Need of Port Communication Equipment

Project Number AR 05-06
Research Project Assessing Container Terminal/Port Productivity: Experiences of the Ports of Los Angeles and Long Beach

Project Number AR 06-01
Research Project Evaluating and Improving the Security of RFID Tags in Shipping Containers

Project Number AR 06-02
Research Project Assessing Near Dock Rail Loading and Offloading Procedures at the Port of LA/Long Beach for Application to a Container Conveyor to ICTFs

Project Number AR 06-03
Research Project A Cargo Security Early Warning System – The Application of Neural Networks to Detect Cargoes with Potential Security Fraud

Project Number AR 06-04
Research Project Impact of New Diesel Fuels used in Port Operations on Subsurface Quality

Project Number AR 06-05
Research Project A Universal Communication Device for Improving Interoperability

Project Number AR 06-06
Research Project Loading and Unloading Containers: Examining the Efficiency of Goods Movement

COMPLETED

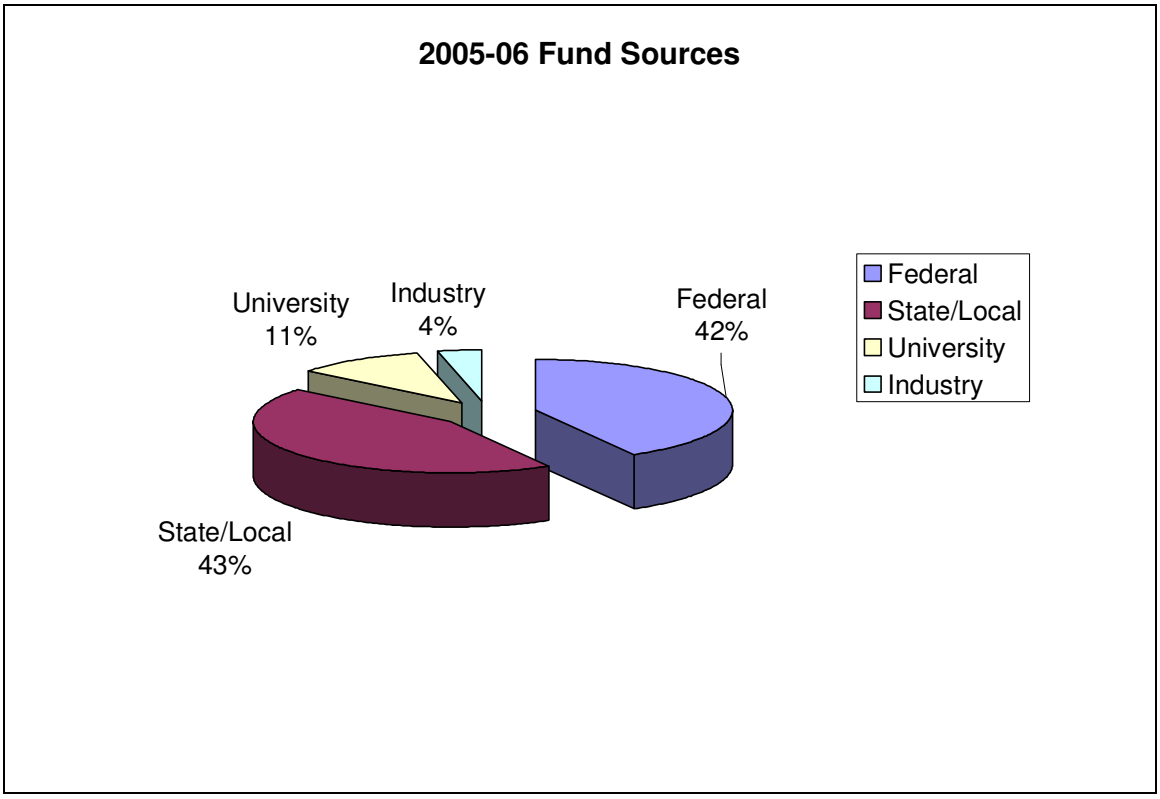
Project Number	AR 04-01
Research Project	Examining the Effects of the Lowenthal Bill on Port Congestion
Project Number	AR 04-02
Research Project	Labor at the Ports: Comparing Work Rules and Working Conditions of the ILA and ILWU

G. FUNDING SOURCES AND USES

Funding Sources

This section reports on budgeted expenses and income for 2005-06. Figure G.1 below gives fund shares by sources. METRANS received a total of $1,925,560 from all sources; the USDOT share accounts for 42 percent. The largest share continues to come from state and local sources: the full dollar-for-dollar match from the California Department of Transportation, plus additional contributions from state and local agencies. University matching funds account for 11 percent, with the remainder from private industry and other sources. The ratio of match to USDOT funding for 2005-06 is $1.41.

Figure G.1



Funding Uses

Figure G.2 gives METRANS funding by use categories for 2005-06. In contrast to prior years, this is not cumulative data over prior years. The chart is based on allocated budget expenditures. This year research accounts for 42%, administration for 27%, technology transfer for 27%, and about 4% for education. Administration includes the METRANS Seminar Series, student support for conferences, and website maintenance. Technology transfer expenditures reflect the one time costs of organizing the National Urban Freight Conference. The education share is higher this year due to a contribution to the MESA program. METRANS does not have a scholarship program; students are supported on research grants. Roughly ¼ of the research budget of a typical project is for student support, not including tuition contributions.

Figure G.2