UNIVERSITY OF MARYLAND

Informed Impact

Maryland Transportation Institute

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COVER PHOTO: MARTIN FALBISONER, MARYLAND STATEHOUSE EXTERIOR

DIRECTOR'S MESSAGE

Sound information is a prerequisite for effective decision-making, both for individuals and societies. In the transportation arena, the results of policy decisions can often hinge on the knowledge that went into those decisions—knowledge about travel behavior and mobility needs, for instance, or about the factors that influence people's choices. Data, if properly gathered and analyzed, can help us develop best practices. It can help state and federal agencies take meaningful action to address the transportation challenges of our time, including congestion, environmental risks, and the need for greater equity.

With the passage of the Bipartisan Infrastructure Law (BIL) in late 2021, an unprecedented opportunity now exists to meet some of our most pressing needs, especially in areas where progress has been hampered in the past by a lack of funding. But the BIL presents its own set of challenges. Many stakeholders need technical assistance in understanding how the funding mechanisms work, what projects are eligible, and how to apply. Moreover, it is imperative we channel the resources available under the BIL into initiatives that are viable, sustainable, effective, and economically sound.

At the Maryland Transportation Institute (MTI), we specialize in providing the kind of data-driven research that can support responsible policy-making. With resources that include the world's largest transportation database—the Regional Integrated Transportation Information System (RITIS)—and a pool of faculty affiliates that spans departments across the University of Maryland System, MTI is a silo-breaking organization that is interdisciplinary to its core. We can illuminate multiple aspects of just about any transportation-related question, whether economic, technological, or environmental. With access to UMD's supercomputing cluster, meanwhile, we have the computational power needed to explore approaches such as modeling, simulation, and machine learning.

Capabilities like these have not gone unnoticed. As you'll learn in our cover story, we had the honor of hosting a delegation from the Maryland Transit Caucus, a group of state lawmakers dedicated to advancing transit and transportation-related legislation. At the federal level, the U.S. Department of Transportation and the Build America Bureau have tapped UMD for the operation of a new

Center of Excellence—known as the Build America Center (BAC)—that will provide technical assistance to stakeholders seeking to implement transportation infrastructure projects, including under the BIL. The new center is hosted by MTI.

In this edition of the MTI Annual Report, you'll learn more about what we have to offer, including a new online dashboard set up by the BAC to assist prospective applicants for BIL funding; recent and ongoing research by our faculty affiliates; and the activities of affiliated centers such as the Center for Advanced Transportation Technology Lab, the National Center for Smart Growth, the Traffic Safety Operations Lab, the Urban Mobility and Equity Center, and the UMD UAS Research and Operations Center. These vignettes offer a snapshot of the rich and varied work in progress at MTI.

Policymakers are driven by the goal of benefiting the public good, and that is a value we share. The work we do is not meant to be filed away on shelves in the ivory tower, but to support concrete action and initiatives. Since our launch in 2019, our focus has always been on closing the gap between research and action. That will remain our prime imperative in 2023 and beyond.

With warm regards,

Cinzia Cirillo
PROFESSOR AND ASSOCIATE CHAIR FOR GRADUATE PROGRAMS, CIVIL AND ENVIRONMENTAL ENGINEERING, UNIVERSITY OF MARYLAND

INTERIM DIRECTOR, MARYLAND TRANSPORTATION INSTITUTE

Critical issues, **informed legislation**

As Maryland lawmakers act on a range of transportation concerns, MTI is providing the needed research expertise and technical assistance.

From pedestrian safety to expansion of public transit, Maryland lawmakers are considering a variety of ways to make getting around easier, safer, more environmentally friendly, and more affordable. The Maryland Transit Caucus, a bipartisan group of state delegates and senators, has spearheaded bills on bicycle and pedestrian infrastructure, funding for Metro, light rail service to Southern Maryland, and reducing emissions, among other initiatives.

In 2022, the Caucus secured a major legislative victory with the adoption of the Maryland Regional Rail Transportation Act, which expedites plans to extend Maryland Area Rail Commuter (MARC) service into Virginia, and requires the Maryland Department of Transportation (MDOT) to advance projects that could make use of federal funds available through the Bipartisan Infrastructure Law passed in 2021.

As Caucus members move forward with their legislative priorities, they are turning to a resource located a short drive down the road from Annapolis—the University of Maryland (UMD) and its Maryland Transportation Institute (MTI), based at the A. James Clark School of Engineering. With more than 80 faculty affiliates from across the University of Maryland System, MTI offers a breadth and depth of expertise that can be marshaled in support of informed policymaking on a variety of transportation-related issues.

Notes Delegate Lorig Charkoudian, a Transit Caucus co-chair, "what we need is for legislation to be based on solid evidence, best practices, and input from communities. Informed legislation means better legislation."

In Fall 2022, a group of 20 Caucus members visited the UMD campus to learn more about the research support available at the university. At a day-long MTI event, faculty briefed them on current research concerning transportation in Maryland and how to make it more equitable, affordable, and green. The lawmakers also had the opportunity to meet with UMD Vice President for Research Gregory Ball, Clark School Dean Samuel Graham, Jr., and Nii Attoh-Okine, chair of the UMD civil and environmental engineering department.

Maryland Delegate Julie Palakovich Carr was instrumental in organizing the visit. She says the idea came about after she noticed significant overlap between the Caucus's priorities and the work being done at MTI. "I saw a number of MTI projects that could potentially have a direct impact on the work we are doing at the Caucus and as state lawmakers," she said.

Examples of overlap include a study being led by economist Anna Alberini (College of Agriculture and Natural Resources) on the potential impact of fare reduction on utilization of public transit, research by Allison Reilly (Department of Civil and Environmental Engineering) on access to transit during emergencies and natural disasters, a study by Xianfeng Yang (Department of Civil and Environmental Engineering) on smart mobility for underserved communities, and ongoing MTI work related to pedestrian and bicyclist safety.

Palakovich Carr and Charkoudian, the caucus co-chairs, are both interested in the concept of "complete streets," the subject of current research by MTI interim director Cinzia Cirillo, because of its potential to improve safety for bicyclists and pedestrians. Simply put, a complete street is one that integrates multiple transportation modes, including biking, walking, and public transit, within its infrastructure. As opposed to many conventional roadways, where pedestrians or bikers find themselves dodging vehicular traffic, a complete street is designed to make it easier and safer to get around without a car.

Such improvements dovetail with Vision Zero, an endeavor by Maryland to eliminate deaths and serious injuries on roadways by the end of 2030.

Notes Charkoudian: "A lot of work on road design has been done in the world of planning, which is important, but many of us are also trying to determine how to drive this from the world of policy, in terms of specific directives for the State Highway Administration and the Maryland Transit Authority. MTI's research can help us fine-tune our policy guidance."

Above all, MTI and more generally UMD research can ensure that initiatives have a solid grounding

A VISIT TO UMD BY THE MARYLAND TRANSIT CAUCUS IN FALL 2022 PROVIDED AN OPPORTUNITY FOR LAWMAKERS TO LEARN MORE ABOUT THE RESEARCH SUPPORT AVAILABLE AT THE UNIVERSITY.
PHOTO: AL SANTOS

Legislation put forward successfully in 2019 by Palakovich Carr commits Maryland to that objective, with similar programs having experienced success in Sweden and other European nations.

Maryland Senator and Caucus co-chair Malcolm Augustine, meanwhile, pointed to MTI's focus on equity and accessibility in transportation as a significant plus. "Given that I am in Prince George's County, I have a particular concern with utilization of public transit," he said. "Transit is the main option that we have available for ensuring mobility for disadvantaged or vulnerable populations."

As the legislature continues to engage these and other issues with direct bearing on the quality of life in Maryland, MTI expertise is a key part of the toolkit, Augustine said.

"The quality of the research is outstanding. What we learned during our visit was that work that is happening inside of MTI directly addresses questions that we are trying to work on as well. We're gaining knowledge, particularly with regard to transit and transit systems, that we can take and either apply to policy directly and/or apply to the presumed outcomes of policy."

in science, emphasized Palakovich Carr—who herself has a science background, having completed graduate work in biology prior to her career in public service.

"I often wish more scientists and researchers would weigh in on issues, whether in transportation or other areas. Lawmakers don't necessarily have specialized knowledge concerning the issues being addressed in a piece of legislation, and so it's important to have experts available who can provide testimony or engage with us in developing policy," Palakovich Carr said.

In all, seven UMD researchers delivered presentations during the Caucus visit. In addition to Alberini, Cirillo, Reilly, and Yang, the presenters included Ariel Bierbaum (Urban Planning, School of Architecture), who discussed the role of transportation and transit access in education equity, Partha Lahiri (BSOS, Joint Program of Survey Methodology), who discussed poverty mapping; and Paul Schonfeld (Department of Civil and Environmental Engineering), who presented public transit-related research.

"I OFTEN WISH MORE SCIENTISTS AND RESEARCHERS WOULD WEIGH IN ON ISSUES, WHETHER IN TRANSPORTATION OR OTHER AREAS. LAWMAKERS DON'T NECESSARILY HAVE SPECIALIZED KNOWLEDGE CONCERNING THE ISSUES BEING ADDRESSED IN A PIECE OF LEGISLATION."

Cirillo named MTI interim director

UMD-based research hub harnesses interdisciplinary expertise.

Cinzia Cirillo, professor of civil and environmental engineering at the University of Maryland (UMD), has been named interim director of MTI. During her tenure, she will work to advance the UMD research hub's mission of bringing together researchers from multiple fields to tackle today's most pressing transportation challenges.

An expert on travel behavior and a strong proponent of interdisciplinary collaboration, Cirillo's work spans areas such as discrete choice analysis, advanced transportation demand modeling, large-scale model systems, value of time studies, data collection and analytics, survey design, transportation and energy, new technology vehicles, and environmental impacts. She is currently chair of graduate programs at the UMD CEE department.

According to Cirillo, her primary aim as chair will be to maintain MTI's high level of service to the transportation community. "Our goal is continued excellence in research, education, and projects," she said.

MTI supports the state of Maryland, federal agencies, and national and international companies by providing a wellspring of expertise to tackle

transportation priorities, Cirillo noted. "Decision makers and stakeholders identify critical issues in the transportation system, and then we provide the research capabilities needed to address the challenges," she said.

These challenges include everything from reducing congestion and boosting the use of public transit to reducing pedestrian and bicyclist fatalities—all examples of research areas that MTI has tackled in recent months.

"Because transportation intersects with so many other societal and human considerations, progress in the field increasingly requires collaboration across disciplines," Cirillo said.

The institute embraces a data-driven approach, leveraging unique capabilities that include access

"DECISION MAKERS AND STAKEHOLDERS IDENTIFY CRITICAL ISSUES IN THE TRANSPORTATION SYSTEM, AND THEN WE PROVIDE THE RESEARCH CAPABILITIES NEEDED TO ADDRESS THE CHALLENGES."

to real-time mobile device data as well as the Regional Integrated Transportation Information System (RITIS), housed at the Center for Advanced Transportation Technology Laboratory.

Seed grants awarded by MTI have covered topics ranging from electric scooter mobility to the effects of eliminating fares on a city bus system. The latter project is being led by Cirillo in collaboration with Anna Alberini, a professor in the UMD Department of Agricultural and Resource Economics.

MTI also hosts the Build America Center, established as a resource to help decision-makers implement innovative highway project finance and delivery methods, including public-private partnerships (P3). Established in collaboration with the Federal Highway Administration and the Build America Bureau, the Center commenced its activities in April 2022.

In 2020, MTI made national headlines by standing up a COVID-19 Impact Analysis Platform that pulled in mobile device data in order to glean real-time insights into mobility behavior during the pandemic, compliance with social distancing guidelines, economic impacts, and other variables. These data-gathering capabilities continue to be utilized by MTI researchers on a wide range of projects, including a revamp of the U.S. National Household Travel Survey.

"We have people working on transportation problems everywhere on campus, including in economics, statistics, computer science, the iSchool, engineering, architecture, and public health," Cirillo said. "Because transportation intersects with so many other societal and human considerations, progress in the field increasingly requires collaboration across disciplines."

"But bringing people together from several departments is not easy," she added. "You need a structure to do this, and MTI provides such a structure. It is well-positioned to advance collaboration across multiple fields."

PHOTO COURTESY OF MORGAN STATE UNIVERSITY

Secretary Buttigieg visits UMEC

Meeting focused on issues related to equity and mobility.

The U.S. Secretary of Transportation, Pete Buttigieg, met with Dr. Mansoureh Jeihani, the director of the Urban Mobility & Equity Center (UMEC) and Dr. Oscar Barton Jr., the dean of Morgan State University's Clarence M. Mitchell Jr. School of Engineering to discuss equity and how it impacts mobility for everyone.

UMEC, an affiliate of the Maryland Transportation Institute (MTI), is a federally funded Tier 1 University Transportation Center housed at Morgan, a historically black college and university in Baltimore, Maryland, that offers degrees in Transportation and Urban Infrastructure Studies in its School of Engineering.

The goal of the USDOT's university transportation centers program is to conduct research that advances transportation and related technology. The program also develops the next generation of transportation professionals.

Morgan also offers an urban setting that itself serves as a lab for studying urban mobility.

As its name implies, UMEC's research considers equity implications in all of its research.

"We've conducted research into urban mobility issues such as the effect of COVID-19 on transit riders and operators, food deserts, equity in accessibility, shared bus and bike lane safety, pedestrian safety, and connected and autonomous vehicles, especially its effect on equity and mobility," Dr. Jeihani noted. "At the meeting we presented how we research equity impacts and these issues, and then enjoyed a lively question and answer session with Secretary Buttigieg."

She added that "transformation and innovation are key outcomes in what we do," and noted that as a minority-serving institution known for its transportation and engineering programs, "we want to do more and better."

Also present were Dr. Robert Hampshire, Deputy Assistant Secretary for Research and Technology, and Ms. Dawn Tucker-Thomas, Senior Transportation Specialist and Federal Grants Manager, who happens to be an alumnae of Morgan.

MTI, JPSM host **2022 SAE conference**

International event covers emerging trends in small area estimation.

THIS YEAR'S CONFERENCE DREW MORE THAN 250 PARTICIPANTS.
PHOTO: AL SANTOS

The 2022 Small Area Estimation (SAE) International Conference was held in May at the University of Maryland. The event, hosted by the Maryland Transportation Institute in collaboration with the Joint Program in Survey Methodology (JPSM) and the Department of Mathematics, was held both in-person and virtually, and drew more than 250 participants from across the globe; visit sae2022.org for detailed information about the conference.

The annual SAE conference serves as a bridge among statisticians, survey methodologists, engineers, economists, mathematicians, computer scientists, and others interested in combining information from multiple databases in developing reliable inferences at granular levels.

Conference sessions also covered emerging topics in survey and official statistics, such as nonprobability sampling, probabilistic record linkage, and data fusion.

KATHERINE ABRAHAM
PHOTO: AL SANTOS

Keynote speakers included David Newhouse of the World Bank Group, Andrew Gelman of Columbia University, and UMD Distinguished University Professor Katherine Abraham.

"The event provided a valuable opportunity to exchange ideas, insights, and experiences, particularly with regard to emerging role of big data," said MTI Interim Director Cinzia Cirillo, who organized the event together with JPSM Director Partha Lahiri. "SAE 2022 was an invigorating experience that reflected the dynamism of the field today."

Noted Lahiri: "In recent years, there is a growing demand from different survey organizations to use SAE to produce disaggregated statistics. SAE essentially uses statistical models to extract information from multiple existing disparate databases and hence is much more cost effective than traditional methods that require new data collection."

Established in 2019, MTI serves as a data hub for researchers across a variety of fields at UMD, including transportation engineering, economics, public health, public policy, and urban planning. Resources available at MTI include the Center for Advanced Transportation Technology Lab's Regional Integrated Transportation Information System as well as extensive location and geospatial data gathering capabilities.

Chang, students honored with **Mickle Award**

A UMD research team wins one of the transportation field's most prestigious honors for a study that could help MDOT clear highways more quickly after an incident.

A team of University of Maryland (UMD) transportation researchers led by Professor Gang-Len Chang has won the D. Grant Mickle award, given each year by the Transportation Research Board National Academy for the best paper in the area of operation, safety, and maintenance of transportation facilities.

Corresponding authors Yen-Lin Huang, Yi-Ting Lin, and Chang officially received the award for their paper, "Extending the I-95 Rule-based Incident Duration System with an Automated Knowledge Transferability Model," at the 2023 Transportation Research Board annual meeting in January. Their work won the TRB Freeway Operations Committee's Best Paper award and was then selected for the Mickle award from among 90 papers nominated by TRB committees.

In their paper, the UMD researchers presented a method that can help expand the scope of a model used in highway incident response without a large increase in cost and resources.

Accidents and other highway incidents can lead to long delays for commuters and increase congestion. To mitigate these effects, many state highway agencies utilize Traffic Incident Management (TIM) systems, which allow them to detect, respond to, and clear traffic incidents with greater efficiency. An effective TIM system can reduce the clearance duration of detected incidents, and minimize the resulting impacts on traffic delay and safety.

As part of its TIM system, the Maryland Department of Transportation (MDOT) has made successful use of a rule-based incident duration prediction model (IDPM) that covers Interstate highways I-95, I-495, and I-695. In brief, the model draws from incident records to make predictions which can then be used in response planning and resource allocation.

With the model having proved effective, MDOT is now planning to extend it to cover highway systems throughout the state. Doing so, however, requires obtaining sufficient incident data to properly calibrate the model's parameters—and harvesting that data can be both time and labor-intensive.

The method proposed by Huang and his colleagues could help overcome that challenge. In their paper, the researchers put forward a knowledge transferability analysis (KTA) method, making use of an automated process that can assess, select, and transfer existing prediction rules in order to estimate incident durations on a new target highway.

Tests of this approach with two different data sets yielded accuracy levels of 82% and 87%, respectively. According to the authors, these rates are comparable to the current IDPM's performance, but require far fewer records for model calibration.

"Most real-world transportation problems face insufficient data," Huang said. "Our study sheds light on the power of such precious and hard-earned data. That is its main contribution."

"It was an honor for us to receive the award and we feel grateful for being recognized. It motivates us to continue high-quality work and help solve additional transportation issues, thus helping to bring about a better transportation environment," he said.

Professor Chang, likewise, emphasized the importance of building on the team's success. "We are certainly pleased with the award, but I also remind my students that we should be humble and committed to doing further high quality work to bridge the gap between state of the art and state of the practice," he said.

The D. Grant Mickle Award was established in 1976. It honors the fifth TRB executive director, who was later appointed a member of the Board's Executive Committee and became its 33rd chairman.

Huang, Lin, and Chang received their Certificate of Award at the TRB meeting's Thomas B. Deen Distinguished Lecture and Presentation of Awards on January 9.

"IF WE ARE GOING TO SOLVE THE GRAND CHALLENGES OF OUR TIME, FROM CLIMATE CHANGE TO SOCIAL INEQUALITY, IT WILL DEMAND IMAGINATION AND INNOVATION IN OUR INFRASTRUCTURE, FROM DESIGN AND MATERIALS TO FINANCING, TO TECHNOLOGY AND BUILDING LONGER LASTING STRATEGIES."

UMD PRESIDENT DARRYLL J. PINES AT THE BUILD AMERICA BETTER SYMPOSIUM ON APRIL 11. PHOTO CREDIT: STEPHANIE CORDLE

New Build America Center to help guide implementation of bipartisan infrastructure law

A historic opportunity exists for states and the nation as a whole to make urgently needed improvements to transportation infrastructure, according to speakers and panelists at the Build Infrastructure Better Symposium, held at the University of Maryland (UMD) on Monday, April 11.

The symposium, which featured two expert panel sessions, doubled as the official launch ceremony for the Build America Center, a new hub established at the UMD civil and environmental engineering department in partnership with the Federal Highway Administration and the Build America Bureau. The center director is Qingbin Cui, a UMD professor of civil and environmental engineering who is considered a leading expert on highway project financing.

Carlos Monje, under secretary of transportation for policy at the U.S. Department of Transportation, delivered a video keynote address, noting the important role to be played by the center in assisting regional, state, local, and tribal authorities as they implement landmark infrastructure legislation adopted by Congress in late 2021. "The new center is a critical tool to deliver meaningfully better projects," Monje said.

The legislation, known formally as the Infrastructure Investment and Jobs Act but widely referred to as the Bipartisan Infrastructure Law, provides $1.2 trillion in funding to help rebuild and renovate highways, roads, and bridges, spur more widespread use of electric vehicles, and ramp up public transit. The Build America Center, led by UMD in partnership with Georgia Tech, Purdue, Virginia Tech, and Stanford, will advance the process by providing technical assistance and expertise to authorities seeking to make the most effective use of the available funds.

"The center will complement the work of our five regional infrastructure accelerators all across the country to create technical capacity for project sponsors, particularly in rural and tribal areas, and to assist them to think outside of the box and explore innovative approaches to fund and deliver shovel-worthy projects," Monje said.

Such approaches include public private partnerships (P3) as well as credit and grant programs accessible through the Build America Bureau, a federal agency with responsibility for spearheading transportation infrastructure projects.

Build America Bureau Executive Director Morteza Farajian was among the featured speakers at the launch event, along with Federal Highway Administration Chief Financial Officer Brian Bezio.

In rebooting the nation's infrastructure, decision-makers cannot simply "build it the way that it was," Farajian said, urging decision-makers to explore "cutting-edge technologies and innovative funding and financing options that may be different from what we used to see in the past."

The opportunities provided by the bipartisan infrastructure bill also come with enormous responsibilities, Bezio noted in his remarks.

"Cities, towns, counties, and tribes will all get millions of dollars in access to discretionary grants," Bezio noted. "Each new grant recipient will need to manage the many financial and project management responsibilities that come with federal aid dollars. This is where the center can play a very significant role in helping to deliver the program. Another challenge is managing these funds and delivering the most value as soon as possible."

Also speaking at the event were Alba Torrents, interim chair of the UMD civil and environmental engineering department, and Maryland Engineering's Dean Samuel Graham, Jr., who pointed to the pacesetting transportation resources available at UMD, including the Maryland Transportation Institute and the Center for Advanced Transportation Laboratory, which hosts the world's largest transportation database.

UMD President Darryll J. Pines, meanwhile, noted that infrastructure improvement is among "the grand challenges of our time," which also include climate change and social inequality. Solving these challenges "will demand imagination and innovation in our infrastructure, from design and materials to financing, to technology and building longer lasting strategies," Pines said.

The two expert panels at the Build Infrastructure Better Symposium focused on state implementation of the infrastructure law and on financing and delivery methods. Panelists included Shawn Wilson, secretary of the Louisiana Department of Transportation and Development and president of the American Association of State Highway and Transportation Officials (AASHTO); James Ports, Jr., secretary of the Maryland Department of Transportation; Yassmin Gramian, secretary of the Pennsylvania Department of Transportation; Roger Millar, secretary of the Washington State Department of Transportation and vice president of AASHTO; Sam Beydoun, project development lead at the Build America Bureau; Patrick DeCorla-Souza, P3 program manager at FHWA; Mark Sullivan, director of the FHWA's Center for Innovative Finance Support; Jaclyn Hartman, chief financial officer at the Maryland Department of Transportation; and Tom Curtin, infrastructure program director at the National Governor's Association.

The panels were moderated, respectively, by Farajian and Sullivan.

THE SYMPOSIUM FEATURED EXPERT PANELS ON THE BIPARTISAN INFRASTRUCTURE LAW AND ON PROJECT FINANCING. PICTURED, FROM LEFT: MARYLAND DEPARTMENT OF TRANSPORTATION SECRETARY JAMES PORTS; PENNSYLVANIA DEPARTMENT OF TRANSPORTATION SECRETARY YASSMIN GRAMIAN; ROGER MILLAR, SECRETARY OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND VICE PRESIDENT OF AASHTO; AND SHAWN WILSON, SECRETARY OF THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT AND PRESIDENT OF AASHTO. PHOTO CREDIT: THAI NGUYEN

New platform identifies **infrastructure funding opportunities**

Dashboard will help states make the most of the 2021 Bipartisan Infrastructure Law.

In Fall 2021, both parties in Congress came together to pass sweeping legislation that funds badly needed infrastructure projects in the United States, from new highways to improved public transit.

The funding opportunities are impressive. But state, municipal, and local officials don't always know how to submit proposals or bid on projects covered by the new legislation, and many lack the personnel and resources needed to navigate the process.

A new dashboard set up at the Build America Center (BAC)—a University of Maryland (UMD)-led center that aims to provide technical assistance to agencies and other stakeholders—will help.

Available to government agencies, community organizations, consulting firms, and the general public, the BIL Launchpad, accessible online at bilaunchpad.com, will provide at-a-glance information about funding opportunities available under the Bipartisan Infrastructure Law (BIL), also known as the Infrastructure Investment and Jobs Act (IIJA).

"Local public agencies need technical assistance to get access to the federal grants under the IIJA, and may not have the necessary workforce and experience," said Build America Center Director

Qingbin Cui, a professor of civil and environmental engineering at UMD. "A trillion dollars' worth of funds are available, but the local agencies need to know how to access this funding."

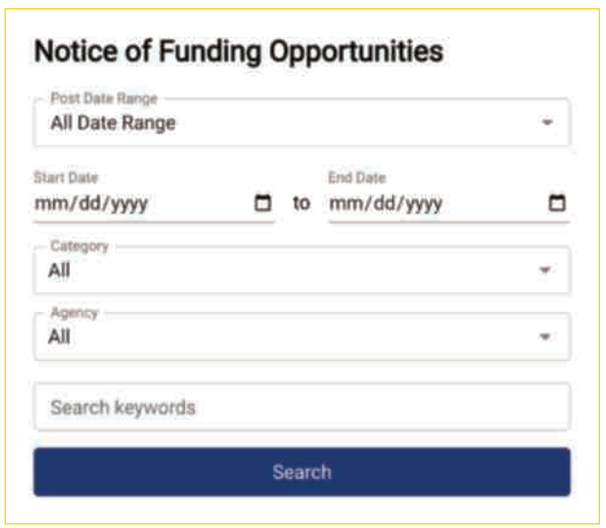
"The BIL Launchpad was developed by our Build America Center to help local public agencies with critical tasks, such as navigating the funding opportunities. Based on your organization type, we can narrow down the funding opportunities and identify the ones for which your organization is eligible," Cui said.

"We can also help organizations plan ahead for funding opportunities in the future. As application windows are typically very short, an organization may find it challenging to identify the best project and develop a competitive application. Our BIL Launchpad helps localities understand the funding opportunities in the past and therefore plan ahead on an annual basis." Cui said.

Moreover, the platform will facilitate collaboration among organizations, including public agencies, allowing applicants to leverage these agencies' expertise. Organizations will be able to bundle projects together so that they can meet the funding requirements, and they can also reach out to consulting firms who can help them with the grant applications.

"We want to ensure that every community can leverage and navigate the funding opportunities that they are eligible for." Cui said.

The BAC, based at UMD and led by Cui, is a multi-institutional partnership with the U.S. Department of Transportation and the Build America Bureau. It was launched in 2022 with a mission to provide technical assistance to decision-makers, enabling them to make the most effective use of available funds. Other partner institutions in the BAC include Georgia Tech, Purdue, Virginia Tech, and Stanford.



Niemeier selected for Bower Award

Clark Distinguished Chair is honored for her research on transportation, climate, and equity.

Deb Niemeier, Clark Distinguished Chair of Energy and Sustainability at the University of Maryland's (UMD) A. James Clark School of Engineering, has been awarded the Franklin Institute's 2023 Bower Award and prize for Achievement.

The award honors Niemeier for "pioneering the advancement and application of knowledge at the intersections among infrastructure, environment, public health, and equity through groundbreaking research on transportation systems, and climate-related hazards," according to an official press release from the Institute.

A National Academy of Engineering (NAE) member, Niemeier joined the UMD civil and environmental engineering faculty in 2019. In 2022, she became director of the Center for Disaster Resilience, an interdisciplinary research hub, based at the UMD civil and environmental engineering department, which specializes in better understanding and addressing the risks posed by natural hazards, including extreme weather. She previously served as acting director of the Maryland Transportation Institute (MTI), and remains an MTI faculty affiliate.

Over the course of her distinguished career, Niemeier has helped spur policy and regulatory changes through groundbreaking research in the areas of vehicle emissions, air quality, affordable housing, and infrastructure funding, both nationally and internationally. More recently, she has focused on aspects of the built environment that give rise to structural inequality, particularly within the context of climate change. She is a Guggenheim Fellow, a AAAS Fellow, and a recipient of the Perry McCarty AEESP Founders' Award for her exceptional and tireless leadership in research, education, and service. In 2021, she was elected a member of the American Philosophical Society.

Expressing her gratitude at being selected for the Bower Award, Niemeier drew attention to the importance of a community focus.

"Much of the STEM culture at universities is focused on entrepreneurship, so the societal contributions faculty make on ways to repair and strengthen communities can be underappreciated," she said. "This award reflects an understanding of the value of useful knowledge, in Franklin's perspective, for making lives better. I am very honored to have been chosen."

Yang joins UMD faculty

Dr. Xianfeng "Terry" Yang has joined the civil and environmental engineering faculty at UMD as an assistant professor (Transportation Engineering). His research areas include traffic operations with connected automated vehicles, machine learning for smart mobility, emergency evacuation, and transportation equity.

Yang is a 2021 recipient of an NSF CAREER award and has published over 120 peer-reviewed articles in journals and conferences. His research has received funding from the National Science Foundation (NSF), the US Department of Transportation (USDOT), the Department of Energy (DOE), the Federal Highway Administration (FHWA), and the Utah Department of Transportation (UDOT). Since 2017, his research has attracted over $7.5M in grants. He is currently an editorial board member of Transportation Research, Part C, Associate Editor of *ASCE Journal of Urban Planning and Development*, Associate Editor of *IEEE OJ- Intelligent Transportation Systems*, and Handling Editor of *TRB Transportation Research Record*. Yang is chair of the INFORMS JST ITS committee and secretary of the ASCE Artificial Intelligence committee. He is a member of two TRB committees, Traffic Signal Systems (ACP25) and Disaster Response, Emergency Evacuations, and Business Continuity (AMR20).

Who we are

Led by the University of Maryland, MTI brings together interdisciplinary transportation expertise from across Maryland universities to develop and deploy innovative solutions that address urban and rural transportation problems. Through partnerships with our government, non-profit, and private-sector collaborators, MTI helps pioneer cost-effective ways to improve safety, reduce congestion, promote sustainability, enhance equity, and preserve infrastructure. With our team of leading international experts in engineering, planning, data analytics, computer and information sciences, social sciences, business and logistics, public policy, public health, and the humanities, MTI is uniquely equipped to foster new approaches that fuel community and economic development in Maryland and beyond.

WHAT WE DO

- Big Data & Data Analytics
- Connected & Automated Transportation
- Economics & Policy
- Freight & Logistics
- Infrastructure
- Modeling & Simulation
- Planning & Environment
- Performance Monitoring & Management
- Safety & Security
- Traffic Operations & Control

MTI AFFILIATED CENTERS AND LABS

- Bridge Engineering Software and Technology Center
- Center for Advanced Life Cycle Engineering
- Center for Advanced Study of Communities and Information
- Center for Advanced Transportation Technology
- Center for Advanced Transportation Technology Laboratory
- Center for Geospatial Information Science
- Center for Global Sustainability
- Center for Health and Risk Communication
- Experimental Economics Laboratory
- FAA Consortium in Aviation Operations Research
- Human Computer Interaction Laboratory
- I-95 Corridor Coalition
- Interindustry Forecasting Project
- Maryland Transportation Technology Transfer Center
- National Center for Smart Growth Research and Education
- Supply Chain Management Center
- Traffic Safety and Operations Laboratory
- UAS Research and Operations Center
- Urban Computing Laboratory
- Urban Mobility & Equity Center

MTI UNIVERSITY PARTNERS

University of Maryland · Morgan State University · University of Maryland Baltimore · University of Maryland Eastern Shore · Frostburg State University

Better roads, safer driving

UMD researchers have partnered with Maryland's SHA to develop an improved pavement mixture design procedure.

A smooth and safe drive depends on good-quality pavement. If the roadway is cracked, rutted, bumpy, or pothole-infested, the result can be damage to vehicles. It can also cause accidents, as rainwater pools in the ruts and hollows, increasing the risk of hydroplaning.

Pavement quality depends on the materials being used and how well they perform over time. Measuring that performance, however, isn't an easy task. For close to two decades, state agencies have used different methodologies, with varying degrees of success.

"The approaches tend to be either too simple or too complicated," said Dimitrios Goulias, associate professor of civil and environmental engineering at UMD. Too simple means not enough variables are being monitored to produce accurate results. Too complicated means so many variables are measured that the process becomes cumbersome and creates as much noise as it does information.

With support from the Maryland State Highway Administration and the Federal Highway Administration, Goulias and UMD civil and environmental engineering doctoral student Anjuman Akhter have set out to develop a more workable approach—one that locates the happy medium between the simplistic and the overly complex. As Goulias explains, "we're looking for a balance. Our goal has been to identify which specific variables and processes will work in measuring the performance of these mixes, and then to incorporate these measurements into the design. This is called Balanced Mix Design."

"We look at the volume, density, and mass of the different ingredients, and then we factor in the critical performance criteria that can result in failures. We then identify an appropriate testing process," he said. Using this approach, Akhter and Goulias have tested and evaluated more than eighteen types of pavement mixtures.

Work on the project was conducted at the civil and environmental engineering department's Whiting-Turner Infrastructure Laboratory, with additional tests at SHA facilities. The team's balanced mix design approach is being considered for adoption by several agencies in the US for asphalt mixtures for roadway construction. Shadow construction projects "are being currently examined for assessing the methodology and fine-tuning the acceptance threshold criteria."

"LESS MAINTENANCE WILL BE REQUIRED, SO YOU'LL SEE FEWER WORK ZONES AND CLOSED-OFF LANES. LESS REQUIRED MAINTENANCE ALSO MEANS LOWER COSTS TO THE STATE, AND ULTIMATELY THE TAXPAYER."

Drivers can expect a number of tangible benefits in the future as pavement performance is measured more accurately, Goulias said. "Roadways will last longer and be in better condition, with little or no cracking and rutting. Less maintenance will be required, so you'll see fewer work zones and closed-off lanes. Less required maintenance also means lower costs to the state, and ultimately the taxpayer," he said.

A UMD civil and environmental engineering faculty member since 1999, Goulias has partnered frequently with state agencies on projects related to highway and bridge materials, pavement structures, quality control and risk analysis, and incorporation of recyclable and/or sustainable materials. Much of his recent work has focused on the development of "green highway" systems with a smaller emissions footprint compared to traditional approaches.

Reining in the hazards of **excessive speed**

CATT Lab data helps states implement anti-speeding measures and assess their effectiveness.

Indian Head Highway (MD 210), which connects Washington, D.C. with suburban communities in Charles and Prince George's counties, has come to be known as one of the state's most dangerous roadways, with speeding blamed for a high number of crashes and pedestrian deaths each year. To help make the highway safer, the CATT Lab has been assisting the Indian Head Highway Area Action Council with a rapid response analysis that provides recommendations on locations for mobile automated speed enforcement cameras, based on analysis of XD vehicle probe data.

Probe Data Analytics (PDA) from the CATT Lab are also being used by other states in their efforts to put a brake on speeding through targeted enforcement, signage, and educational programs. In Oregon, analysts from the state Department of Transportation are using the CATT Lab data to assess the effectiveness of localized law enforcement efforts. PDA can deliver insights on the variation in speeds along multiple segments of highways before and after enforcement measures are put in place.

Tracking causes of **congestion**

Innovative app provides more comprehensive monitoring

The CATT Lab released its Causes of Congestion dashboard for the National Highway System in late 2021, providing a powerful new tool that can be used by state transportation agencies to help determine which safety countermeasures and congestion mitigation strategies may have the biggest impacts. The app incorporates a new methodology for utilizing real-world data, developed at the CATT Lab in partnership with dozens of state Departments of Transportation (DOT) and the Bureau of Transportation Statistics, and represents a significant improvement over the original, 17-year-old Federal Highway Administration Causes of Congestion pie chart. It fuses weather, speeds, signals, incidents, holidays, and work zone data to pinpoint the locations and severity of congestion and to assign a probable reason or "cause" of said congestion.

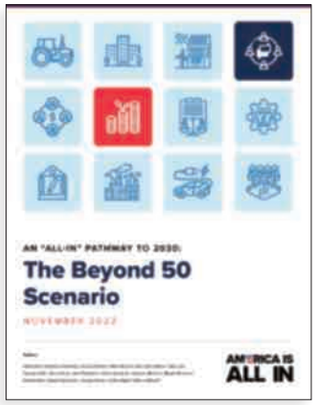
Several states are already using the results of this data to justify continued investments in operations strategies. The Florida DOT has also used this information as part of a broad proclamation for Crash

SOURCES OF DISRUPTION NATIONWIDE
$45.84B USER DELAY COST **$ 1.75B** VEHICLE HOURS OF DELAY

Responder Week to impress upon the public and legislature the criticality of transportation operations. An even more detailed version of the application is now available exclusively to state DOT officials for analyzing the causes of congestion on nearly any road and any date range. Data are updated weekly.

To try out a free version of the app, visit https://ritis.org/archive/congestion.

CGS analysis: Zero-emissions vehicles, closure of coal plants, clean energy mandates key to meeting climate targets



Bottom-up action from states, cities and businesses, combined with ongoing federal leadership, can enable the United States to meet its 2030 climate target of 50-52% emissions reductions from 2005 levels, according to an in-depth analysis released by UMD researchers and a sweeping coalition of leaders who support climate action.

The report from the Center for Global Sustainability (CGS) and "America Is All In" coalition was presented by its co-chair, Michael R. Bloomberg, the United Nations secretary general's special envoy, at the UN Climate Change Conference, or COP27, in Sharm El-Sheikh, Egypt. The paper's analysis and writing were led by CGS with support from the World Resources Institute, clean energy nonprofit RMI and partners at the coalition, which includes leaders from thousands of U.S. cities, states, tribal nations, businesses, schools, and faith, health and cultural institutions.

The report found that implementing all current policies at federal and non-federal levels would bring the United States to a 39% reduction in greenhouse gas emissions from 2005 levels by 2030. To close the gap and achieve the U.S. climate target, the "Beyond 50" scenario presented in the report recommends:

- Adopting zero-emission vehicle sales targets and mandates;
- Accelerating retirement of all existing coal plants;
- Implementing state-of-the-art fugitive methane leak recovery along with climate-smart agricultural practices;
- Setting "buy clean" standards for industrial facilities to increase production efficiency and encourage use of clean fuels and carbon capture and storage.

The majority of U.S. emissions reductions must occur from the power sector (30%), transportation sector (9%) and methane sector (4%); achieving these goals requires increased ambition from cities, states, businesses and other actors, the report said.

To read the full report, visit go.umd.edu/Beyond50

Pinpointing the region's **worst bottlenecks**

Washington D.C.'s Channel 7 News references RITIS analytics.

The nation's capital is famous for its monuments, galleries, lively cultural life…and frequent traffic snarls. But what are the most congestion-prone parts of the region? In 2021, Channel 7 News—an ABC affiliate—reported on the answer to that question, with sections of I-95 and DC-295 emerging as the top locations for traffic tie-ups.

The Channel 7 report drew from an analysis conducted by the Metropolitan Washington Council of Governments of the top ten bottlenecks in the region produced using the Regional Integrated Transportation Information System (RITIS), developed at the Center for Advanced Technology Transportation Lab (CATT Lab).

RITIS users can produce their own Top 10 Bottleneck reports, using a set of new algorithms and communications templates created for the RITIS system by the CATT Lab.

For more information on RITIS, visit www.ritis.org

National Center for Smart Growth

A SCENE IN DOWNTOWN FREDERICK, MARYLAND. PHOTO: CITY OF FREDERICK

When the new light rail service known as the Purple Line opens in Maryland, the benefits will be many: improved accessibility, fewer cars on the road, reduced congestion and emissions, and the ability to travel quickly across the northern DC-area suburbs, without having to ride into the city center and then back out.

But the line will have other impacts as well, some of which could pose problems for local residents. The line's route travels through a number of lower-income communities, including Langley Park, and public transport is known to raise housing prices. Some worry that residents could be driven out by gentrification, or that the line could encourage still more construction and development in areas that are already saturated.

When policymakers seek to gauge such impacts—and come up with ways to mitigate them—they can turn to research produced by UMD's National Center for Smart Growth (NCSG), an interdisciplinary research hub that conducts studies and educational programs designed to promote sustainable development. In 2015, the NCSG formed the Purple LIne Corridor Coalition (PLCC), which brings together stakeholders from across Maryland's Prince George's and Montgomery counties, including county and municipal officials, advocates, and NGOs.

"We're particularly interested in the equity impacts," said the NCSG's executive director, UMD urban studies and planning professor Gerrit Knapp. "Transit has a lot of beneficial impacts in providing new accessibility and getting cars off the road, but it also has the potential to spur gentrification."

Though it won't be open to riders until at least 2026, the Purple Line is already affecting markets and housing affordability, he said. "Construction is taking place that disrupts the local business environment, and we think those effects are being borne disproportionately by very small businesses, often businesses of color. We've set out a strategy that aims to preserve affordable housing and preserve the small businesses in the corridor, while also providing employment opportunities."

Among other tools, the center recommends inclusionary zoning, which requires that a certain percentage of new development meet affordability criteria, and "right of first refusal," which empowers current residents to purchase a property if it goes on sale. The state can also provide funding to support affordable housing.

Like the center's work in general, its Purple Line research is not simply an academic exercise but is meant to support thoughtful policymaking. "This is not just ivory-tower research that ends up gathering dust in the archives of some journal," Knapp said. "We're out to have an impact."

Crucial as the Purple LIne project is, it represents only one facet of the NCSG's work. The center has just received a $400k award to develop a guidebook for equitable transit from the National Highway Research Program, in partnership with the Urban Institute. It has also just signed a contract with WMATA to conduct travel demand modeling of the WMATA system, with the goal of predicting ridership at specific locations. In both projects, the NCSG will be bringing robust research experience and top-rung expertise to the table. "We've walked the walk," Knapp said.

For more information about the NCSG, visit umdsmartgrowth.org

Traffic safety and operations laboratory

Crashes and other highway accidents don't only affect the drivers involved. Secondary roads may become congested as vehicles seek alternate routes, and lane closures can cause backups that stretch for miles. The disruptions can be widespread and take hours to resolve.

It's the job of transportation agencies to keep these impacts at a minimum, and one they can do more easily if they can predict how long an incident will last. At the University of Maryland's Traffic Safety and Operations Lab, researchers have devised tools that allow them to do just that.

The goal, says lab supervisor and UMD transportation engineering post-doc Yao Cheng, is to "provide support to transportation agencies so they can devise better operational strategies, and give them a better understanding of traffic conditions."

When a crash occurs, for instance, agencies may need to decide whether to channel traffic by means of a detour, or whether to close ramps to limit access to the affected stretch of highway. They might need to adjust signal control settings on the parallel arterial in order to better accommodate rerouted traffic. "If we understand the incident better, we can provide better traffic control and operations," Cheng said.

Researchers at the lab, which is directed by UMD Civil and Environmental Engineering Professor Gang-Len Chang, have been developing an algorithm-based suite of tools that agencies can use to assess the duration of an incident, as well as other factors. A paper detailing the research won the Transportation Research Board's D. Grant Mickle Award, one of the most prestigious recognitions available in the field.

The paper, "Extending the I-95 Rule-Based Incident Duration System with an Automated Knowledge Transferability Model," was authored by doctoral students Yen-Lin Huang and Yi-Ting Lin, along with Dr. Chang.

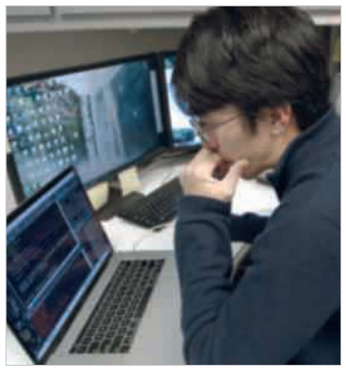
That research, however, represents only one aspect of the lab's work. With funding from both federal and state agencies, the center conducts a variety of projects focused on traffic control and operation, traffic simulation, travel time estimation, real-time traffic monitoring, emergency evacuation, traffic safety analysis and evaluation, intelligent transportation systems, and innovative highway design.

A SCREEN IN THE TRANSPORTATION SAFETY AND OPERATIONS LAB DISPLAYS AN INTEGRATED MULTI-MODAL SYSTEM EMERGENCY EVACUATION SYSTEM FOR THE BALTIMORE METROPOLITAN AREA.
PHOTO: LEE GILLENWATER

Notably, Chang and his students have contributed to improved safety at intersections by developing technologies that can reduce accident risks in the so-called "dilemma zone"—the area ahead of traffic signals where approaching drivers are faced with a choice—brake quickly and come to a sudden stop, or try to beat the light.

A smart sensor system developed at Chang's center can track approaching traffic and adjust the timing of the lights as needed, making the dilemma zone an easier puzzle for drivers to solve. The system has been implemented at several incident-prone intersections around Maryland.

All of the lab's work is done in partnership with state transportation authorities. Currently, through the Applied Technology and Transfer Analysis Program (ATTAP), established in 2005 through a partnership between UMD and Maryland Department of Transportation State Highway Administration, the center provides technical assistance to the Office of Traffic and Safety.



YEN-LIN HUANG, A RESEARCH ASSISTANT AT THE UNIVERSITY OF MARYLAND (UMD), WORKS IN THE TRANSPORTATION SAFETY AND OPERATIONS LAB. A PAPER CO-AUTHORED BY HUANG, TOGETHER WITH YI-TING LIN AND PROFESSOR GANG-LEN CHANG, WAS AWARDED THE TRANSPORTATION RESEARCH BOARD'S D. GRANT MICKLE AWARD, ONE OF THE MOST PRESTIGIOUS AWARDS IN THE FIELD.
PHOTO: LEE GILLENWATER

For more information, visit attap.umd.edu

UMD UAS

Research and Operations Center

The facility, which conducted a history-making drone flight in 2019, has rebranded in order to reflect its expanded scope.

Its name has changed; its mission proceeds. The University of Maryland's (UMD) UAS Test Site, which in 2019 conducted the first-ever drone delivery of a live organ for transplant, changed its name in October 2022 to the UMD UAS Research and Operations Center (UROC).

The change reflects the full scope of the work done over the years, said its director, John Slaughter. "We do much more than conduct tests, although they are part of many of our projects. We support a wide range of research involving aerial autonomy, we provide operational and technical expertise, and we conduct educational and outreach activities," he said. "We're also spearheading regional efforts aimed at ultimately integrating uncrewed aircraft into the national airspace."

Those efforts include the Chesapeake Bay UAS Route Network (CURN), a proposed set of route segments in Maryland in which drones would ultimately share airspace with their crewed counterparts in on-demand operations.

In 2020, the UMD UAS Test Site—now UROC—commissioned the Padina Group to conduct a feasibility study regarding the proposal, which could help drive a significant expansion in the use of drones for commercial and other purposes in Maryland. "We expect to see rapid acceleration in the coming years, but it's important to ensure that a robust framework for safe, sustainable operation is in place,' Slaughter said. "A successful path forward depends on a combination of technical advancement and operational best practices. Those are both key areas of focus at UROC."

"Not only does our team represent thousands of hours of collective flight time, utilizing a full spectrum of uncrewed aircraft, but we have developed a set of operational procedures that set an example for the industry as a whole," he said.

Headquartered in California, MD, the UMD UAS Test Site officially opened in August 2014, with a mission to accelerate the safe and responsible use of UAS technology. It is part of a technical corridor in Southern Maryland that also includes the University System of Maryland at Southern Maryland (USMSM) and its recently opened Southern Maryland Autonomous Research and Technology (SMART) Building.

Since its inception, the UMD UAS Test Site has partnered with many federal agencies, including DHS, NASA, and NOAA; defense organizations, including the Army Research Laboratory (ARL), the Defense Advanced Research Projects Agency (DARPA), and the Naval Air Warfare Center Aircraft Division (NAWCAD); and researchers based at the University of Maryland and elsewhere. Notable recent endeavors include developing optimized methods of calibration for satellite payloads used in search and rescue operations, and employment of customized drones and payloads to research their utility in calibrating satellite payloads used in measuring sea ice thickness.

But it is the April 2019 organ delivery that stands as the Test Site's best-known achievement so far. Conducted in partnership with the University of Maryland School of Medicine and the University of Maryland Medical Center, the mission resulted in the successful transport of a live kidney for transplant into a waiting patient. By demonstrating that deliveries of this kind can be conducted reliably and safely, this first-of-kind delivery opened the door for potentially life-saving improvements in the process of organ delivery—a process that is currently plagued by inefficiencies and delays.

UROC will continue to be forward-looking, Slaughter said. "Along with research and education to support addressing the problems of today, we look forward to meeting the needs of the future," he said. "Whether we are assisting UMD faculty or federal agencies in researching methods for addressing a changing climate, aiding students in preparing for their futures as aerospace engineers, or setting the path for the widespread use of UAS in Maryland, we look to do things that are unique and make a difference."

"Exciting things are happening in the world of uncrewed aircraft, and our job is to be on the leading edge," Slaughter said.

FACULTY SPOTLIGHT

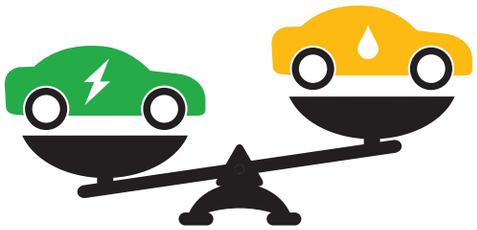
Anna Alberini

An economist, Alberini explores the intersection between transportation and energy.

Many experts agree on the need to expand the market share of battery-powered electric vehicles and other alternatives to the conventional gas-powered car. But successful policymaking in this area depends on understanding the factors that influence purchasing choices, including income and demographics.

Research by Anna Alberini, a professor based at UMD's College of Agriculture and Natural Resources, is helping to shed more light on those factors.

An energy and environmental economist, Alberini conducts research on residential energy demand, and on ways in which policies can shape that demand. She analyzes the energy decisions—including decisions about driving and vehicle choice—that individuals and families make and the consequences of those decisions.



"Transportation is a massive user of energy, one which puts out a large volume of emissions," she said. "I'm interested in seeing how people respond to factors such as gasoline prices and government incentives, and in the choices people make about car purchases."

In a recent study, Alberini mined regional travel survey data in order to pinpoint some of the typical characteristics of drivers who own electric or hybrid vehicles, and how they differ from those who rely on conventional, gas-powered cars. The differences turned out to be significant. Electric and hybrid owners, she found, tend to be comparatively wealthy, with more workers in the family. Many own more than one car, with the other being gas-powered.

While some of these findings confirm existing perceptions, Alberini also discovered something she hadn't expected: drivers of electric and hybrid vehicles tend to choose a wide variety of travel modes to get around: they not only drive, but bike, walk, and use public transit.

"It's a much more diverse pattern" compared to drivers of conventional vehicles, she said.

The study is one of several Alberini is involved with that relate to transportation and policy. In another, she has been working with transportation authorities in Northern Virginia to assess the results of a free-fare experiment implemented on Alexandria's DASH bus system. With support from an NSF grant, she and her research collaborator, MTI interim director Cinzia Cirillo, are seeking to determine whether making public transit less expensive—or even free—can lead to significant increases in ridership. That would be a boost for the environment, and also for equity, since many lower-income residents cannot afford a car—let alone a more environmentally friendly electric or hybrid vehicle.

In other studies, meanwhile, Alberini is examining the effectiveness of schemes aimed at incentivizing the purchase of electric vehicles—for instance, through financial rewards to those who purchase them, or through providing funds for the charging infrastructure. She and a graduate student are also looking into why progress in fuel economy appears to have stalled, following major advances in the past.

MTI, Alberini said, has facilitated her work both by streamlining the logistics and connecting her with prospective collaborators and graduate students.

"It's put me in touch with students who are interested in participating in projects. It's been very helpful to have the administrative support that I needed to submit the NSF proposal that was funded," Alberini said.

FACULTY SPOTLIGHT

Allen P. Davis

A stormwater expert, Davis is helping to pioneer innovative strategies for tackling a major environmental hazard.

With transportation networks both underpinning our way of life and contributing significantly to environmental hazards, there's a natural overlap between the disciplines of transportation and environmental engineering. Allen P. Davis, Charles A. Irish Sr. Chair in Civil Engineering and a Distinguished Scholar-Teacher at UMD, conducts much of his research at this point of overlap.

One of the nation's leading experts on water quality and stormwater management, Davis has worked for more than 30 years with state and local agencies as they seek to rein in the harmful byproducts of transportation infrastructure.

As he explains, "we're looking at stormwater quality as it runs off of parking lots, roadways, and buildings, and looking to improve the quality of that stormwater, because it's picking up pollutants as it goes along these surfaces."

Such toxin-laden overflows pose a hazard to just about any ecosystem. In Maryland, there is particular concern about the health of the Chesapeake Bay, an economic bulwark for the state as well as a cherished natural asset. Maryland state and local agencies, notably the State Highway Administration, have a mandate to enforce stormwater regulations based on the Chesapeake Bay Total Maximum Daily Load (TMDL)—and they do down to the level of municipalities.

But keeping runoff out of the Bay is far from easy, especially given the continued pace of development in the state. More development means more roads and traffic, and thus more runoff. Upticks in severe weather, including floods, aren't helping. As a result, Chesapeake Bay water targets set for 2025, including planned reductions in nitrogen, phosphorus, and sediment, are unlikely to be met.

"The municipalities haven't been able to implement enough stormwater management and we continue to develop," Davis said. "We continue to knock down forests and fields and put in roadways and buildings and parking lots, all of which contribute to runoff."

Clearly, new approaches are needed in order to move the needle. In recent years, Davis has been deeply involved in the development of new technologies—or what he refers to as "green stormwater infrastructure"—that can improve stormwater treatment. He's also looking for ways to improve the effectiveness of existing technologies. "We need to identify which approaches are going to provide the most bang for your taxpayer buck," he said, "and that means thoroughly understanding the stormwater characteristics. If I have a choice of a) or b), which one should I go to get the most benefit for my dollar, the thousands I'm spending on putting in these stormwater treatment systems?"

Davis has also been collaborating with another UMD professor, Ahmet Aydilek, on ways to revitalize land that has been disturbed by the construction of new transportation networks. "When you go in and remove forests and land and put highways in, there's a lot of bare soil that needs to be stabilized as quickly as possible," he said. "Stabilizing means getting vegetation to quickly grow there so the soils don't wash away." Aydilek and Davis are working both with the Maryland and Minnesota state transportation departments on addressing this problem.

More recently, Davis has been collaborating with UMD Associate Professor Birthe Kjellerup on a Chesapeake Bay Trust Fund project that aims to identify land areas with high PCB concentrations in stormwater. Findings from their research can potentially help counties target cleanup funds more effectively, by channeling it to areas with the highest PCB concentrations.

Through MTI, Davis and other environmental engineers are able to connect and collaborate with more traditionally-focused transportation experts to conduct big-picture research.

"In the past, when someone said 'transportation engineering,' they usually meant someone who specializes in designing infrastructure. Today, there's a broader challenge. Yes, transportation is about delivering people and goods from one place to another, but this infrastructure has environmental impacts," he said.

Schonfeld:
Supply chain havoc shows need for resilient networks

A UMD professor and his students are examining ways to mitigate disruptions to transportation systems.

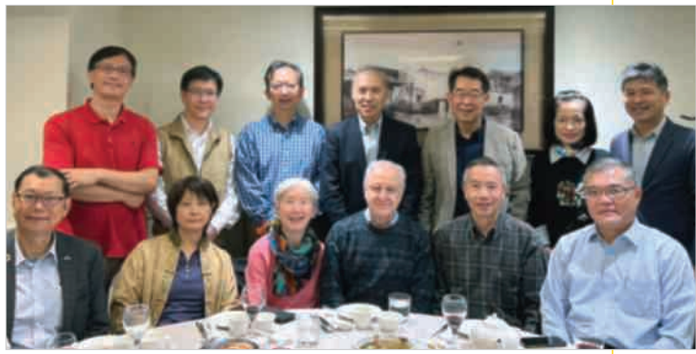
When the COVID-19 pandemic struck in early 2020, it placed strains on transportation systems that were not designed to accommodate disruptions at that scale. The effects, including broken supply chains, product shortages, and rising prices, are still with us today.

As UMD civil and environmental engineering professor Paul Schonfeld notes, tightly scheduled transfers have become the norm in freight transportation, and these tight connections depend in turn on a highly efficient and reliable transportation system. "When the transportation systems are disrupted, these supply chains can be quite badly degraded, leading to losses in production and insufficient supplies of goods that people need," Schonfeld said.

Although current systems factored in a certain degree of "normal" disruptions, they didn't count on entire countries closing themselves down for extended periods, as happened at the height of the pandemic. "That created major, unforeseen upheavals," Schonfeld said. "If all your products are manufactured locally, that's more manageable. However, in the modern, globalized economy, products utilize components that are produced far away. When some countries closed their production facilities and their transportation systems, the effects were felt all over the world."

This is not just a short-term problem. Whether in the form of public health crises, extreme weather conditions, natural disasters, geopolitical upheaval, or other high-impact events, the potential exists for future supply chain disruptions. In their current research, Schonfeld and his graduate students are looking for ways to introduce more resilience into the system.

"We're working on how to restore a disrupted network as quickly as possible, as well as how to reduce the vulnerability of such a network to disruptions in the long term," Schonfeld said. "How do you manage, schedule, and allocate resources and manage the work crews to restore the road and rail networks as quickly and efficiently as possible? How do you improve the resilience of that network to disruptions when you have years to invest in it? These are the kinds of problems we're analyzing."



SCHONFELD (CENTER), SEEN HERE WITH FORMER STUDENTS FROM TAIWAN, WAS INVITED TO DELIVER THE OPENING PRESENTATION AT THE CHINESE INSTITUTE OF TRANSPORTATION'S ANNUAL CONFERENCE IN TAIPEI.

It's one of several research problems being studied by Schonfeld and his students; others include the efficient design of high-speed rail networks and the integration of multimodal systems to achieve greater synergies.

It's important, Schonfeld says, to take a holistic view of transportation networks.

"I'm very interested in problems involving the development of these networks and their evolution over time," Schonfeld said, "That requires analyzing interrelated alternatives. Almost anything that takes place in a transportation network affects other parts of the network, so when you make changes in one area, it's important to consider the effects elsewhere. We've been working on problems like these as they relate to road, rail, inland waterways, and airports."

Analyzing complex systems with an eye to optimizing them has been a common theme in Schonfeld's work. A UMD faculty member since 1978, he has authored or coauthored more than 200 journal papers, examining various bottlenecks and vulnerabilities in the system and proposing solutions to improve them. His work has garnered international recognition; in December, for instance, Schonfeld was invited to deliver the opening presentation at the annual conference of the Chinese Institute of Transportation, held in Taipei.

STUDENT SPOTLIGHT

Amanda O'Shaughnessy

The University of Maryland Graduate School recently announced six campus-wide winners of the 2022 Three-Minute Thesis Competition (3MT), an international competition where students are challenged to explain their research in just three minutes. Amanda O'Shaughnessy, a civil and environmental engineering (CEE) master's student, was named a winner of the 3MT competition for her research on transportation embankments. Her advisors are CEE professors Ahmet Aydilek and Allen Davis.

O'Shaughnessy's presentation, titled When Roads Want to be Dams: Looking to Dam Safety to Regulate Transportation Embankments, emphasizes the significance of being able to develop engineering solutions to address transportation systems.

"In civil engineering, the research we are doing impacts everyone," said O'Shaughnessy. "From the road you drive on to the water quality in the Chesapeake Bay, it's important to make sure that engineering is done using the newest, best practices, and communication is the only way to ensure that happens."

Indeed, O'Shaughnessy's 3MT demonstrates the importance of using best practices when developing transportation embankments. She explains that when roads cross rivers or streams, a culvert is placed into a transportation embankment to allow for the passing of water. Engineers use past weather data to determine how much water each culvert needs to be able to pass.

Many existing culverts are not able to handle the rising amounts of water due to climate change and increased precipitation. In these cases, transportation embankments may consequently act as dams to hold back the pooling water. Though, if these water forces are too strong, they could cause embankment breakage and road damage. This damage is similar to a dam breakage and has led to several cases of roads failing.

"There is a new player in the game when it comes to dam safety: transportation embankments," says O'Shaughnessy.

O'Shaughnessy is conducting research to find engineering solutions to this challenge, including using dam safety elements to regulate transportation embankments. First, O'Shaughnessy gained an overall picture of how states currently deal with embankments and stormwater. Her approach included a policy review to demonstrate that embankment breakage is a hazard, analyze culvert designs, and determine how different states define what a dam is. She also performed a literature review and found that impounded water hasn't been heavily considered when designing transportation embankments.

After her initial research, O'Shaughnessy used geotechnical modeling to look at water levels, seepage, and water pressure to see what would happen to embankments in worst case-scenarios. She wanted to see if aspects of dam safety should be applied to transportation embankments and if so, what could be applied.

"This project has helped me think about the broader impacts of the research. How do we tackle the problem of updating our infrastructure? How do we make sure it's safe given the changing climate? We want to make sure these systems are safe because we use them every day," stated O'Shaughnessy.

Shuling Wu

As a professional occupational therapist, Shuling Wu has devoted her career to helping people with injuries, chronic conditions, or disabilities return to their jobs, hobbies, and daily activities. In doing so, she's become aware of the ways in which the built environment—including transportation infrastructure—can impede recovery.

"Especially for lower-income or otherwise disadvantaged populations, the transportation system is often set up in ways that can exacerbate physical ailments or chronic conditions," Wu notes. "If you're someone who is not getting enough sleep, and then you have to take three buses to get to work—maybe waiting half an hour at each bus stop—you're going to be exhausted by the time you get to your destination."

Because of such factors, Wu said, the medical model that predominates in occupational therapy has inherent limitations, with patients often progressing only to a certain point before their recovery stalls. "We need a more holistic approach, one which takes into account all the factors that can exacerbate a condition—or in some cases may have caused it to begin with."

To gain more insight into this challenge, Wu has stepped back from her full-time career in order to pursue a doctorate at the University of Maryland's (UMD) School of Public Health. Her mentor is Jennifer Roberts, who directs the Public Health Outcomes and Effects of the Built Environment (PHOEBE) Laboratory at UMD.

Wu has been working with Roberts to help shed light on the potential public health effects, whether positive or negative, of Washington, D.C. Metro's new Purple Line. As part of this endeavor, Wu and Roberts conducted transit interviews at local Metro and bus stations, seeking to gauge perceptions about the new line and its likely impacts. Among other findings, their survey confirmed that Metrorail—which is both speedier and more expensive compared to the bus—serves a more affluent demographic.

"The people at the bus platforms and the people using Metrorail were entirely different populations," Wu said. "The bus users represent the marginalized communities and the transit core." Many said that they looked forward to the Purple Line because of its potential to spur development and improve perceived neighborhood quality, even though they were themselves unlikely to ride it due to the anticipated higher cost.

A paper detailing the research has recently been published by *Cities and Health*, with Wu as the lead author.

While the study didn't focus specifically on users with disabilities or chronic conditions, the findings provide insights that are relevant to occupational therapy—including the need to factor in the availability and affordability of transit.

"If we want to achieve a more complete understanding of chronic pain and chronic illness, we have to go beyond the medical model," she said. "It's not just about identifying this or that condition and coming up with a program of treatment. It's also about how we set up our social systems, public transportation being one of them, and about how we set up the built environment. We need a more holistic mindset."

LEADING INTO THE FUTURE: CREATING A DIVERSE AND INCLUSIVE TRANSPORTATION PIPELINE

Karen Philbricks

Dr. Karen Philbricks is the executive director of the Mineta Transportation Institute (MTI) at San José State University, which leads three competitively-selected, multi-university consortia. In a Distinguished Seminar at MTI on November 30, Philbricks addressed the workforce shortage in transportation. Drawing from her own experiences, she discussed aspects of the field that could be a draw for students as they consider their career paths. She also highlighted ways in which surface transportation research, education, workforce development, and technology transfer can lead to improved mobility of people and goods.

TRADE-OFF BETWEEN SAFETY, MOBILITY, AND STABILITY OF AUTOMATED VEHICLES

Xiaopeng (Shaw) Li

Dr. Xiaopeng (Shaw) Li is an associate professor at the Department of Civil and Environmental Engineering at the University of Wisconsin-Madison. On November 9, Dr. Li delivered an MTI Distinguished Seminar on problems related to automated vehicle (AV) following control—a feature that can have a critical impact on traffic safety, mobility, and stability.

Research led by Li shows that following control in commercial AV tends to become more unstable as headway is set to smaller values; thus, a tradeoff exists among the safety, mobility, and stability aspects of AV following control design. Li was able to explain analytically the underlying vehicle control mechanism that results in this trade-off, and his findings have been verified by field experiments with production vehicles. His research compared vehicles with different power trains and explored various ways of improving vehicle performance.

NEW RESEARCH ON ELECTRIC VEHICLES IN THE WASHINGTON, DC, METRO AREA

Anna Alberini and Giovanni Santoni

Dr. Anna Alberini, professor at UMD's College of Agriculture and Natural Resources, and Giovanni Santoni of Transurban presented new research findings on electric vehicles (EV) at an MTI seminar on October 12. Alberini's primary concern in this research was to glean insights into the demographics, socioeconomic status, and travel behavior of battery electric vehicle (BEV) and plug-in hybrid drivers (PHV), compared to drivers of conventional vehicles.

The researchers found significant differences: households that own BEVs or PHVs tend to be more affluent, and travel behavior is more diverse, with household members often walking, biking, or using public transportation rather than using a car. Once in the car, though, travel patterns tend to be the same. Moreover, households that own a battery electric or hybrid vehicle often own a conbventional vehicle as well.

Insights from the research can potentially aid efforts to promote the transition away from internal combustion engines to battery vehicles.

CHANGING REGISTRATION TAXES ON ELECTRIC VEHICLE ADOPTION: EVIDENCE FROM DENMARK

Gianluca Trotta

MTI hosted Dr. Gianluca Trotta, senior energy economist at COWI, on May 6 for a Distinguished Lecture on Denmark's experience with incentivizing adoption of battery-operated electric vehicles (BEV) through tax policy. The country has traditionally stimulated use of BEVs through a registration tax exemption that was lifted in 2016 and partially re-introduced in 2018. Exploiting car registration as well as detailed population data covering the period 2013-2019 and using Bayesian additive regression trees (BART), Trotta has obtained new empirical evidence on the effects of the registration tax evolution on the adoption of BEVs in Denmark and the socioeconomic factors that influence BEV adoption.

Trotta holds a Ph.D. in Economics, Law and Institutions from the University of Rome "Tor Vergata" (Rome, Italy). His main research interests are energy efficiency, energy behavior, and energy policy.

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