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Research Update

ENVISIONING THE FUTURE: STEPS Research Informs Policy

The Institute's Sustainable Transportation Energy Pathways (STEPS) research program is proving itself an important resource to state and federal policymakers as they consider public policies to reduce greenhouse gas (GHG) emissions from the transportation sector. STEPS, which is examining the pathways for transitioning to an alternative fuel transportation future, is substantially informing California Air Resources Board (ARB) research as the agency prepares to revise the state's groundbreaking vehicle greenhouse gas (GHG) and zero-emission vehicle (ZEV) regulations.

STEPS researchers have produced a series of reports examining what it will take to reach goals to reduce GHGs 80% below 1990 levels by 2050. The first "80in50" report completed in 2008 by researcher Chris Yang and students Ryan McCarthy, David McCollum, and Wayne Leighty, focused on how California could meet this ambitious goal in the transportation sector. Follow-on 80in50 analyses conducted by Yang and McCollum in 2009 examined how the country might meet the same goals.


Joan Ogden

Recently, Leighty, STEPS co-director Joan Ogden, and Yang have expanded the study beyond its original static approach to one that identifies plausible transitional paths for reaching the goals, using a mix of fuels and vehicles, and analyzing market factors and technological feasibility.

"In addition to developing these 80in50 path scenarios, we hope to transfer more knowledge to the ARB," says Ogden. She thinks the researchers' modeling will be useful not just for the upcoming vehicle regulation review, but for other regulations, too, such as intermediate goals and near-term policies like the Low Carbon Fuel Standard.

"Our scenarios form a strong basis for ARB by delineating what we think is possible or plausible going forward. This allows ARB to develop its own scenarios with confidence, drawing upon a strong analytical foundation."

In related research that is separate from the STEPS Program, Ogden, Yang and ITS-Davis director Dan Sperling are participating on a California Council on Science and Technology (CCST) panel that is envisioning a low-carbon future for all energy sectors for 2050. The STEPS Program's 80in50 transportation work, Ogden says, has been very useful for this broader visioning effort.

Ogden adds that the California Hydrogen and Fuel Cell Vehicle Roadmap Study, supported by Shell Hydrogen, Toyota, Honda, and Daimler, developed a roadmap for hydrogen fuel cell vehicle and infrastructure rollout in Southern California, substantially informing ARB's hydrogen infrastructure scenarios.

On the national front, Ogden participated on a National Research Council panel that released a report last month, "Transitions to

Alternative Transportation Technologies – Plug-in Hybrid Vehicles." This report followed a 2008 NRC report on hydrogen transitions. The study found that plug-in vehicles will have high incremental costs due to expensive lithium-ion batteries well into the 2030-2040 timeframe, and will have little impact on oil consumption or greenhouse gas emissions before 2030 because there will be relatively few of them on the road. Ogden, who was herself surprised by the cost findings but concurs with her colleagues' conclusions, says the overarching message of the report is that it will take considerable investment and time to develop alternative technologies.

"We can't take any promising technology off the table just yet. We need a portfolio approach with improved vehicle fuel economy, electric-drive vehicles, and low-carbon fuels."

TRB: Researchers and Students Converge in DC

A large contingent of UC Davis students and researchers once again converged in Washington for the Transportation Research Board's annual meeting earlier this month. See the list of UC Davis researchers who gave papers and participated in poster sessions.

The annual ITS-Davis reception was again a big success. Read more in the Institute Update.

Sustainable Transportation Center Update

VISITING PRACTITIONER: Trip Generation Research Informs Land Use and Planning

Richard Lee, Ph.D., an associate at Fehr & Peers, is the 2009-2010 STC Visiting Practitioner and Researcher. The goal of the STC Visiting Practitioner Program is to strengthen ties between the STC's academic activities and applied transportation practice.

Lee's research and consulting experience spans 20 years. His current research focus is quantitative analysis of smart growth to evaluate its effectiveness in promoting transit and alternative modes. With the support of STC Program Fellow Rachel Maiss, Lee is leading a new Caltrans-sponsored project that aims to develop a technically sound and operationally straightforward method for appropriately estimating "trip generation" for "smart growth" land use projects such as urban and suburban infill, transit-oriented development, as well as clustered and mixed land uses.

Trip generation is an essential step in traffic impact studies, required by California laws to assess the probable impact of a proposed development project on vehicle traffic, transit use, and pedestrian and bicycle travel in the vicinity of the project. For decades, transportation analysts have relied on trip generation rates published by the Institute of Transportation Engineers. However, these rates, mostly based on data from suburban developments, tend to significantly overestimate vehicle trips in urban areas where more active modes such as transit, walking, and biking are viable. Funding and infrastructure is then directed toward cars and roads and away from more active modes.

The Caltrans/UC Davis project team is developing an alternative approach to trip generation that is more realistic for smart growth projects. This approach will build on promising trip generation research and methods developed in both the U.S. and abroad, and will be refined based on input from both experts from academia as well as practicing transportation engineers and planners.

STC AWARDS: Faculty Grants and Student Dissertation Fellowships

Each year, the STC offers grants for faculty research projects and student dissertations that advance research and education in sustainable transportation. The following awards were just announced.

STC Seed Grant
Professor John Harvey, director, UC Pavement Research Center, has received a second STC Seed Grant to continue his research on the use of rubberized warm-mix asphalt (R-WMA) as a more sustainable alternative to conventional hot mix asphalt (HMA) and rubberized hot mix asphalt (RHMA). Harvey will identify and quantify the environmental and energy efficiency impacts of R-WMA compared to HMA and RHMA, and will develop a lifecycle analysis tool to model and measure the environmental improvements.

Dissertation Fellowships
Zheng (Marco) Wan
"An Analysis of the Policies and Technical Efficiency of Public Transit Systems in China's Cities"

Yongling Sun

"Societal lifecycle cost comparison of alternative fuel vehicles"

Outstanding Student of the Year


Nathan Parker with STC director Susan Handy

Nathan Parker, the STC's 2009 Outstanding Student of the Year, accepted his award with honorees from the other University Transportation Centers at the 19th Annual Outstanding Student of the Year awards ceremony at the 89th annual Transportation Research Board Annual Conference in Washington.

Parker, a Transportation Technology and Policy Ph.D. student, is assessing the potential for greater use of biofuels in California and the U.S. He demonstrated excellence in all the criteria: academic achievements, research excellence, leadership and professionalism.

Wayne Leighty, the STC's 2008 Outstanding Student of the Year, is simultaneously pursuing a Ph.D. and an MBA at UC Davis. Leighty's master's thesis, "Modeling of Energy Production Decisions: An Alaska Oil Case Study," received the 2008 Friends of ITS-Davis Outstanding Master's Thesis Award. He is currently working with the Sustainable Transportation Energy Pathways Program at ITS-Davis and is an emerging venture analyst with the UC Davis Energy Efficiency Center.

ACTIVITIES: STC People and Events

STC director **Susan Handy** bicycles to campus almost every work day, but research, including her own, shows she's an anomaly. In the U.S. men's cycling trips outnumber women's by at least 2:1. Handy's research hypothesizing why the disparity exists has recently been highlighted in Scientific American and on a number of bicycling and transportation blogs. While perceived safety and utility concerns are factors, Handy says attitudinal variables are important; a little outreach and education could go a long way to addressing women's bicycling questions and concerns, Handy suggests. Handy's love of bicycling and her research are featured in a National Wildlife Federation magazine, Campus Ecology.

Morgan Kanninen joined the STC staff in October. As the center coordinator she maintains the STC Web site, coordinates competitive grant and fellowship programs, organizes STC workshops, symposia, and other outreach activities, and serves as the primary administrative contact with government agencies. Kanninen, a 2007 graduate from the UC Davis Community and Regional Development department, was a research assistant with the STC's Sustainable Streets Project.

STC Sponsors Women's Conference

In October, STC sponsored the 4th International Conference on Women's Issues in Transportation, organized by the Transportation Research Board and held in Irvine, California. The purpose of the conference is to add substantially to the research base on women's transportation issues that has been developed over the past four decades, to take stock of its current status, and to identify future research needs.

Annual Report Now Available

The STC's 2008-2009 Annual Report is now available.

Education Highlights

STUDENT PROFILE: Greg Gould

Greg Gould suspects the reason there is a dearth of young people studying freight transport is their misperception that goods movement is boring -- that it's just an engineering and operations research problem.

"It's too bad people don't see the connection: Where trucks and trains travel has everything to do with people's behavior and land use decisions. It's all about how the stuff people want gets to where they live, and that depends on what they want to buy, where they want to buy it, and where they choose to live," he says.

That connection drives Gould's passion for developing better models to estimate the emissions associated with moving goods around the world and their impact on communities and the environment.

A Civil and Environmental Engineering Ph.D. candidate, Gould arrived in Davis four years ago from the University of Maine. "Here I was in California, where air pollution is such a problem and air quality policy is so important," yet the common perception is that cars are the biggest problem. Gould quickly learned that goods movement is a significant and increasingly large contributor to transportation emissions in the state. Furthermore, he learned the modeling tools policy makers have relied on to develop freight transport policy are outdated. He quickly connected with Professor Deb Niemeier,

who was working under a California Air Resources Board research grant to develop a new locomotive emissions model.

The work evolved into Gould's dissertation. Gould developed a model that more accurately calculates locomotive fuel consumption based on factors such as locomotive type, load (bulk vs. intermodal), track grade, and route-specific details that current models don't consider. The model calculates criteria emissions using U.S. EPA emissions factors for different engines and carbon emissions based on fuel consumption. Gould's model is more accurate and "spatially resolved" because it incorporates these spatial factors in a geographic information system. The modeling platform also allows the user to easily change model inputs and view results in a map or table at multiple geographic scales, a feature that is important for considering local air pollution effects.

The state will benefit from this new model because it relies on less confidential data and will be a framework that is easier to update, Gould notes, adding that the previous model developed in the 1980s relied on aggregate methods and largely obsolete data provided by the railroad companies. Since then, he adds, obtaining data from these private entities who own the infrastructure and vehicles has been difficult.

Gould is now looking at how models are used to make policy decisions, and to evaluate health outcomes and environmental justice issues. He is now focused on trying to move this model and other types of mobile source emission models to a web-based platform, facilitating improved public information and participation. For example, someone living next to a rail yard could easily change assumptions in the web-based platform to see how the neighborhood would be affected if the railroad doubled the train traffic.

"Giving people more convenient access to these models and data gives them access to information that enables their participation in finding solutions and builds greater trust in policy makers. People can see how and why decisions are made," Gould observes.

Gould presented his findings at TRB earlier this month. After he graduates this spring or summer, he hopes to further explore web-mapping applications in transportation planning, and to find a faculty position that allows him to continue his current research at the intersection of sustainable engineering, development, transportation, and land use.

CONGRATULATIONS, GRADS: June 2009

Brendan Connors, M.S., Mechanical and Aeronautical Engineering
Adviser: Mont Hubbard

Adam Henry, Ph.D., Transportation Technology and Policy
Adviser: Paul Sabatier
Dissertation: "Tying it All Together: Networks and Policy-Oriented Learning in Regional Planning Processes"

Bryan Jungers, M.S., Civil and Environmental Engineering
Adviser: Dan Sperling
Thesis: "The Evolution of Sustainable Personal Vehicles"

Laura Poff, M.S., Transportation Technology and Policy
Adviser: Michael Zhang

Dana Rowen, M.S., Agricultural and Resource Economics
Adviser: Travis Lybbert

Ru Wang, M.S., Transportation Technology and Policy
Adviser: Deb Niemeier

TIME IS NOW: Prospective Student Applications Due Soon

Applications are due April 1 for fall 2010 admission to the Transportation Technology and Policy graduate program at ITS-Davis. If you're thinking about returning to school, now is the time to apply.
Learn more.

ITS-Davis and Campus Highlights

CROSS-CULTURAL EXCHANGES: China and Davis

In recent months the ITS-Davis China Center on Energy and Transportation (C-CET) has served as a catalyst for meetings and information exchange between national governments and educational institutions.

Dan Sperling (2nd from right) at U.S.-China Electric Vehicle Forum in Beijing

Last fall ITS-Davis director Dan Sperling and C-CET director Yunshi Wang attended the first U.S.-China Electric Vehicle Forum in Beijing. U.S. DOE Assistant Secretary for Policy and International Affairs David Sandalow joined with Minister Wan Gang of the Chinese Ministry of Science and Technology to co-host the event and highlight the rapidly growing electric vehicle industry in both countries. Sperling delivered a presentation on U.S. government policy on EVs, and Sperling and Wang discussed ITS-Davis research activities in private meetings with Chinese and American government and industry representatives.

Graduate students Jacob Teter and Geoff Morrison played an important support role in planning the forum. As interns last summer at DOE's Office of Policy and International Affairs in Washington, DC, they researched and developed background briefing materials for U.S. officials participating in the forum. They also contributed to the development of a high-level strategy for clean energy collaboration between the two nations, announced during President Obama's trip to China in November.

Jacob Teter (left) and Geoff Morrison

Teter spent fall quarter as an exchange student at Tsinghua University in Beijing researching technologies and policies the city can adopt to mitigate pollution and congestion. He is examining the social costs and benefits of introducing zero-emissions vehicle technologies in megacities, as well as other fiscal and policy options such as congestion pricing and biking policies.

Several C-CET graduate students have taken advantage of internship opportunities. Last summer, Eric Huang worked at the International Council on Clean Transportation (ICCT) to build a database on China's vehicle population and its potential emissions. Yongling Sun is also working on a China vehicle emissions model, also at the ICCT. In 2010, C-CET expects to send several students to Beijing's Innovation Center for Energy and Transportation (iCET) and to the Chinese Academy of Transportation Sciences (CATS). Continuing the beneficial cross-cultural exchange, ITS-Davis is hosting four visiting scholars from China and expects to welcome more in 2010.

PEOPLE NEWS: Faculty Awards and Accolades

Joan Sollenberger with ULTRANS director Mike McCoy

Joan Sollenberger has accepted a one-year appointment as deputy director of the Urban Land Use and Transportation Center (ULTRANS). As Caltrans' Division of Transportation Planning Chief, Sollenberger has developed and implemented statewide transportation planning policies and programs designed to enhance community livability through better coordination of transportation and land use across California. Using her state planning and policy knowledge, Sollenberger will lead efforts to ensure the state is fully committed to developing an integrated inter-regional model system to inform statewide land use and policy decisions. Creating this integrated statewide planning and land use model is an important focus of ULTRANS, and Sollenberger is perfectly positioned to advise ULTRANS researchers on ways the model can be most useful to inform policymakers.

California Energy Commissioner

Dan Sperling is the first UC Davis representative to be named to the Transportation Research Board (TRB) Executive Committee. The TRB Executive Committee is the senior policy body of TRB, composed of approximately 25 members appointed by the Chairman of the National Research Council. Sperling's three-year appointment begins this month. Sperling also has been named to the State of California Climate Adaptation Advisory Panel. In November, Sperling also was invited to give a briefing at the White House on overall strategies to create a more sustainable transport system in the U.S., with a focus on future policy and incentives for vehicles, and in December he joined the California delegation at the UN Climate Conference in Copenhagen.

Ph.D. student **Adina Boyce** is the newest recipient of the ITS-Davis Greenlight Fellowship sponsored by AAA Northern California, Nevada & Utah. This AAA fellowship seeks to attract more minority students to the transportation field, specifically to encourage the

Adina Boyce

study of alternative fuels and other vehicle efficiency technologies. Boyce is interested in transportation network modeling with applications to the environment and fuel usage.

Anthony Eggert (left) and Dan Sperling in Copenhagen

Lauren Hilliard is this year's recipient of the Helene M. Overly Graduate Scholarship from the Women's Transportation Seminar (Sacramento Chapter). Hilliard, who was active in transportation as an undergrad and worked in the field, returned to school in 2009 to pursue an advanced degree. She is a graduate student researcher at the Urban Land Use and Transportation Center (ULTRANS).

Lauren Hilliard

TRB RECEPTION: Always a Big Time

Professor Pat Mokhtarian (center) with Stanford graduate student Deepak Merugu (left) and ITS-Davis alumnus Giovanni Circella (right)

Joe Krovoza (left) chats with TTP alumnus Brett Williams

Graduate students Jamie Davies-Shawhyde, Dana Rowan, and Justin Woodjack (left to right) enjoying the reception

TTP at TRB: recent alumna Laura Poff (left) and graduate student Alexander Allan

DECEMBER VISITORS: Year-end Look to the Future

ITS-Davis hosted its annual Board of Advisors meeting in early December. The meeting featured an overview of the Institute's 2009 activities, and a deep dive into key research programs including the Urban Land Use and Transportation Center (ULTRANS), the Air Quality Research Center, the Plug-in Hybrid Electric Vehicle (PHEV) Research Center, and the Sustainable Transportation Energy Pathways (STEPS) Program.

In early December, ITS-Davis hosted a brief stop-over of the Nissan Leaf electric vehicle on its nationwide tour in advance of its market launch next fall. Nissan is the first major automaker to announce it will market a full-function electric vehicle in the U.S., with California a major target market. Nissan is a longtime supporter of the Institute though the Corporate Affiliates Program. ITS-Davis and Nissan embarked on a major demonstration of city electric vehicles with the Nissan Hypermini earlier this decade.