

CTS Catalyst

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Accelerating the pace of transportation innovation

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Uncovering manufacturers' perspectives on the transportation system

It's no secret that manufacturing plays a key role in driving economic growth, or that transportation is essential for the success of any manufacturing operation. While the relationships among manufacturing, transportation, and economic growth have been studied on a large scale, however, there is often little dialogue between transportation organizations and the manufacturers themselves. A recently completed pilot study conducted jointly by the Minnesota Department of Transportation (MnDOT), the University of Minnesota Humphrey School of Public

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Resilient Communities Project offers new model for collaboration

Across Minnesota and throughout the country, there is a growing interest in new approaches to community sustainability related to a wide range of local issues, including transportation. In the past, many communities have connected with nearby research universities for one-time projects and partnerships. However, a new program at the University of Minnesota aims to build the practice of sustainability through deeper and broader community connections.

"Each year, we work intensively with one Minnesota community in order to advance its sustainability and resilience," says Resilient Communities Project (RCP) director Carissa Schively

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'Line to Leadership' training helps workers advance careers

The "gray tsunami"—the tidal wave of aging baby boomers—could mean big changes in the workplace. Organizations need to be thinking now about grooming their younger employees to become effective supervisors and fill the shoes of retiring boomers.

The Minnesota Local Technical Assistance Program (LTAP) partnered with Hennepin Technical College (HTC) this fall to help local transportation agencies meet this critical workforce development need. They offered a one-day workshop—"From Line to Leadership: Transitioning from Operations to Supervision"—in October in St. Cloud and Rochester.

"We hope for this to be the first in a series of workshops we offer in this category," says Mindy Carlson, LTAP training manager. Minnesota LTAP is a program of CTS.

The workshop is tailored for new supervisors and those thinking of taking their career to the next level, as well as for current supervisors who want to enhance their leadership skills, communication, and effectiveness. It focuses on avoiding common pitfalls and identifying ways to make the most of a leadership role.

Students brought a range of experience to the October classes. Todd Majorus, who became a foreman with Goodhue County Public Works this summer, found the class very useful. "I learned... about how to become a better boss—my strengths and my weaknesses," he says. Kurt Reblein, a maintenance supervisor/shop foreman in Albert Lea, has been a supervisor for more than 10 years. "I learned communication is a big thing," Reblein says. "The biggest issue is keeping everybody informed, keeping everybody on track, and keeping everybody happy."

Hennepin Technical College



The training helps meet a critical workforce development need.

developed the initial version of the workshop in collaboration with industry partners, and it has expanded the program in response to overwhelmingly positive feedback. HTC offers 8- and 32-hour classes throughout the year at its Eden Prairie facility and also conducts shorter, customized training sessions at organization work sites.

"Our industry partners said they wanted this training because they are anticipating a skills gap and a leadership gap, and they didn't have a way to effectively move people from operations to team leader," says Mike Colestock, HTC's associate dean.

The trigger to offer a version through Minnesota LTAP came in part from the Minnesota LTAP Steering Committee. "When many highway/street/public works departments need a new supervisor, they look to promote their existing employees since those employees know the facilities, the equipment, the mission of the organization—they know the ropes," says Greg Isakson, county engineer of

About
18%
**OF MINNESOTANS
OLDER THAN 65**
are in the labor force.

Source: State Demographic Center

Goodhue County and a member of the committee. "Unfortunately, the skills to operate a machine do not relate to supervising others. The operator with the best potential to become a supervisor may not possess the set of new skills required to become a successful supervisor. This class was designed to fill that gap and provide those basic supervisory skills," he explains.

The LTAP workshop is supported through funding from the Minnesota Local Road Research Board and the Federal Highway Administration and facilitated by the U of M's College of Continuing Education.

Helping GIs shift gears

Members of our armed forces serving in war zones take tremendous risks, even when just driving down a street. Because of threats from IEDs, snipers, or insurgents waiting to attack, service men and women develop driving habits such as running stop signs and swerving wide for any irregularity in the road.

But back home, driving habits that may have saved their lives can put them, and the lives and safety of others, at risk. To help service members returning from deployment readjust, University of Minnesota researcher Erica Stern studies the driving behaviors that many soldiers bring home and suggests ways to help them change those habits.

“For example, when they are deployed, any irregularity in the road could hide an IED, so soldiers swerve 10 feet [to avoid them],” says Stern, an associate professor in the U’s Program in Occupational Therapy, Allied Health Programs. “So returning soldiers tend not to straddle a pothole as we do. Instead, they might change lanes or go onto the shoulder. It’s a high-anxiety situation for them,” she says. “These driving behaviors are adaptive in war zones. They are a logical response to a stressful environment.”

Stern spent several years as a faculty fellow in the Rehabilitation and Reintegration Division of the Office of The Surgeon General of the Army. At the same time, she, along with two graduate students, surveyed the driving behaviors of 150 regional National Guard members who had returned from overseas deployments and 49 never deployed military (mostly ROTC students at the U).

Then, based on the survey results, one group of her advisees researched ideas for interventions and another used these ideas to draft self-help brochures, one for service members with driving issues and another for their families.

The survey shed plenty of light on the origins of driving issues. For example, soldiers developed behaviors regardless of whether they were usually a driver or a passenger while deployed. “Everybody in a military vehicle has a responsibility for surveillance, watching for an IED or an insurgent attack,”

Stern explains. “So driver and passengers both come back with behaviors.”

Soldiers can come back with quite different issues, says Stern. For example, those whose convoy would barely creep along to avoid being surprised by IEDs may, when driving U.S. roads, become anxious about driving fast because “they can’t watch the environment carefully enough.” Likewise, a soldier who had to jackrabbit between points A and B in Iraq may become anxious about slow driving back home and be more likely to speed on residential streets.

In following the progress of returnees across three months, the researchers found that driving behaviors gradually lessened and largely disappeared during that time, although anecdotes indicated that some specific behaviors may persist for 12 months or more. As for driving anxiety, it persisted at a higher level for returnees than for the nondeployed even after 90 days.

Since completing the regional study, Stern and co-principal investigator Todd Rockwood, an associate professor and expert in survey development and analysis in the School of Public Health’s Division of Health Policy and Management, have been carrying out a national survey funded by the Department of Defense. They are comparing the driving behaviors of soldiers who returned from deployment injury-free and soldiers who returned with a traumatic brain injury (TBI) to a control group that has never been deployed. The data are still coming in.

“Our goal is to offer suggestions for treatment,” says Stern. “We have already prepared the skeleton of a brochure for those with TBI.”

(Adapted from a UMNews article by Deane Morrison.)

Since the wars in Afghanistan and Iraq began, more than
TWO MILLION
U.S. TROOPS HAVE BEEN DEPLOYED,
including thousands of Minnesotans.



Scientists examine visions for achieving renewable fuel standards

How the United States goes about reaching Renewable Fuel Standard targets will have major consequences for the nation's landscape and environment. University of Minnesota scientists examine three U.S. federal agencies' visions of how the nation could meet the targets in a September 6 cover story in *Environmental Science & Technology*.

The Renewable Fuel Standard in the Energy Independence and Security Act of 2007 requires that 36 billion gallons of renewable fuel be blended into transportation fuel in the United States by 2022. Of that amount, 15 billion gallons are to be from conventional biofuels, most likely ethanol from corn grain. The other 21 billion gallons are to be advanced biofuels from feedstocks and sources of biomass other than corn grain.

"The Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Department of Agriculture (USDA) have all tried to address how the nation will meet the ambitious renewable fuels target, and all three scenarios are different," says Bonnie Keeler, lead author of the article. Keeler is a doctoral student in natural resources science and management in the University's College of Food, Agricultural and Natural Resource Sciences (CFANS) and a research associate at the Institute on the Environment (IonE).

Whatever way the nation goes about reaching the targets will have consequences for land use, land management, and the environment, Keeler says. Why? Recent studies have already shown that harvesting residues from existing cropland and timberland simply won't be enough. Other land will need to be converted to dedicated



biofuel crop production, Keeler says.

By comparing and contrasting the DOE's, EPA's and USDA's scenarios, University scientists aim to inform the discussion on this important policy issue, says Jason Hill, co-author of the article. Hill is an assistant professor in CFANS and an IonE resident fellow.

"There are many similarities and some very surprising differences," Hill says. What Minnesota's role will be in reaching the biofuels standard is one of those differences when it comes to perennial grasses. The USDA projects Minnesota will produce 750,000 to 1 million acres of perennial grasses in 2022, but the DOE and EPA project none.

"This is just one example of how there are large implications for agriculture

even at the state level," Hill says.

The article's authors hope their analysis brings the different federal agencies' modeling efforts to the forefront of the discussion and helps target research efforts to improve projections of future biomass production.

"The different visions we present in our article are already being used by the agencies for how they allocate research funds and how they distribute resources to assist biorefineries in securing loans, for example," Hill says.

The other authors of the article are Brian Krohn and Tom Nickerson, doctoral students in the Department of Bioproducts and Biosystems Engineering.

(Adapted from a College of Food, Agricultural and Natural Resource Sciences article by Patty Mattern.)

The Renewable Fuel Standard requires that
36 BILLION GALLONS
OF RENEWABLE FUEL

be blended into transportation fuel in the United States by 2022.

The Road to Renewal: **Private Investment, Public Trust Funds**

At the pump and in our tax bills, we all pay for road and bridge infrastructure. But what if the infrastructure could also pay you? A new approach—an investment public-private partnership (IP3) combined with a public trust fund—could not only generate substantial revenues, says Cornell University's Rick Geddes, it could also mean annual dividend checks for citizens.

Geddes, an associate professor in the Department of Policy Analysis and Management and director of the Cornell Program in Infrastructure Policy, will discuss this proposed approach at the CTS Winter Luncheon on February 12 in Minneapolis.

In the IP3 approach, Geddes says, the value embedded in U.S. infrastructure is released through pricing to make that pricing politically feasible. A portion of the wealth generated from lease concession agreements is preserved in perpetuity through a permanent fund—a type of public trust fund. Permanent funds are currently in use in Alaska, Alberta, Texas, Norway, and many other jurisdictions to preserve natural resource wealth, he says.

Following Alaska's example, Geddes proposes that investment income from the fund be used to provide an annual dividend payment to all households within newly priced regions. The IP3 thus creates direct citizen-stakeholdership in transportation infrastructure, which increases public support for pricing and encourages households to take a greater interest in infrastructure maintenance and operation.

Geddes was a commissioner on the National Surface Transportation Policy and Revenue Study Commission from May 2006 to January 2008. He is the author of *The Road to Renewal: Private Investment in U.S. Transportation Infrastructure* (AEI Press, 2011).

Register for the luncheon at cts.umn.edu/Events.



New model predicts reliability of asphalt pavements at low temps

Researchers in the U's civil engineering department have developed a new model that aims to more accurately assess the reliability of asphalt at low temperatures. The model could ultimately reduce the costs associated with laboratory testing and help improve road conditions by reducing the occurrence of low-temperature cracking.

According to Assistant Professor Jia-Liang Le, one of the challenges related to reducing low-temperature cracking is quantifying the large variability in asphalt pavement strength, even when it is made from the same batch of materials. Asphalt also behaves in a quasibrittle manner at low temperatures, which makes it difficult to understand the material's behavior or predict its failure rate with existing measures. This means that extensive laboratory testing may be required to accurately determine asphalt pavement strength with a low failure-probability rate.

In a CTS-funded project, Le and his team have developed a physics-based model for the probability distribution of the strength of asphalt pavements. The new model helps researchers accurately predict pavement reliability without testing thousands of samples in the lab. It also allows them to extrapolate results from a few laboratory tests on small specimens to larger real-world applications.

The new model works by determining the pavement's peak load—the point when a macro-crack begins. To determine this value, the model requires testing only a few sizes of asphalt specimens, Le says. And at each size, only three to five different samples need to be tested to get a mean value of the peak load. Using that information, the model can then calculate the probability distribution of the strength of these pavement samples.

"We found that it's possible for us to determine failure probability without extensive testing," Le says. "This could mean a significant reduction in experimental costs."

In a related project funded by the NCHRP, Le is developing a new pavement material that aims to achieve better crack resistance at low temperatures by reinforcing asphalt mixtures with nano-scale particles. The material is also expected to have damage-sensing capabilities, which will provide an efficient means to monitor pavement health.

EXPO AHEAD

Exhibitors sought for career expo

The 2014 Transportation Career Expo will be held February 18 from 4:30 to 7:15 p.m. in Coffman Memorial Union's Great Hall on the Minneapolis campus.

The expo allows companies, agencies, and professional organizations to network with students and recent graduates and tell them about their job or membership opportunities.

If your organization would like to exhibit at the expo, please register online by February 5. For more information, call Shawn Haag at 612-625-5608 or visit cts.umn.edu/Events/Careerexpo.

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Affairs, and University of Minnesota Extension aims to address this communication gap.

“We wanted to talk directly with a diverse group of manufacturers and carriers in southwest Minnesota in order to learn about their specific challenges, priorities, and needs,” says MnDOT market research director Donna Koren. “Using an innovative project methodology, we identified simple, rich, and actionable findings that will benefit the economy of both the region and the state.”

The pilot project focused on 12 counties in southwest Minnesota that make up MnDOT District 8. The research team began by identifying key industry clusters within the region; industry clusters have been shown to be driving economic forces because they sell outside the local, state, and national market—bringing money into the region and creating jobs in other economically dependent industries such as retail and food service. Ultimately, more than 172 regional businesses were contacted for participation in this project, and 75 in-person interviews were completed with manufacturers, shippers, and carriers.

“In order to best serve the transportation users in Minnesota and to make the best decisions that we can with limited transportation funding, we must understand the perspectives of the people we serve,” says Jon Huseby, MnDOT’s district engineer for this region and project sponsor. “In the context of this study, we chose to focus on businesses [that] have a very significant impact on the economy and quality of life in (Greater) Minnesota—that being manufacturers.”

The research team also viewed this project as a relationship-building tool. “We wanted to open the dialogue between MnDOT and these important regional businesses so that they would know how to ask for help if they needed it,” says Koren. “We also included economic development officials, chambers of commerce, regional development commissions, and county and city engineers in the project. We expect this will help us all find ways to work together to support economic growth.”

During the interviews, participants were encouraged to focus their comments on high-value, low-cost improvements that MnDOT can address in the short term without over-promising projects that currently cannot be funded. The result of these interviews was a wealth of new information and important findings in the areas of transportation infrastructure, operations and maintenance, communication,



Photo courtesy: Daktronics

The scoreboard at TCF Bank Stadium was one of the delicate products shipped from southwest Minnesota.

and policy. For example, findings included the need for smooth pavements and wide shoulders, the value of advance-warning lights at intersections with traffic signals, the importance of highway safety, the challenges of maneuvering oversized vehicles through roundabouts, and manufacturers’ desire for improved communications regarding such things as road conditions and detours.

“Some of the industry-specific transportation issues were eye-opening, such as the critical need for smooth routes to transport delicate, high-tech equipment without breakage and the importance of keeping vehicles transporting live animals constantly moving to ensure air circulation,” says Humphrey School research fellow Frank Douma.

The research team will compile the findings from the pilot program into a final report due out by the end of 2013. In the meantime, MnDOT is working to address a number of the challenges and suggestions uncovered through the pilot program. Then, agency officials will explore using the best practices developed in the pilot project to carry this program to other MnDOT districts and support economic vitality throughout the state.

READ CATALYST ONLINE

for links to research reports and other resources.

University of Minnesota reception at TRB

The University of Minnesota is hosting a reception for friends and alumni during the Transportation Research Board 93rd Annual Meeting in Washington, D.C. The reception will be held at Stone’s Throw Restaurant and Bar at the Marriot Hotel on Sunday, January 12, 2014, from 5:30 to 7 p.m.

Details are available at cts.umn.edu/Events.

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Slotterback. "This sustained and collaborative process fosters the development of a meaningful relationship between the University and the community and provides benefits to everyone involved."

The RCP was launched in 2012, largely through the grassroots effort of the University of Minnesota Sustainability Faculty Network—a group of more than 60 faculty members from diverse disciplines engaged in sustainability education. Initial support also came from the U's Institute on the Environment and the Center for Urban and Regional Affairs.

In the RCP's first year, a pilot partnership with the City of Minnetonka yielded 14 projects connected with 25 courses in more than 8 colleges. Several of those projects were related to transportation, including one project examining transportation demand management and another looking at transit-oriented development in the suburban environment.

"The major benefit of the Resilient Communities Project is the ability to complete projects that the city has identified as being important to the community," says Jeff Thomson, associate planner with the City of Minnetonka. "The resources that RCP brings to the community through the staff, faculty, and students provide a tremendous amount of knowledge, enthusiasm, and time."

For the 2013–2014 academic year, the RCP received proposals from seven communities interested in becoming the organization's next community partner. The City of North St. Paul was ultimately selected and has identified 21 community sustainability projects. RCP anticipates matching these projects

with more than 30 separate courses throughout the University.

Projects in North St. Paul related to transportation include building connections within the city's trail system and work on implementation of the city's Living Streets plan. "The community has faced challenges and opposition to advancing projects outlined in its current Living Streets plan," says Slotterback. "We're bringing together students and faculty from three different colleges to work together and document the range of benefits the city could realize with a Living Streets initiative."

Resilient Communities Project participants anticipate long-lasting benefits for their communities. "RCP infuses sustainability into all aspects of city operations," Thomson says. "It facilitates a larger discussion within the city regarding sustainability and

resiliency. Through RCP, the city also benefits from the relationships that are built with the University and its staff, faculty, and students. These relationships last after the partnership with RCP has ended."

Perhaps most importantly, this new model for community collaboration will provide far-reaching benefits that extend well beyond the partner communities. "Students will gain real-world experience in sustainability, faculty will have the opportunity to connect disciplinary knowledge to the larger issues of sustainability, and other communities and organizations will benefit from best practices generated from this innovative community-based practice," says Slotterback. "Ultimately, the project partners will become leaders in sustainability, helping to advance the practice of sustainability in the future."



A project in North St. Paul includes building connections within the city's trail system.

EVENTS CALENDAR

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