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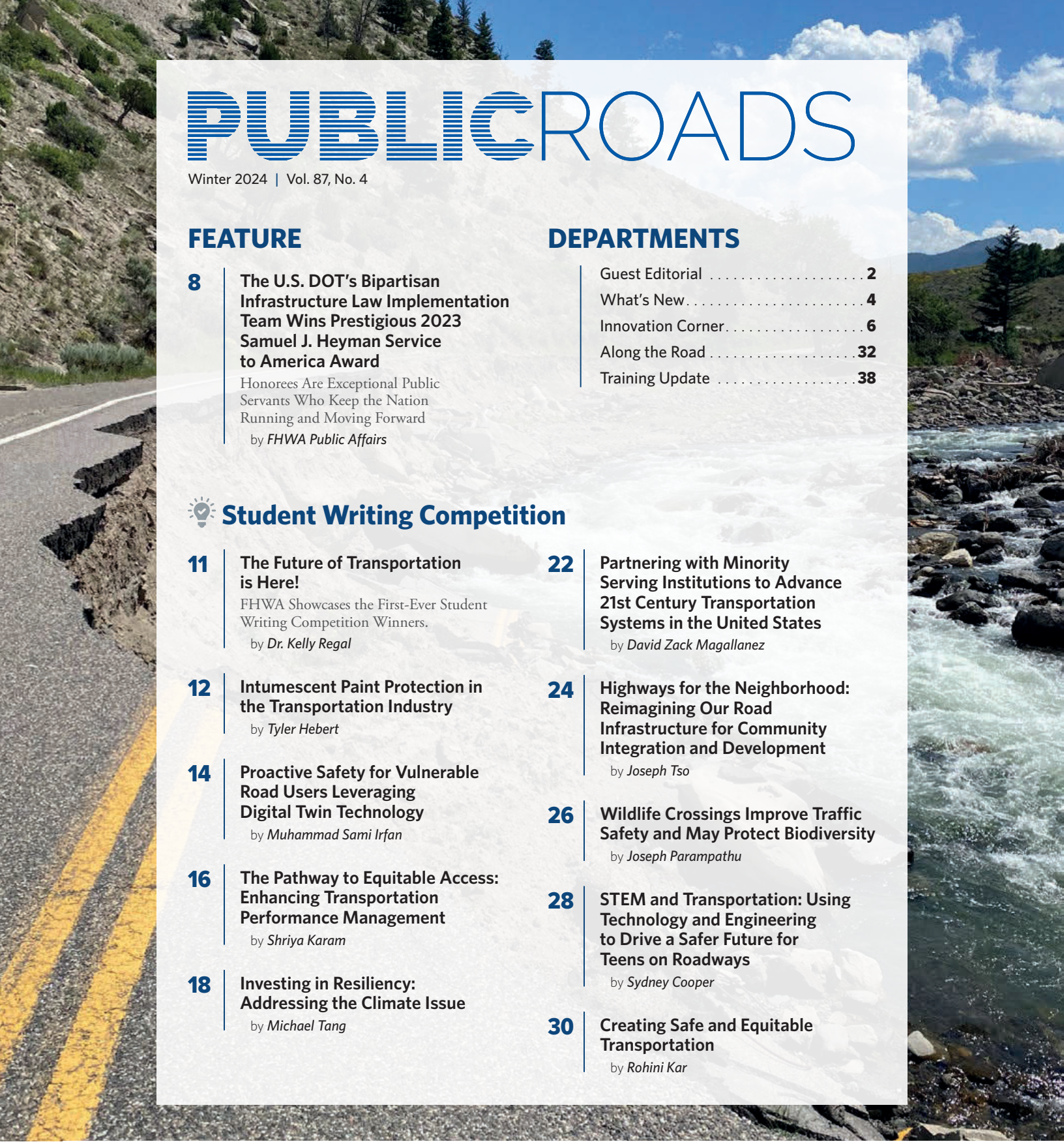
Winter 2024

PUBLIC ROADS
STUDENT WRITING COMPETITION

WINNERS

U.S. Department of Transportation
Federal Highway Administration



PUBLICROADS

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Honorees Are Exceptional Public Servants Who Keep the Nation Running and Moving Forward

by *FHWA Public Affairs*

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ABOVE: Flooding and mudslides severely damaged the road along the Gardner River in Yellowstone National Park.

COVERS: The bridge to the future is in the minds of the young with a passion for innovation and technology.

FHWA composition. Images © Gorodenkoff / immimagery / AdobeStock.com.

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The Secretary of Transportation has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this department.

Source: FHWA.

Sixty Years of the Civil Rights Act:

Examining the Legacy of FHWA's Title VI Enforcement and Its Ongoing Duty to Promote Non-Discrimination

This year marks the 60th anniversary of U.S. President Lyndon B. Johnson signing the Civil Rights Act into law in 1964. Title VI of the act prohibits recipients of Federal financial assistance from discriminating based on race, color, and national origin. This anniversary provides an important opportunity for us to reflect on the effects of past transportation decisions as well as an opportunity to rethink what it means to comply with Title VI requirements.

The U.S. Department of Transportation and the Federal Highway Administration acknowledge that past transportation decisions either failed to consider, or consciously disregarded, the disproportionate impacts our actions would have on minorities and low-income communities. With this acknowledgement, we are now transforming our approach to Title VI. Instead of maintaining a passive approach to Title VI by limiting our actions to complaint investigations, we are taking proactive and strategic steps to assist our recipients in building their own programs to identify possible racial disparities and remedy or avoid discriminatory practices. Recognizing potential Title VI issues early on in transportation planning is key to preventing major enforcement heartburn later, such as delaying a major project or providing financial compensation to impacted persons.

While these proactive steps are a critical piece of our Title VI approach, we are not afraid to enforce violations. FHWA's legacy of modern Title VI enforcement began with a complaint filed in 2011, regarding bus stops in Beavercreek, OH. FHWA's investigation found that the City of Beavercreek's refusal to approve the construction of three bus stops created a disparate impact on minority residents who depended on transit services to access community amenities. The investigation concluded that the city failed to prove a connection between a legitimate justification (public safety) and its refusal to approve the bus stops. The case's legacy was the subject of a 2016 documentary, *Free to Ride*, and is cited in the U.S. Department of Justice's *Title VI Legal Manual*.

Within the last decade, the FHWA Office of Civil Rights (HCR) has come a long way in enforcing Title VI. Sometimes, the only recourse for persons who believe they have been discriminated against by a FHWA funding recipient is through FHWA's Title VI administrative complaint process. FHWA receives and processes Title VI complaints, covering a wide range of topics including mega highway expansions, residential displacements, flooding, and access to public amenities. Through a process of resolving complaints by voluntary resolution, FHWA has worked with its State and local government funding recipients on many occasions to prevent and remedy discrimination.

Transportation decisions impact the lives of real people who are trying to safely arrive to and from school and work as well as access healthcare and other essential services. Embedding Title VI considerations into all transportation decisions is the best way to provide everyone an equal opportunity to enjoy the benefits that transportation provides.

Irene Rico
Associate Administrator, Office of Civil Rights
Federal Highway Administration

TOP LEFT: *Source: LBJ Library photo by Cecil Stoughton.*

TOP RIGHT: *Source: The U.S. National Archives and Records Administration; and © Alfred Wekelo / Wagner / AdobeStock.com.*

RIGHT: *Source: FHWA.*

SCRC

SMART COMMUNITY RESOURCE CENTER

Source: USDOT.

The Smart Community Resource Center

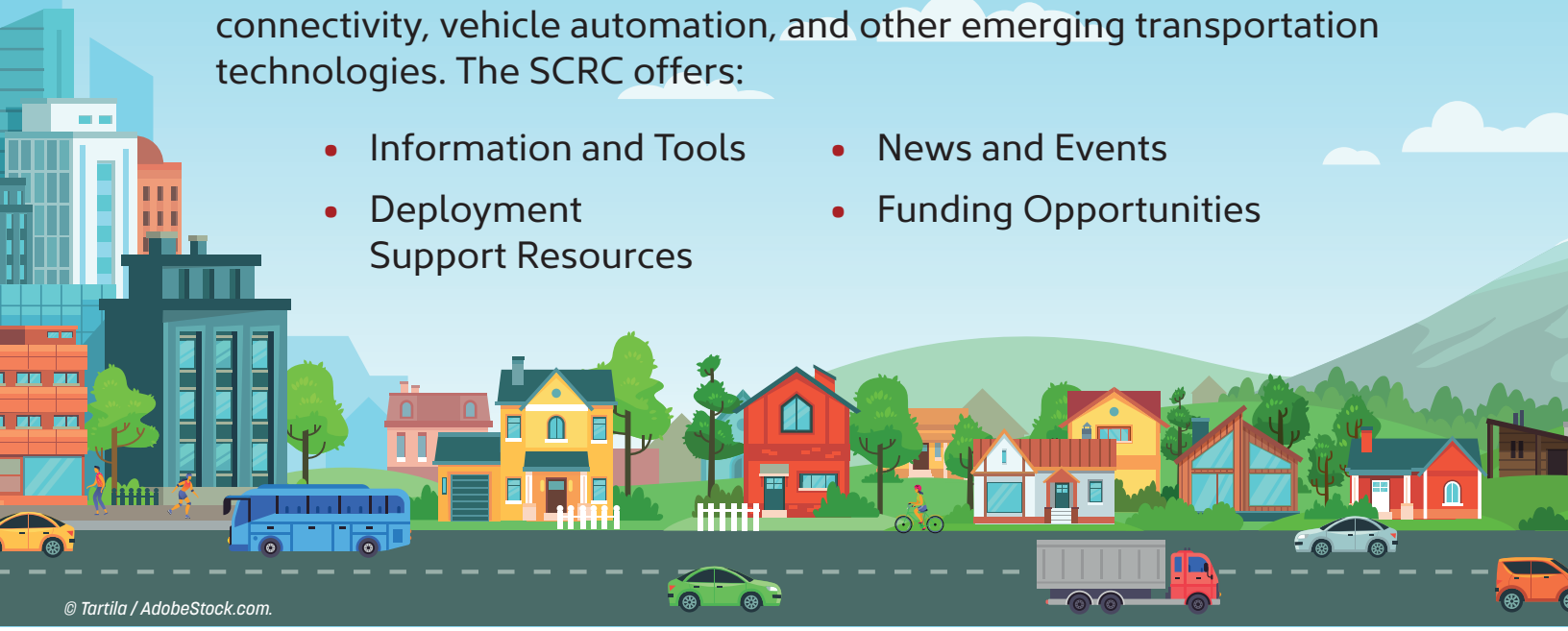
What You Need When You Need It

USDOT IS MAKING RESOURCES READILY AVAILABLE TO ITS DEPLOYERS.

Created by the U.S. Department of Transportation's Intelligent Transportation Systems (ITS) Joint Program Office (JPO), the Smart Community Resource Center (SCRC) helps connect States, Tribal governments, and local communities with the knowledge and expertise they need to advance their ITS and smart community transportation projects and programs.

The SCRC includes USDOT resources related to interoperable connectivity, vehicle automation, and other emerging transportation technologies. The SCRC offers:

- Information and Tools
- Deployment Support Resources
- News and Events
- Funding Opportunities



To access the SCRC, visit https://www.its.dot.gov/scrc.

Effective Data Strategies in Delivering the U.S. Federal Highway Program

by **TIANJIA TANG**, **BRIAN BROTSOS,**
YUSUF MOHAMEDSHAH, and **DAVID WINTER**

"Data is the fuel and GPS. It enables us to make informed decisions, optimize travel, enhance safety, support equitable infrastructure, and ultimately deliver a more efficient and sustainable transportation system," said Randall (Keith) Benjamin II, associate administrator for Highway Policy and External Affairs at the Federal Highway Administration.

On October 4, 2023, FHWA Executive Director Gloria Shepherd gave a presentation, "Effective Data Strategies in Delivering the U.S. Federal Highway Program," at the XXVII World Road Congress (Prague 2023) as part of the event's national reporting session. The talk covered five critical strategies FHWA has implemented to ensure quality data collection.

As highlighted by Executive Director Shepherd, data are crucial to FHWA and its decisionmaking process. FHWA's ability to obtain high-quality and timely data is not a coincidence. Over the years, the agency has developed and implemented various strategies for gathering data. These strategies have proven reliable, especially during the COVID-19 pandemic, to assess weekly national travel demand.

The first strategy involves FHWA's reliance on State highway agencies and the inclusion of private contractors in data reporting. State highway agencies own most of the traffic monitoring equipment installed on public roads and work with private contractors to operate these devices. Allowing private contractors to directly submit traffic data on behalf of their State highway agency clients streamlines the process and significantly improves data timeliness. This strategy has been highly effective in obtaining weekly traffic-flow data.

The second strategy is for FHWA to acquire data and information directly from private businesses. This direct-purchasing approach provides FHWA with real-time travel speed data for the entire National Highway System, supporting the transportation performance management initiative and reducing the burden on State and local agencies.

FHWA's third approach involves collaborating with and supporting private sector businesses in deploying big data and advanced data analytics. This cooperation with private sector enables the agency to gain valuable data and information that may not have been available otherwise, as the collaboration expedites research development and technology deployment. The FHWA national traveler origin-destination data are one result of such collaboration. Additionally, this collaboration allows FHWA to comprehensively evaluate the reliability of traffic data obtained through nontraditional methods (e.g., location-based service big data, cellular data, GPS data).

ABOVE: Developing strong data strategies is a key component to success for FHWA.
© ipopba / AdobeStock.com.

FHWA is also upgrading its big data analytics and artificial intelligence (AI) capabilities as one of its strategies. The agency recently established an advanced AI lab under the Path to Advancing Novel Data Analytics (PANDA) program. Through PANDA, FHWA wants to develop its employees' ability to handle big data and AI to meet the agency's growing internal needs.

The final strategy involves the ongoing reassessment of the agency's data program. FHWA periodically reviews existing data and information programs to ensure their relevance, adequacy, and cost feasibility. Currently, the agency is conducting large-scale testing of alternative methods for collecting household travel behavior data through the National Household Travel Survey program. Furthermore, the agency is exploring alternative approaches to collecting and analyzing national motor vehicle licensed driver data as well as new data processing and reporting tools for the Highway Performance Monitoring System.

In conclusion, Executive Director Shepherd emphasized that while data and information do not make decisions, effective decisions must be data driven. FHWA is proud to prioritize data in delivering its highway program to the American people.

TIANJIA TANG, Ph.D., is the chief of FHWA's Travel Monitoring and Surveys division. Dr. Tang has a B.S. in civil engineering from the University of Central Florida and a Ph.D. from the University of Arkansas. He is a registered professional engineer in the State of Georgia.

BRIAN BROTSOS, B.S., is an FHWA chief data officer managing digital solutions and data strategy. Brian has a B.S. in computer science from DePaul University.

YUSUF MOHAMEDSHAH, M.S., is a research highway safety specialist in FHWA's Office of Safety and Operations Research and Development. He holds a master's degree in civil engineering from Virginia Tech, and a bachelor's degree in civil engineering from Mumbai University.

DAVID WINTER, P.E, is the director of FHWA's Office of Highway Policy Information. David is a registered professional engineer and has a B.S. in industrial engineering from the University of Nebraska.

For the material covered by Executive Director Shepherd, navigate through: *https://www.piarc.org/ressources/documents/source/XXVII-World-Road-Congress-Prague-2023-PIARC/ed8faa4-40787-Brochure-3-XXVIIth-World-Road-Congress-Prague-2023-PIARC-World-Road-Association.pdf*.

For more information about PANDA, see *https://highways.dot.gov/public-roads/winter-2023/whatsnew*.

TFHRC VIRTUAL TOUR PREMIERES AT TRB EXHIBIT BOOTH #841

Visit Labs through All-New Online Experience

See Turner-Fairbank Highway Research Center like you have never seen it before—from your computer or cellphone!

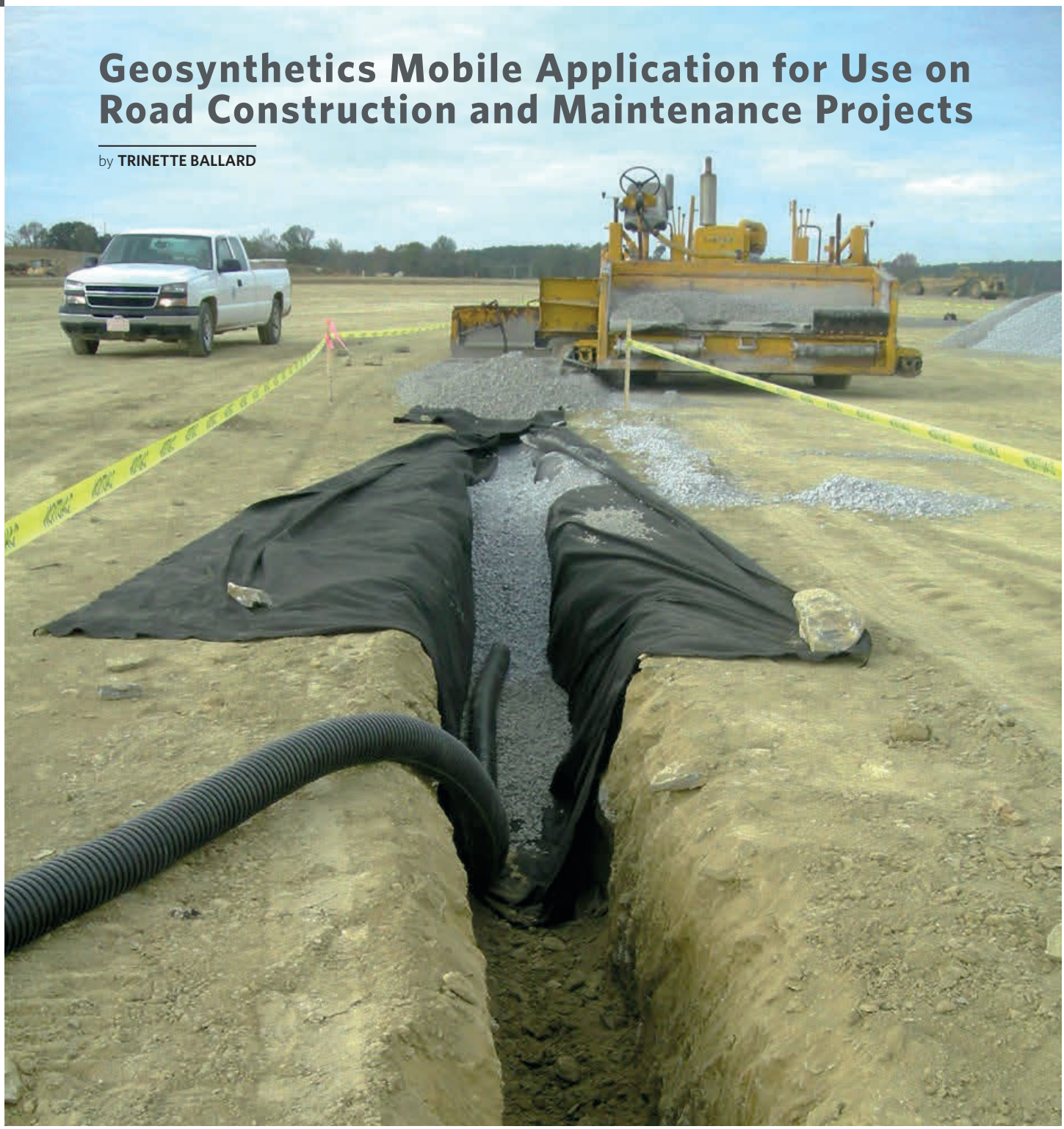
By launching the virtual tour this winter, FHWA invites you to a close-up look at 6 of the 15 cutting-edge laboratories that are helping to move the needle on transportation innovation and research.

While on the virtual tour, you can open touchpoints to learn more about the labs, equipment, and ground-breaking studies researchers are actively engaged in.

You can check out the virtual tour at the FHWA Turner-Fairbank Highway Research Center booth during the Transportation Research Board 2024 Annual Meeting exhibit hall hours, or by visiting : https://highways.dot.gov/research.

Geosynthetics Mobile Application for Use on Road Construction and Maintenance Projects

by **TRINETTE BALLARD**



ABOVE: The installation of a drainage trench using a needle-punched nonwoven geotextile lining with drainage rock and a perforated collector pipe. *Source: FHWA.*

Geosynthetics are artificial polymer materials used to improve soil conditions. For the transportation industry, using geosynthetic materials like geogrids, geotextiles, geocells, and erosion control materials is important for extending the life of a roadway and improving safety. In addition to roadways, geosynthetics are used with retaining structures, slopes, and barriers. These materials assist with controlling water flow, stabilizing dirt, reinforcing soil supporting structures, and creating barriers to protect layers of other materials from moisture. Using geosynthetic materials on projects must be applied correctly, or they will not work as intended. Therefore, project managers working with this material need access to information that will assist with the field installation of geosynthetic materials.

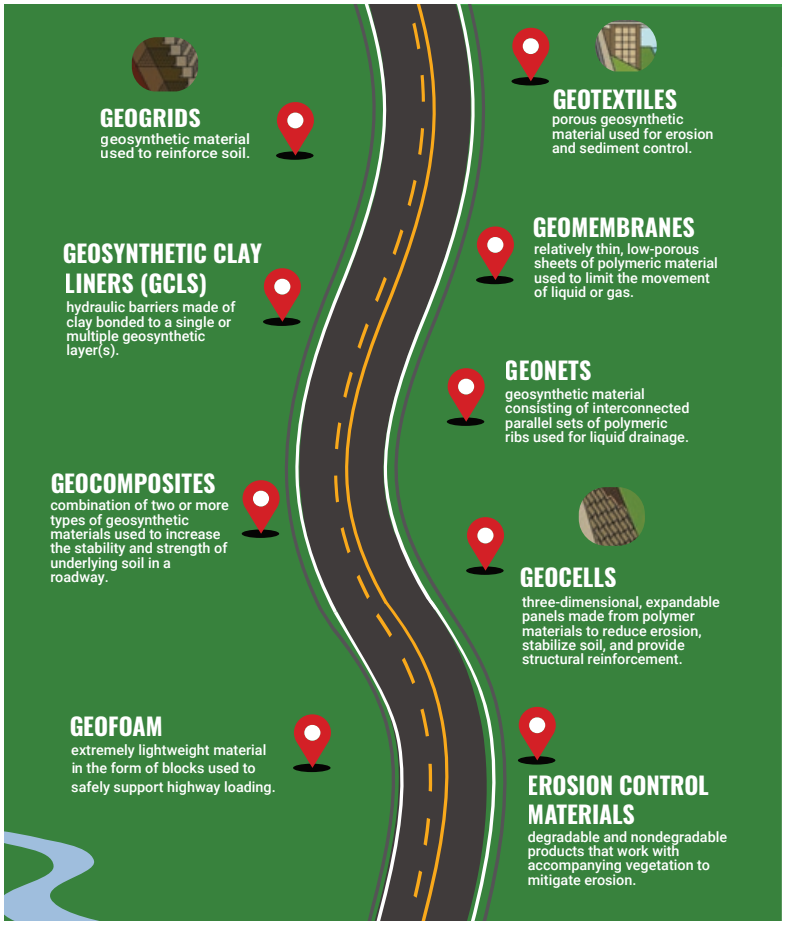
The geosynthetic industry approached the Federal Highway Administration about developing a manual that personnel can use in the field. The original plan was to create six pocket guides that project managers could carry onsite as a reference. Instead, FHWA turned to technology to revolutionize working with geosynthetics through the development of the

Geosynthetics Field Installation Notes Tracker Mobile Application. This new app is also FHWA's latest effort to become more environmentally sustainable by eliminating the use of paper when visiting road construction and maintenance projects; it also provides quick and easy access to information.

Joe Conway, director of FHWA's Office of Innovation and Workforce Solutions' Local Aid Support team, says, "We are constantly pushing the use of innovative solutions to State, local, and Tribal agencies. The mobile app presented us with an opportunity to do the same."

The app was published in early 2023 in both the Google Play and Apple Store—free of charge—and is already approaching 2,000 downloads. "The excitement we are seeing around the new mobile app is refreshing. We encourage anyone utilizing geosynthetics on road projects to download the app," says Daniel Alzamora, senior geotechnical engineer in FHWA's Resource Center.

The mobile app features a step-by-step guide detailing the basics of geosynthetics and how they are used in highway construction, from selection and installation to maintenance and repair. "Although the appropriate design of geosynthetics is important to performance, the selection of a geosynthetic that meets the design intent and the installation of these materials is also key to achieving the expected performance. This app provides users with information on the various types of products and installation procedures for different applications to help users be successful when utilizing geosynthetics," says Alzamora. With the mobile app, users can also, in real time, log field notes, bookmark content, search keywords, and quickly access industry terms and definitions.



The Geosynthetics Field Installation Mobile Application features information to extend the life of pavement, improve safety, and mitigate erosion control through nine primary functions or types of geosynthetics.
Source: FHWA.

The Geosynthetics Materials Association (GMA), in essence, works to expand the geosynthetics market. The organization provides a network to exchange information, solve common problems, and develop mutually beneficial relationships. Since they liked the idea of a mobile app to assist project managers with properly installing geosynthetic materials, GMA partnered with FHWA to provide applicable images and review its content. Fred Chuck, the executive director of GMA, has also been assisting FHWA with getting the word out about the new app and encouraging its use. "The engineers, agencies, contractors, and others involved in transportation projects will greatly benefit from the ease of access to information on geosynthetic products and applications. Additionally, use of the app will expand knowledge of the benefits, making geosynthetics more acceptable on transportation projects," continues Chuck. "The mobile application can serve as a framework for future mobile application projects in FHWA. We have already received several calls from other offices expressing an interest," says Conway.

For more information on the geosynthetics mobile app, visit: *https://www.fhwa.dot.gov/clas/geosynthetics/*. To view a video on how the mobile app works, visit: *https://www.youtube.com/watch?v=Dr-gRj_LIbw*.

LEFT: The app, released in early 2023, is available free of charge through several app stores.
Source: FHWA.

TRINETTE BALLARD is a Local Aid Support program manager in the Office of Transportation Innovation and Workforce Solutions and has been with FHWA for 16 years.

The U.S. DOT's Bipartisan Infrastructure Law Implementation Team Wins Prestigious 2023 Samuel J. Heyman Service to America Award

Honorees Are Exceptional Public Servants Who Keep the Nation Running and Moving Forward

by **FHWA PUBLIC AFFAIRS**

On October 17, 2023, the U.S. Department of Transportation's Bipartisan Infrastructure Law Implementation Team was honored with the 2023 Samuel J. Heyman Service to America Medal for Management Excellence. These awards—also known as the "Sammies"—help shine a light on hardworking Federal teams and employees, rebuild public confidence in the Federal government, and inspire the best and brightest individuals to join and remain in Federal service. "These public servants demonstrate the best our Nation has to offer," said Max Stier, president and chief executive officer of the Partnership for Public Service. He noted that the 2023 "Sammies winners, like many of the more than 2 million career civil servants around the country, work every day to confront our Nation's biggest challenges."

Meet the Bipartisan Infrastructure Law Implementation Team

The recipients of the Management Excellence award include U.S. DOT employees Maria Lefevre, Executive Director of the Office of the Under Secretary for Policy; Paul Nissenbaum, Associate Administrator of the Federal Railroad Administration; and Gloria Shepherd, Executive Director of the Federal Highway Administration. They and the entire Bipartisan Infrastructure Law Implementation Team were chosen to receive this award due to their exceptional efforts to implement the $1 trillion Infrastructure Investment and Jobs Act—also known as the Bipartisan Infrastructure Law—which Congress approved in 2021. This law provided the largest investment in highways, railways, shipping ports, and airports in decades, and its funding will help repair, renew, and reinvigorate the Nation's aging transportation systems.

The Bipartisan Infrastructure Law is the largest U.S. transportation investment since construction of the interstate highway system and the largest infrastructure investment in U.S. history. The Federal Highway Administration (FHWA) has already released more than two dozen pieces of guidance and distributed over $120 billion in highway formula funding to states as a result of this law. With 1 out of every 4 dollars of Bipartisan Infrastructure Law funding flowing through the FHWA, the U.S. DOT transportation officials knew that the law would require a DOT-wide effort, which is why they formed the Bipartisan Infrastructure Law Implementation Team. The implementation team leaders—Lefevre, Nissenbaum, and Shepherd—worked with the team to help craft and implement the $1.2 trillion law, which is helping to modernize the country's highways, bridges, shipping ports, railroads, airports, and more. "This team has successfully rolled out scores of new and expanded funding programs all across the country," said Carlos Monje, Under Secretary of Transportation for Policy. "Their

ABOVE: From left, Lefevre, Deputy Secretary of Transportation Polly Trottenberg, Nissenbaum, and Shepherd pose following the "Sammies" award ceremony.

© Allison Shelley for the Partnership for Public Service.

diligence and hard work resulted in equitable and sustainable programs that will improve our ability to compete globally and renew Americans' faith that their government can deliver."

For Transportation Secretary Pete Buttigieg, the achievements of the new law depend on successful implementation. That means, he said, "having excellent career staff who can take the existing pulleys and levers of our agency and combine them with the new resources that we have." He noted that the implementation team "displayed creativity with a sense of urgency," while bringing "passion and depth to the job."

"Federal employees are responsible for many noteworthy and inspiring accomplishments that are seldom recognized or celebrated," said FHWA Executive Director Gloria Shepherd. "Thanks to the Bipartisan Infrastructure Law we have the opportunity to work on historic initiatives, including supporting transportation safety, enhancing equity by reconnecting communities that were previously divided by transportation infrastructure, creating well-paid jobs, and implementing electrification, which will help reduce our country's carbon footprint. I am humbled and honored to receive this prestigious award."

The Oscars of Public Service

In September 2001, American businessman and lawyer Samuel J. Heyman founded the nonprofit and nonpartisan Partnership for Public Service to help build a better government and a stronger democracy. Soon after, the Partnership for Public Service awarded its first Sammies, choosing to highlight categories such as Emerging Leaders; Science and the Environment; Safety, Security, and International Affairs; Citizen Services; and Federal Employee of the Year. For more than 20 years, the Sammies, which are often called the "Oscars of public service," have recognized Federal employees who raise the bar for all public servants and have encouraged others to follow in their footsteps.

No one knows the importance of working together to raise the bar better than the U.S. DOT Bipartisan Infrastructure Law Implementation Team. "The 2023 Sammie for Management Excellence does not belong to me alone: it belongs to everyone who put in the hard work over many years and decades that led to all of the FHWA's accomplishments—including implementation of the Bipartisan Infrastructure Law," said FHWA Executive Director Gloria Shepherd. She continued: "I count myself fortunate to work in an organization filled not only with transportation professionals, but with genuinely good people. I can't wait to see what else we will accomplish together."

For a full list of 2023 Sammie winners, please visit: *https://servicetoamericamedals.org*.

In September 2023, five new battery-electric buses entered service at Zion National Park. They are the first of an entirely new fleet of electric buses Zion will acquire using a $33 million Bipartisan Infrastructure Law-funded grant from the U.S. Department of Transportation.
Source: National Park Service.

FHWA PUBLIC AFFAIRS: The FHWA Office of Public Affairs provides advice and guidance to senior agency officials about public opinion and possible public/media perceptions of FHWA policies, programs, and activities.

Bipartisan Infrastructure Law funding helps modernize U.S. highways, bridges, shipping ports, railroads, airports, and more.
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WRITE FOR PUBLICROADS

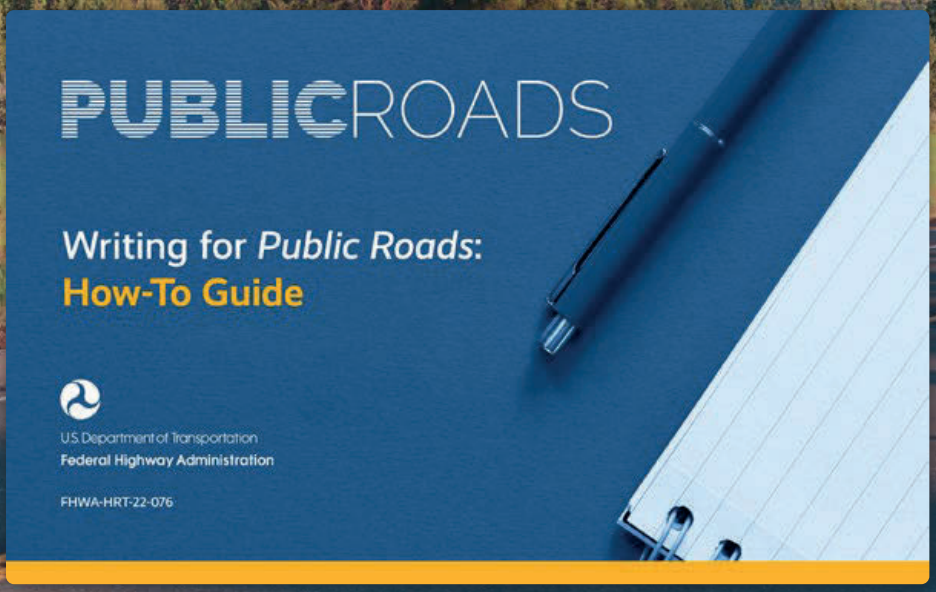
Public Roads offers FHWA and State department of transportation staff an avenue for communicating both technical and general-interest topics with peers (such as engineers, scientists, and economists) and other stakeholders across the highway industry.

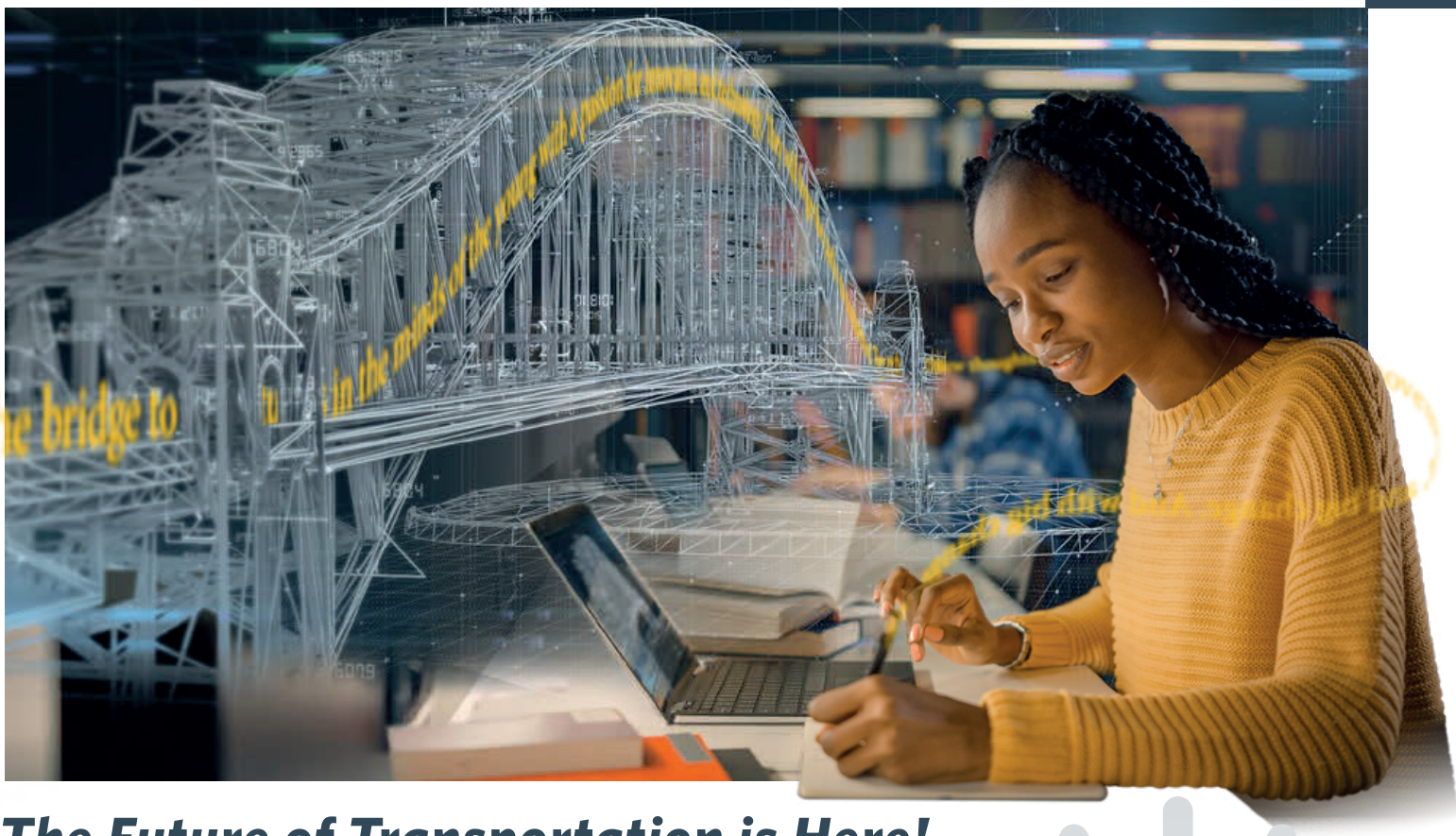
Other Federal agencies, local and Tribal DOTs, field researchers and practitioners, and academia may also submit content for *Public Roads* but are encouraged to collaborate with FHWA and State DOTs.

Check out our **Writing for *Public Roads*: How-to Guide** to learn about the many ways you can contribute to *Public Roads*. From full-length feature articles to 200-word summaries, you can choose the option that best fits the information you want to share.

To access the guide and learn more about article types, submission deadlines, and requirements, visit ***https://highways.dot.gov/research/publications/public-roads/FHWA-HRT-22-076***.

Questions? Contact us at ***PublicRoads@dot.gov***.





The Future of Transportation is Here!

FHWA Showcases the First-Ever Student Writing Competition Winners.

by **DR. KELLY REGAL**

> The bridge to the future is in the minds of the young with a passion for innovation and technology. They will forge the paths to tomorrow. They are the driving force behind new thoughts, great movement, and big change. And with big change, will come even bigger opportunities.

The following articles were written by students as part of the Public Roads Student Writing Competition. The views and opinions expressed in these articles are the authors and do not necessarily reflect those of FHWA or the U.S. Department of Transportation (USDOT). The contents do not necessarily reflect the official policy of the USDOT.

Source: FHWA.

TOP: *FHWA composition. Images © Gorodenkoff / immimagery / AdobeStock.com.*

The opening lines on the cover of this special issue of *Public Roads* couldn't be more accurate and relevant for transportation today. As those lines weave their way from the minds of brilliant and innovative students from across the United States into deeper thought and future action, we open up a world of opportunity for not only the students but the Nation as a whole. The action these students will one day take will impact the world of transportation as we know it.

It is with much excitement that the Federal Highway Administration and *Public Roads* present the winners of the first-ever Student Writing Competition. For several years, engaging students to become a voice in *Public Roads* and the transportation community was part of a "wish list" of actions we hoped to one day take. That day has now arrived.

High school, undergraduate, and graduate students studying science, technology, engineering, and mathematics submitted their articles during the summer of 2023, resulting in the winning articles you are about to read. From "Intumescent Paint Protection in the Transportation Industry" to "Creating Safe and Equitable Transportation," the winning student authors conducted detailed research, created compelling case studies, and offered meaningful problem-solution concepts valuable to transportation professionals working to solve today's challenges with forward-thinking ideas.

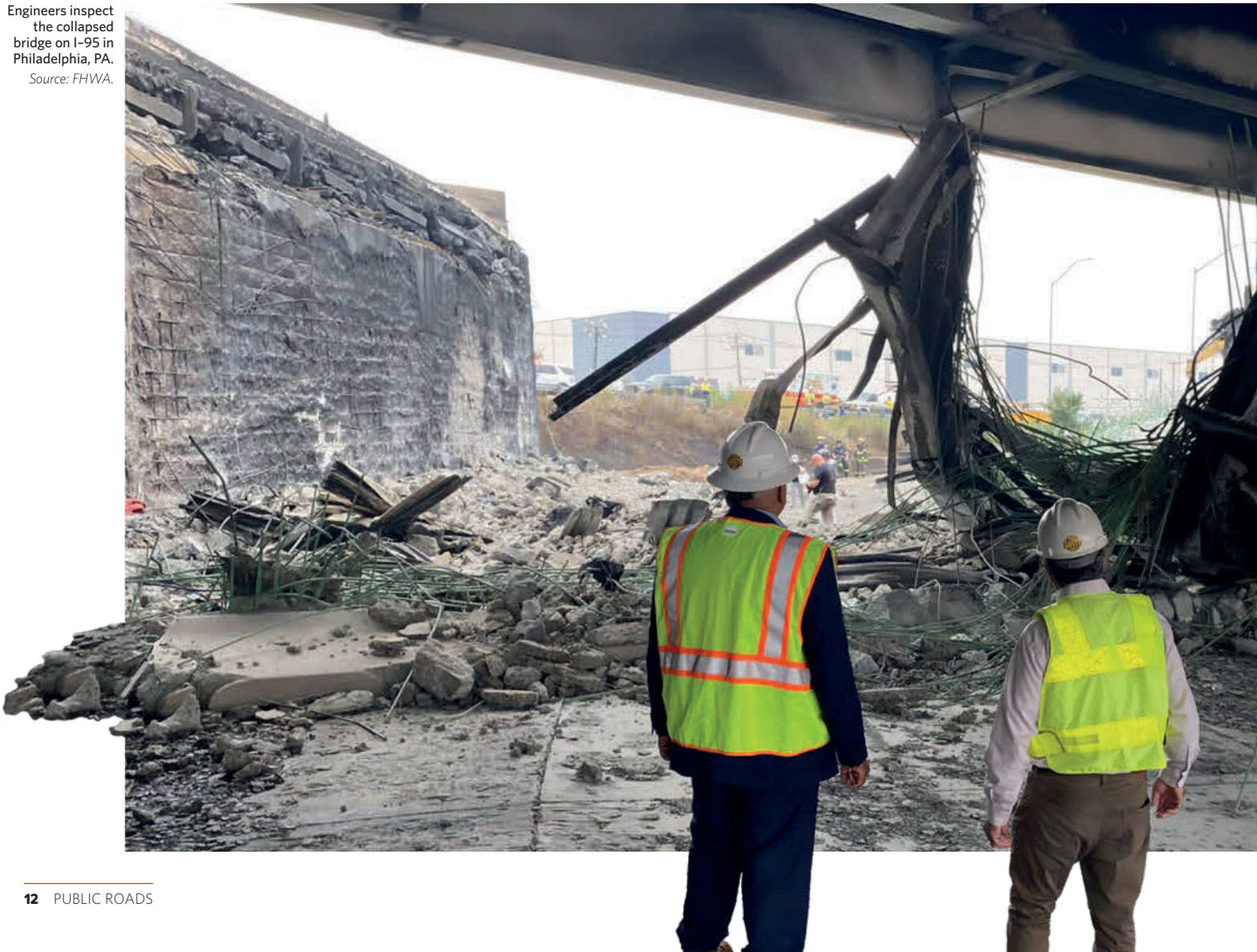
Thank you to all the students who participated in this momentous event and congratulations to the winners!

INTUMESCENT PAINT PROTECTION IN THE TRANSPORTATION INDUSTRY

by **TYLER HEBERT**

With the recent collapse of the bridge on I–95 in Philadelphia, PA, there is a spotlight on fire as a threat to transportation infrastructure. On June 11, 2023, a tanker carrying gasoline caught fire under an overpass and caused the steel girders of the bridge to become weak and fail due to the extreme temperatures. While these events are rare, bridge collapses can lead to large portions of fundamental highways being shut down for extended periods of time and possibly put many lives at risk. In the United States between 1997 and 2015, over 165 bridge fires occurred, and 30 resulted in collapse due to this damage. The majority of these fires are caused by tankers and trucks either leaking or spilling flammable chemicals on or below bridge decks. Of these bridges, steel bridges were the most susceptible to this particular kind of collapse, because they are higher than both wooden and concrete structures. Steel, in the presence of fire, generally remains unchanged until temperatures reach 600 °F; however, when temperatures of 1,100 °F occur, the steel loses half its strength. Gasoline fires quickly reach temperatures exceeding 1,500 °F, which contributed to the fast deterioration of the steel girders located on the I–95 bridge. As a result, fire is a very important concern for any kind of steel structure, especially buildings that are more susceptible to frequent fires.

There are a variety of methods used to eliminate this issue in the construction industry, such as using specialized materials to decrease the spread of fire and increase the structural resistance, but the same cannot be said for the transportation industry. One such method is the use of intumescent paint, a fire-retardant coating used to insulate different materials exposed to fire. While there are many varieties of this paint available to engineers and contractors, the general goal of these coatings is to withstand high temperatures for an extended period to allow for a longer emergency response time. When exposed to heat, the coating sublimates and expands up to



Engineers inspect the collapsed bridge on I–95 in Philadelphia, PA. *Source: FHWA.*

100 times its original thickness in the form of a carbonaceous char. This char creates a barrier between the specific structural component, such as essential girders or abutments, and the intensity of the flame. Intumescent paint can be applied to any structural material, whether steel, wood, concrete, or plaster. Based on the particular product, these coatings can withstand high temperatures for anywhere from 30 to 120 minutes. The emergency responders in Philadelphia arrived at the scene in only 10 minutes after they were alerted to the incident. Intumescent paint could eliminate large disasters by increasing the likelihood that firefighters will arrive on scene and extinguish the fire before any major structural impacts. Certain intumescent paint brands have also been tested and determined compliant in accordance with ASTM E-84, Surface Burning Characteristics of Building Materials, and ASTM E-119, Standard Test Methods for Fire Tests of Building Construction and Materials.

Intumescent paint is not the first proactive fireproofing technique, which raises the question as to what the current fireproofing methods are for highways and bridges. The National Fire Protection Association (NFPA) has various design criteria and standards to protect bridges from the possibility of collapse by fire. The NFPA standard for road tunnels, bridges, and other limited-access highways includes Standard 6.3.1.1, which states that "structural elements shall be protected in accordance with this standard in order to achieve the following functional requirements: support firefighter accessibility, minimize economic impact, and mitigate structural damage." Currently, NFPA does not have the enforcement authority to ensure these standards are being implemented on highway bridges. Other agencies, such as the Occupational Safety and Health Administration, have applied some of these standards, but NFPA criteria are not legally binding on their own. As a result, it would be advantageous to review the current policies and guidelines to ensure all proper precautions are being exercised.

Visual depiction how intumescent paint works in a bridge fire.

FWHA illustration; images source: © Intel /Andrey/tiero/ AdobeStock.com.

One issue with the implementation of intumescent paint in bridge applications is the cost. Intumescent coatings generally cost $4 to $12 per square foot; however, the avoided emergency replacement cost and economic impact of a bridge collapse would greatly offset this initial cost. To examine this mitigated cost, another bridge can be observed to determine the economic impact of losing a vital portion of an essential transportation system. A bridge collapse occurred in Minnesota on I–35W in 2007, which was traversed by over 140,000 daily commuters. A study conducted by the Minnesota Department of Employment and Economic Development on this catastrophe calculated upward of $17 million in losses in 2007 and $43 million in 2008. While this collapse was not caused by a fire, the lack of this crucial bridge for commuters resulted in a large economic hindrance. As a result, it is essential to provide proactive fire protection to all major traveled bridges, which can possibly mitigate extreme costs in the future.

Since intumescent paint is typically applied inside buildings with relatively controlled environments, additional research is needed to analyze the impact of precipitation, freeze-thaw cycles, and temperature fluctuations on intumescent paint performance and longevity. Furthermore, detailed investigations of the current fire protection practices need to be evaluated by State departments of transportation to prevent future incidents and ensure proper standards are being implemented. Overall, intumescent coatings have the potential to provide critical protection to bridges, which are a major component of transportation systems throughout the United States.

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- International Passive Fire, Ltd. (*https://www.fireproofpaint.co.uk/intumescent-paint-how-does-it-work-and-why-is-it-needed/*).
- MCEER (*https://www.eng.buffalo.edu/mceer-reports/13/13-0008.pdf*).
- CoatingsTech (*https://www.paint.org/coatingstech-magazine/articles/overview-intumescent-coatings/*).
- CNN Business (*https://www.cnn.com/2023/06/12/economy/i-95-philadelphia-collapse-economic-impact/index.html*).
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PROACTIVE SAFETY for Vulnerable Road Users Leveraging DIGITAL TWIN TECHNOLOGY

by **MUHAMMAD SAMI IRFAN**

In a grim outlook for vulnerable road users (VRUs) in the United States, the Governors Highway Safety Association reported that VRU deaths in traffic incidents had reached levels only seen previously in 1981. Any road user who is not in a motor vehicle with a protected outside shield, such as a pedestrian, cyclist, wheelchair user, or construction worker, falls under the definition of a VRU. The estimated figure of 7,485 fatalities within VRUs reverses the decades of apparent improvement in VRU safety. During the same time frame, vehicle drivers have experienced advancements in advanced driver assistance systems (ADAS) aimed at enhancing driving safety for them. However, these systems have not shown significant improvements in VRU safety, as the data indicate. Advancement in VRU safety technology has not matched the pace of ADAS. The Federal Highway Administration has set its target for zero deaths on roads, and the U.S. Department of Transportation's National Roadway Safety Strategy (NRSS) aligns with the same goal. Additionally, section 148 (a)(16) of title 23 of the United States Code underpins the need for States to improve VRU safety on their roads. Consequently, the NRSS emphasizes the Safe System Approach that can anticipate human errors and act accordingly to reduce or prevent crash scenarios.

ABOVE: Vulnerable road users, such as seniors and children, benefit from a proactive approach that reduces accidents and improves safety.
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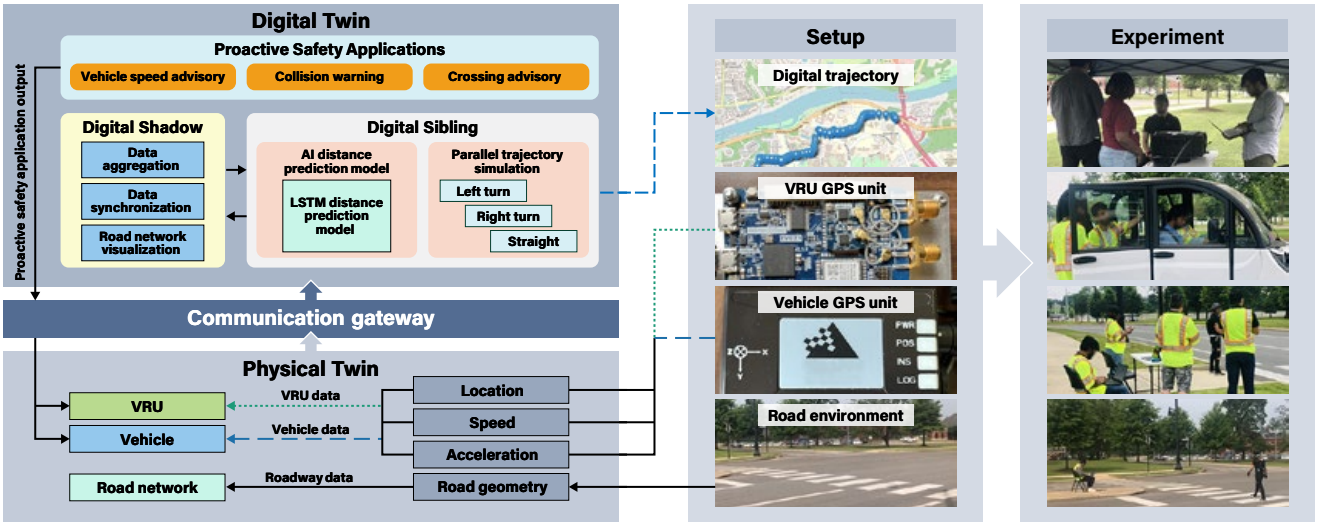
While measures such as traffic calming can enhance safety for VRUs, they are still reliant on drivers and pedestrians making their own judgment and following traffic rules. In the event of an imminent collision, there is no way to warn either the driver or VRU to take corrective action. In order to support the case of proactive safety principle of the Safe System Approach, the system should be capable of proactively estimating collision risk by predicting trajectories of vehicles and VRUs simultaneously in all possible future safety-critical scenarios. Currently, warning services using connected vehicle technology have been developed that can alert drivers and VRUs of potential collisions, yet there remains a gap in collision predictive capabilities. The objective of this article is to propose a novel approach, leveraging digital-twin (DT) technology to proactively ensure VRU safety along with an experimental case study on VRU-vehicle trajectory prediction for collision warning.

Problem Formulation

Pedestrian-vehicle collision scenarios are listed at first, and the problem is formulated as a trajectory prediction problem. A probabilistic approach will help to determine, based on multiple potential simultaneous trajectories for the vehicle



DT-based proactive safety solution for VRU safety and experimental implementation of case study.
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and pedestrian, the probability of a certain collision scenario occurring. The following scenarios are proposed for the proactive safety consideration of VRUs: high approach speed of a vehicle, incomplete crossing during phase change, blocked view of pedestrian or vehicle, and road work.

Proposed Solution

A DT-based solution is proposed to proactively tackle the safety of the VRU under the given scenarios. DT systems maintain a real-time digital version of a real-world object or process. The proposed solution approach creates a real-time digital representation of the road environment, incorporating vehicle and VRU trajectory data, roadway geometry, and crosswalk configurations. Through the real-time data synchronization between the real and the digital versions, the DT can be used to conduct parallel simulations of the VRU and roadway.

The input to the system will be the trajectory data for the vehicles and VRUs. Camera or light detection and ranging sensors already deployed along roadways in the physical world can be used to perform accurate position detection of vehicles and VRUs and extract trajectory information. The physical twin will transmit the data to the digital twin via a backhaul system. These data will be used by the digital-twin version to create digital replicas of both a vehicle and VRU. Three distinct subcomponents of the DT will be the digital shadow, digital sibling, and the safety application. The digital shadow aggregates data from physical twin sensors and synchronizes spatio-temporally separated information. The digital sibling component performs parallel simulations of different what-if scenarios of VRU-vehicle collisions. Historical data from previous time frames can be used as input to artificial intelligence-based distance prediction models that can predict the trajectories for enough time in the future to be able to mitigate any risks that should arise. In addition, the digital sibling has to consider each specific problem scenario outlined in a parallel manner to be able to address all possible scenarios. By plotting the predicted distance along the typical paths of a vehicle and VRU, it would be possible to determine whether a potential conflict is imminent between a vehicle and VRU. The simulation results feed into the safety application, which interfaces with the physical twin to send advisory messages and warnings to drivers, VRUs, or roadside message boards. The novelty of this DT-based safety approach is that it can provide reliable measures of safety warning in realtime as a vehicle is approaching a VRU.

Case Study

As a case study of the application, field experiments are being conducted using a real-world VRU and vehicle in a university campus area in Tuscaloosa, AL. A combined Global Positioning Systems (GPS) and inertial navigation systems system is used to collect vehicle location and speed data. The same data for the VRU are collected using a portable GPS unit. Under different scenarios of crossing the road in front of the vehicle, data are collected from the respective sensors. In the case study, the aim was to build the digital twin of the VRU and vehicle and predict a potential collision. The data were fed to a long short-term memory machine-learning model to train it to predict distances of the VRU and vehicle. The predicted distance can be used in parallel simulation scenarios of different possible trajectories to determine the likelihood of a collision. Once the digital model is built and trained, a connection to the physical versions can be made through wireless connectivity between sensors and processing unit. It was found that a proactive crash warning could be successfully generated using the predicted distances of the vehicle and VRU as determined by the DT system.

MUHAMMAD SAMI IRFAN is a graduate student at the University of Alabama in Tuscaloosa, AL. Muhammad is currently studying civil, construction, and environmental engineering and will graduate in 2025.

For More Information

- "U.S. pedestrian deaths reach a 40-year high" (*https://www.npr.org/2023/06/26/1184034017/us-pedestrian-deaths-high-traffic-car*)
- "23 USC 148: *Highway safety improvement program*" (*https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title23-section148&num=0&edition=prelim*)
- "National Architecture Reference for Cooperative and Intelligent Transportation" (*https://www.arc-it.net/html/servicepackages/sp57.html#tab-3*)

The Pathway to Equitable Access:

Enhancing Transportation Performance Management

by **SHRIYA KARAM**

Through the 2021 $1.2 trillion Federal Bipartisan Infrastructure Law (BIL), the United States Department of Transportation (USDOT) is investing in enhancing infrastructure for disadvantaged, underserved, and overburdened populations to ensure a more safe, reliable, and equitable transportation system. Through BIL, $13 billion is being allocated for Tribal-specific communities, and up to $130 billion is going toward upgrading rural roads, bridges, and other infrastructure. Additionally, recent funding through the 2023 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program finances transportation projects for rural and urban communities to advance equity and other outcomes. Together with the Biden-Harris Administration's 2021 Justice 40 Initiative, which seeks to ensure that 40 percent of the benefits from the USDOT's transportation initiatives go toward disadvantaged communities, Federal research and policy objectives are focused on ensuring equitable outcomes from transportation investments.

Part of these Federal funds going toward furthering equitable outcomes are being allocated in the form of discretionary grants for metropolitan planning organizations (MPOs), State and local DOTs, and other local transportation agencies. To guide these organizations in investing Federal funds in expanding highways, roadways, and other infrastructure to support disadvantaged communities, the Federal Highway Administration (FHWA) utilizes Transportation Performance Management (TPM). TPM is a framework that provides agencies with the tools to evaluate the impacts of transportation projects using a data-driven approach and other metrics, supporting them through data improvements and project planning. The performance metrics under TPM largely include measuring travel time burdens, safety, emissions, and reliability impacts.

TPM is guided by the FHWA 2019-2022 strategic plan, which seeks to improve project decisionmaking for infrastructure and capacity enhancement through a performance-based program and data-driven approach. However, TPM as a performance evaluation system tends to be narrowly focused because it measures infrastructure-based impedance, such as travel time, safety, emissions, and reliability. This results in evaluation assessments that are focused on how individuals can physically utilize the transportation system, rather than considering people's restrictions in accessing essential destinations via transportation. Potential restrictions can range from need-based ones (such as lack of vehicle ownership and/or low-income status) to mobility-based ones (such as disability and age) to other overburdened circumstances (such as Tribal or rural communities). Without

ABOVE: Accessibility to safe and reliable services, such as transportation, is vital to all and allows individuals to get to where they work, shop, and pursue their interests.
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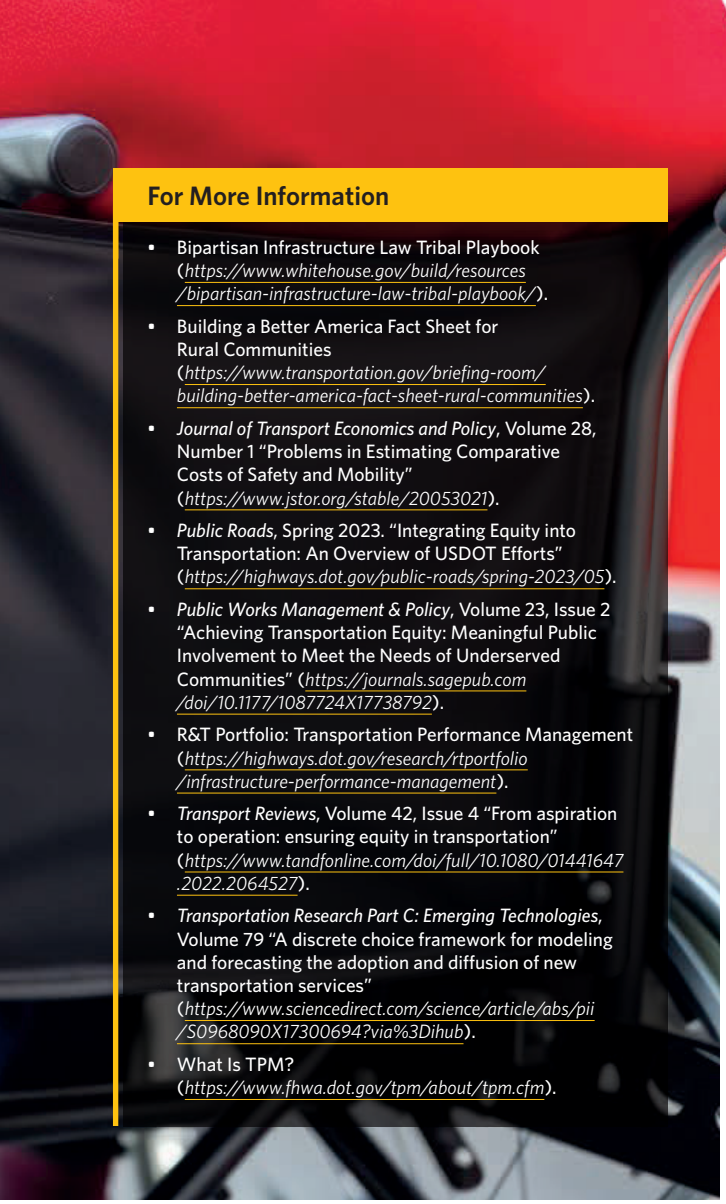

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- R&T Portfolio: Transportation Performance Management (*https://highways.dot.gov/research/rtportfolio/infrastructure-performance-management*).
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- *Transportation Research Part C: Emerging Technologies*, Volume 79 "A discrete choice framework for modeling and forecasting the adoption and diffusion of new transportation services" (*https://www.sciencedirect.com/science/article/abs/pii/S0968090X17300694?via%3Dihub*).
- What Is TPM? (*https://www.fhwa.dot.gov/tpm/about/tpm.cfm*).

a framework to determine which projects may most benefit disadvantaged communities, the expenditure of Federal dollars is at risk of investing in projects that may unintentionally place disproportionate burdens on disadvantaged populations.

Advancing a New Equity-Driven Transportation Planning Framework

In determining transportation investments to benefit disadvantaged populations, in accordance with USDOT equity objectives, FHWA's TPM considers equity and the transportation restrictions that disadvantaged people face. To do this, FHWA's TPM revises its assessment approach to involve the complex constraints of disadvantaged populations who will be directly impacted by transportation interventions.

To identify projects that will most benefit the people in need, it is first important to understand disadvantaged travelers' needs and complex circumstances. In doing so, TPM should incorporate traveler decisionmaking and predicted behavior patterns to proactively determine which investments would be most beneficial to disadvantaged travelers. One possible Federal initiative to learn from is the USDOT's Equitable Transportation Community (ETC) Explorer, which provides planners with an understanding of how a community is experiencing transportation disadvantage to help ensure that the benefits of investments are addressing those disadvantages.

However, the ETC Explorer is focused on measuring the level of disadvantage of a geographic area rather than identifying potential projects based on the behavior and demand patterns of disadvantaged travelers. Expanding on the ETC Explorer, future development in equity-based transportation planning should consider integrating the behavior and needs of these disadvantaged travelers before determining investments.

Additionally, future iterations of TPM should not only consider equity objectives but should also consider equity in tandem with other critically important outcomes, such as safety, reliability, and the environment. Equity objectives that seek to deliver outcomes to benefit the most disadvantaged travelers may often conflict with system efficiency, cost, reliability, and safety objectives. For example, projects that provide increased accessibility for rural or Tribal populations may not necessarily be the most cost-effective investment for the transportation agency. Thus, the TPM needs to provide a framework for evaluating the tradeoffs between multiple transportation objectives to weigh critical outcomes (e.g., safety, environment) with equity. This will ensure that investing in projects that deliver equity outcomes does not compromise other critically important objectives essential for implementing transportation projects.

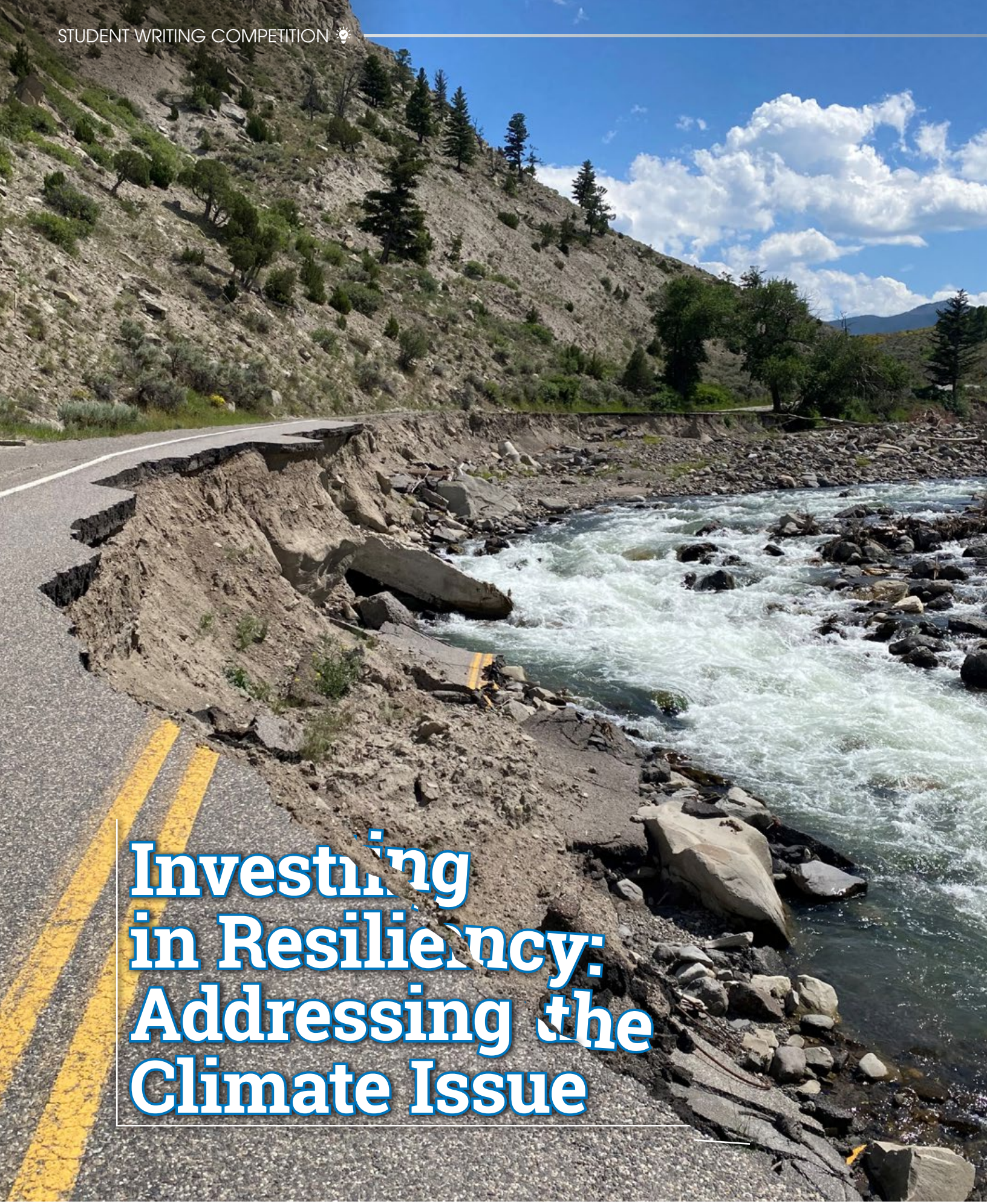
Recommendations for Implementing a New Equity-Based TPM

To incorporate equity into TPM, individual-level data collection efforts are needed to best understand the perspectives of disadvantaged travelers who will be directly affected by transportation investments. Through disaggregated data collection at the individual level, methods of determining needs can be more reflective of individual circumstances in order to better identify targeted interventions toward addressing needs. Individual-level data collection will need additional coordination efforts with local MPOs, State and local DOTs, and local transit agencies to collect data and survey diverse individuals.

FHWA interagency coordination can also ensure that all performance objectives (e.g., safety, reliability, environment, etc.) are being incorporated into planning processes, along with equity. Additionally, when considering a potential investment that seeks to address equity outcomes, community engagement and public feedback is critical to evaluate how interventions are achieving their intended objectives. Community feedback will ensure that these projects that seek to deliver equity outcomes are truly benefiting those in need.

Given that Federal objectives and funding are prioritizing equity objectives, now is the time to ensure that Federal spending is going toward projects that will truly benefit the most disadvantaged communities. To do so, FHWA should invest in re-modernizing TPM to prioritize an equity-based transportation planning framework.

SHRIYA KARAM is a graduate student at the Massachusetts Institute of Technology in Cambridge, MA. Shriya is currently studying engineering and will graduate in 2028.



Investing in Resiliency: Addressing the Climate Issue

by **MICHAEL TANG**

As the effects of climate-related events grow in severity, there is an increasing demand for emergency construction and strong infrastructure. Funding programs, such as the Emergency Relief for Federally Owned Roads (ERFO) program, grant Federal agencies the ability to rebuild and reinforce damaged infrastructure. This program not only helps in the recovery from economic losses, but also prepares communities for future disasters through resilient design and construction practices.

ERFO

The ERFO program provides financial assistance to Federal agencies when natural disasters severely damage Tribal facilities, Federal facilities, and "other federally owned roads that are open to the public" (Federal Highway Administration). The program intends to supplement aid and cover the heavy expenses of repair and reconstruction. Depending on the repair, prior approval is required to begin construction and receive aid. If a Federal agency decides to make emergency repairs during or right after a disaster, prior approval is not required. If a Federal agency plans to make permanent repairs, occurring after the disaster, approval is required.

Funding in Action

In June 2022, several rivers in Yellowstone National Park experienced historic flooding due to heavy rainfall and late snowmelt. One of those rivers was the Gardner River, which flows along the North Entrance Road. During the historic flooding, Gardner River had a provisionally determined peak flow of 2,890 cubic feet per second. This is nearly four times its average peak snowmelt flow of 800 cubic feet per second. The flooding severely damaged the road, as rockslides occurred along the Gardner Canyon and mudslides washed away parts of the road. Consequently, the North Entrance Road was impassable.

To quickly restore access to the north entrance of Yellowstone National Park, an administrative route connecting Mammoth, WY, to Gardiner, MT (called Old Gardiner Road), was reconstructed. The single-lane dirt road was converted into a two-lane paved road with the addition of a guardrail and a "new quarter-mile approach road into Mammoth Hot Springs" (National Park Service (NPS), "Flood Recovery Updates") to avoid a steep grade ranging from 12 to 15 percent. The goal was to have the road "open year-round to provide access to people who live and work in Mammoth as well

FACING PAGE: Flooding and mudslides severely damaged the road along the Gardner River in Yellowstone National Park.
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LEFT: FHWA's Steven Davis (far right) analyzing plan sheets while leading a small research group along a proposed alignment.
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as those who live outside the Northeast entrance in Cooke City" (Benjamin Vincent, Western Federal Lands Highway Division (WFLHD)). The temporary route was designed and constructed in 4 months by WFLHD of FHWA. This project was largely funded by the ERFO program (NPS, "Flood Recovery Updates").

The efforts to reopen the north entrance did not stop there. NPS and FHWA are currently working closely together to come up with a long-term and permanent solution for a new entrance road. According to NPS, "the criteria for selection will focus largely on alternatives that are least environmentally impacting, least visually impacting, most resilient to future natural disasters, most expeditious and cost effective, and take advantage of unimpacted existing road infrastructure if possible" (NPS, "Flood Recovery Updates"). With these criteria in mind, WFLHD designer Steven Davis and a cross-functional (multidisciplinary) team from WFLHD were able to develop three potential alignments. The team recently presented the alignments to representatives from Yellowstone National Park, NPS, and other partners involved. The parties were able to analyze the alignments through plan sheets, three-dimensional models, and walking the alignments from start to end by traversing through unpaved areas. The cross-functional team received detailed feedback from the meeting and plan to incorporate them into the proposed alignments. WFLHD will continue to "refine all three proposed alignments until the Yellowstone National Park staff selects a preferred alignment" (Steven Davis, WFLHD) to construct. The project timeline and construction efforts for the North Entrance Road will be "predicated on which alternative is selected" (NPS, "Flood Recovery Updates").

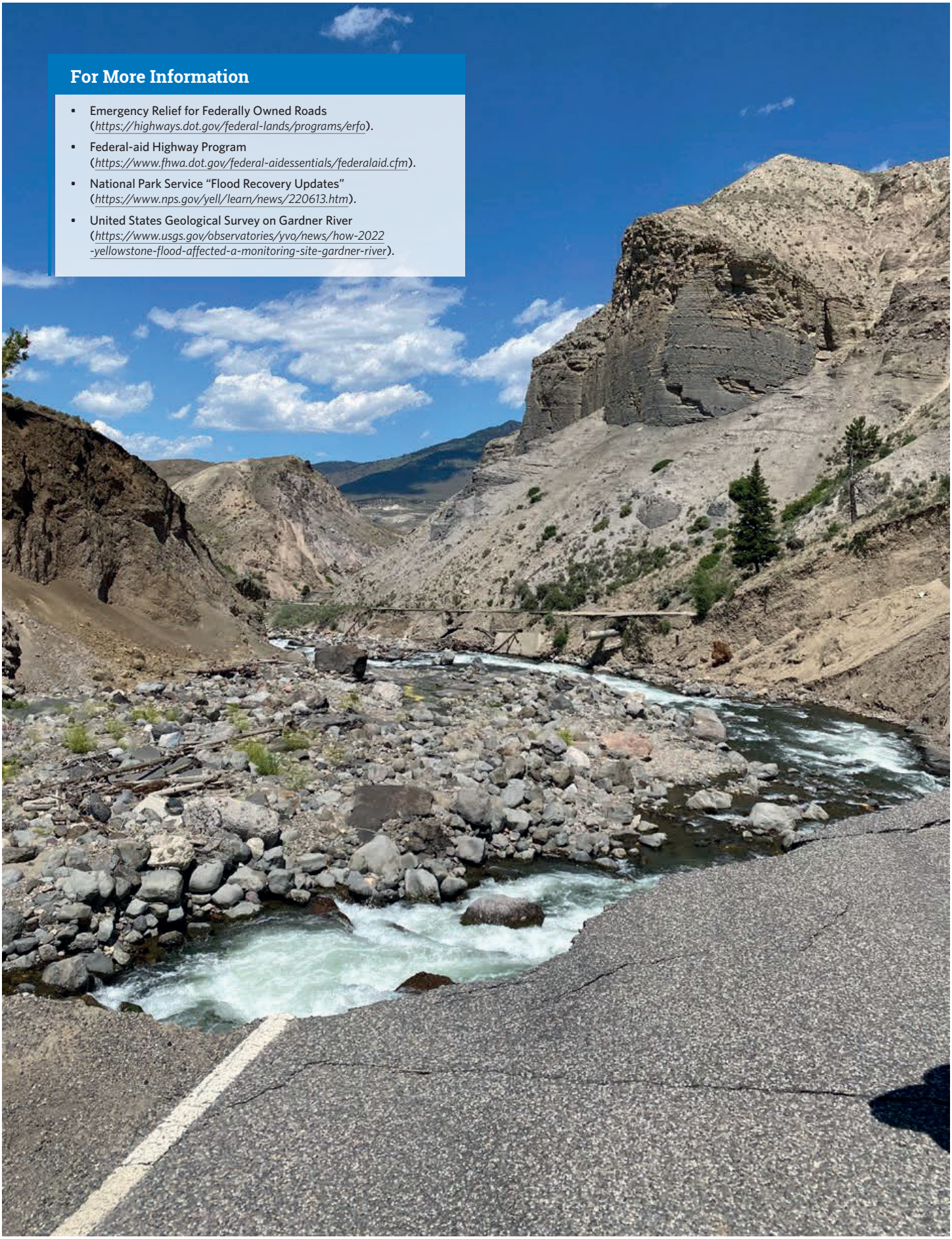
Conclusion

Investing in transportation infrastructure is an important step in addressing climate change and natural disasters. With the help from programs such as the ERFO program, transportation agencies, like FHWA, can restore damaged infrastructure and adopt innovative construction techniques, materials, and technology that can withstand climate-related stresses. These efforts will improve the durability of transportation infrastructure, providing safety and mobility for all. By investing in resilience, transportation systems can withstand the effects of climate change and natural disasters and support the needs of future generations.

MICHAEL TANG is a student at the University of Portland in Portland, OR. Michael is currently studying civil engineering and will graduate in 2024.

FACING PAGE: North facing view of North Entrance Road showing guardrails and a damaged sewage pipe hanging from the side of the road.

RIGHT: Members from WFLHD, NPS, Yellowstone National Park, and other groups walking along the proposed alignments and traversing through unpaved areas.



For More Information

- Emergency Relief for Federally Owned Roads (*https://highways.dot.gov/federal-lands/programs/erfo*).
- Federal-aid Highway Program (*https://www.fhwa.dot.gov/federal-aidessentials/federalaid.cfm*).
- National Park Service "Flood Recovery Updates" (*https://www.nps.gov/yell/learn/news/220613.htm*).
- United States Geological Survey on Gardner River (*https://www.usgs.gov/observatories/yvo/news/how-2022-yellowstone-flood-affected-a-monitoring-site-gardner-river*).

PARTNERING WITH MINORITY SERVING INSTITUTIONS TO ADVANCE 21ST CENTURY TRANSPORTATION SYSTEMS IN THE UNITED STATES

by **DAVID ZACK MAGALLANEZ**

Innovation is the driving force behind the advancement of transportation systems in the 21st century. The Federal Highway Administration (FHWA) plays a pivotal role in shaping the future of transportation in the United States by enhancing the safety and performance of the Nation's transportation system through research and the acceleration of innovative technologies and practices (*https://highways.dot.gov/about/fhwa-strategic-plan*). One powerful avenue for achieving these goals is by partnering with minority serving institutions (MSIs) from around the Nation. This article highlights the importance of FHWA's collaboration with MSIs to tap into the talents of students and faculty to help advance research and development in transportation systems while aligning with the agency's goals of its commitment to safety, efficiency, and sustainability.

By partnering with MSIs, FHWA gains access to a diverse range of perspectives, innovative ideas, and cutting-edge research. Faculty, staff, and students at MSIs bring unique insights and expertise to the table. Collaborating with MSIs will enable the agency to explore novel approaches, technologies, and practices that can revolutionize transportation systems and enhance safety and performance. A unique example of an MSI driving innovation in transportation is California State Polytechnic University–Pomona. It recently landed a $40 million U.S. Department of Transportation grant to fund the new Center for Understanding Future Travel Behavior and Demand, a research center focusing on understanding future transportation needs and preferences. By conducting research in this area, the university can contribute to evidence-based decisionmaking at the local, State, and Federal levels (*https://polycentric.cpp.edu/2023/04/cal-poly-pomona-collaborates-on-landmark-40-million-transportation-research/*). The insights gained through this research will help inform the development of more efficient, sustainable, and accessible transportation systems that cater to the diverse needs of communities, including minority populations.

Research serves as the backbone of transportation innovation. FHWA, through partnerships with MSIs, can tap into their research capabilities and facilities. These institutions are known for their excellence in inquiry and have

ABOVE: Collaboration and partnership leads to innovation, advances in research, and forward-thinking transportation systems.
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For More Information

- "FHWA Strategic Plan Fiscal Year 2022–2026" (*https://highways.dot.gov/about/fhwa-strategic-plan*).
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- Minority Serving Institutions: Educating All Students (*https://cmsi.gse.rutgers.edu/sites/default/files/msis_educating_all_students.pdf*).

a wealth of expertise in fields relevant to transportation, such as engineering, data analytics, urban planning, sustainable practices, and much more. By collaborating with MSIs, FHWA can accelerate research and development activities, driving the advancement of new technologies, materials, and methodologies. This, in turn, translates into tangible benefits for transportation systems, including improved safety, enhanced efficiency, and reduced environmental impact. In addition, MSIs often have strong connections with local communities and residents, industry partners, and government agencies (*https://cmsi.gse.rutgers.edu/sites/default/files/msis_educating_all_students.pdf*). This contextual understanding is invaluable when conducting transportation research as it enables MSIs to address real-world problems and develop solutions that are relevant and meaningful to the local community.

By forging strong partnerships with MSIs, FHWA embraces a pivotal moment to take the lead in transforming the transportation sector into a beacon of equity, sustainability, and innovation. These collaborations send an unequivocal message of the agency's resolute commitment to driving positive change and advancing social and economic justice. By aligning with broader efforts to address inequities, promote diversity, foster innovation, leverage community connections, and cultivate a diverse workforce, FHWA charts a course toward a transportation future that serves every American and leaves no one behind. Together, we embark on this transformative journey, reshaping the very fabric of transportation in the pursuit of a more inclusive and prosperous tomorrow.

DAVID ZACK MAGALLANEZ is a graduate student at the University of Texas at San Antonio in San Antonio, TX. David is currently studying urban and regional planning and will graduate in 2025.

BELOW: The application of data and advancements in technology benefit national and global transportation futures.

Highways for the Neighborhood: Reimagining Our Road Infrastructure for Community Integration and Development

by **JOSEPH TSO**

On June 29, 1956, a significant transformation occurred in the United States: the start of the Interstate Highway System. This network, spanning over 40,000 miles, connected the Nation from coast to coast. The highways, with their wide lanes and high speed limits, revolutionized the safety and comfort of travel, marking a new era in American transportation. A construction marvel, our roads served as a testament to our engineering prowess, facilitated the efficient movement of people and goods across the country, and connected previously distant cities.

However, the development of this system was not without controversy. Critics argue that the highways disrupted local communities and altered the existing social fabric. The environmental impact of the highways—contributing to noise and air pollution—has also been a point of contention. Furthermore, critics contend that the highways, in their current form, prioritize long-distance transportation and daily commuters, often at the expense of local travel and community welfare. This negativity has led to calls for a more balanced approach to transportation planning, one that considers the needs of local communities as well as long-distance travelers. While it may not currently be feasible to address the issues of highways on a national scale, it is certainly possible to implement creative solutions that mitigate their impact locally. This article proposes the reimagining of highways as potential assets for local communities.

An excellent example of highway revitalization is in San Francisco, CA. Here, a transformation has occurred that challenges the traditional view of highways as disruptions to local culture and community coherence. Previously overlooked and blighted underpasses, once seen as barriers dividing the city, have been reinvented as vibrant parks. Progress Park, nestled beneath I–280 in the burgeoning Dogpatch neighborhood, was once a fenced-off area filled with rocks and debris. Today, it's a community park where neighbors play bocce, dog owners bring their pets, and workout groups gather. This transformation has fostered community cohesion and turned once divisive underpasses into vibrant arteries of community engagement and recreational activity.

The space around and beneath highways also presents unexpected opportunities for economic revitalization, with Boston serving as an excellent example. Formerly overlooked underpasses have been converted into urban parks and cultural attractions. Landscaped pedestrian boardwalks and bicycle paths have created new connections between communities previously separated by highway infrastructure. Visitors also enjoy amenities such as world-class street art, a dog park, curated retail, fitness, food, and beverage

ABOVE: Unused urban areas can prove beneficial to communities by redeveloping them into parks, recreational areas, and retail space. *© Cozyta / AdobeStock.com.*

For More Information

- "Gateway Green" (*http://www.gatewaygreenpdx.org*)
- "History of the Interstate Highway System" (*https://www.fhwa.dot.gov/interstate/history.cfm*)
- "Public Weighs Options for Fixing Problems Caused by Cross Bronx Expressway" (*https://motthavenherald.com/2023/06/23/public-weighs-options-for-fixing-problems-caused-by-cross-bronx-expressway/*)
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- "Progress Park" (*https://greenbenefit.org/progress-park*)
- "USDOT Announces Additional Measures to Help States in Areas Affected by the Colonial Pipeline Incident" (*https://www.transportation.gov/briefing-room/usdot-announces-additional-measures-help-states-areas-affected-colonial-pipeline*)

experiences. These once empty areas, now transformed into lively spaces, not only generate economic activity but also stimulate local entrepreneurship and provide platforms for regional cultural showcase.

The city of Portland, OR, showcases a creative way to use areas near highways, showing dedication to environmental sustainability and community improvement. A key example is the "Gateway Green," a 25-acre park situated at the junction of two interstate highways, I–205 and I–84. The Gateway Green is a versatile public area created with community feedback, acting as a center for outdoor activities like mountain biking, hiking, and bird watching. Additionally, it includes facilities for stormwater management and native plants, improving the urban environment and supporting the city's environmental objectives. This creative use of unused space encourages community involvement and economic growth while proving that the transformation of existing land or structures around highways can be highly advantageous for local communities.

Despite the many positive examples, there are still thousands of locations across the United States where there is a great need for improvement. A prime example is the Cross Bronx Expressway in New York City, NY, a source of division and blight for surrounding neighborhoods, many of which are low-income communities of color. The highway restricts access to open spaces and adversely affects public health. To address this, a comprehensive plan could be developed to transform the highway into a community asset. This could involve decking over or transforming certain highway segments that cause the most harm to neighborhood health, prosperity, and cohesion.

Alternatively, transforming the highway into an urban boulevard would involve reducing the number of lanes, adding pedestrian and bicycle amenities, and lining the street with trees. This change would create a pedestrian-friendly environment and potentially free up land for open space and community amenities. Implementing such a plan would necessitate collaboration between State departments of transportation, city officials, and local communities, and careful consideration of costs, benefits, and potential impacts. If executed effectively, it could significantly improve residents' quality of life and contribute to the area's overall revitalization.

In conclusion, the concept of transforming unused highway spaces into thriving community areas is not just theoretical; it's already a reality in cities like San Francisco and Boston. These areas have taken what was once seen as a problem and turned it into a solution, creating new cultural, economic, and green spaces that bring people together, stimulate local business, and help make cities more sustainable. This same potential exists across the United States, including places like the Cross Bronx Expressway. Through creative planning and teamwork between local communities, city officials, and transportation departments, we can redesign or repurpose these highways to make them more beneficial to the surrounding neighborhoods. By carefully considering the costs and impacts, we can help improve the quality of life for residents, stimulate local economies, and make our cities more connected and sustainable. So instead of seeing highways as problems, we need to start seeing them as opportunities for positive change.

JOSEPH TSO is a junior at Wilbert Tucker High School in Fairfax, VA, and will graduate in 2025.

BELOW: With planning, some unused urban areas can be turned into dog parks and community gathering spots.

Wildlife Crossings Improve Traffic Safety and May Protect Biodiversity

by **JOSEPH PARAMPATHU**

Surface transportation cuts across natural habitats vital to species survival and ecological biodiversity. As road density increases, so do edge habitats, fragmenting the remaining wildlife habitat into smaller and smaller pieces while increasing the area where vehicle-wildlife collisions are likely to occur. As the Federal Highway Administration's (FHWA) *Wildlife Crossing Structure Handbook* notes, fragmentation is particularly harmful to "wildlife that have large area needs, are found in relatively low densities, and have low reproductive rates." When road infrastructure separates wildlife populations from vital sources of food, water, or shelter; or where roads bisect optimal habitat, they can be especially harmful to wildlife survival. But road infrastructure can incorporate crossings to keep habitats connected even as roads grow and develop—integrating, rather than dividing, the habitats.

Habitat fragmentation both reduces the area of the habitat available and changes the qualities of that habitat: Habitat fragmentation is an aspect of habitat configuration. Connecting habitats on two sides of a divider, such as a highway, wildlife crossings reconfigure habitats to better support ecologies on both sides of the divide. The smaller a habitat patch, the fewer species it can sustain. Still, fragmentation, when controlling for habitat loss in general, may have some positive effects on species that benefit from immigration rate, patch isolation, access to multiple habitats (for animals that spend their adult lives in a different habitat from where they breed or birth), and positive edge effects, especially those species whose main predators need wide-open ranges for survival. The effects of fragmentation or connectivity on a particular species depend on that species' needs.

Even absent intentional design, wildlife already cross public roads. The 2004 *Biological Conservation* study "Use of Highway Undercrossings by Wildlife in Southern California" reported "regular use of underpasses and drainage culverts beneath highways by wildlife, including species of conservation concern." The *Biological Conservation* study authors recommended building pathways intended primarily to support crossings that connect suitable habitats "for protecting native species in areas bisected by high-speed roadways."

However, the article "Impact of Wildlife Crossing Structures on Wildlife-Vehicle Collisions," published in the *Transportation Research Record* in 2004, concluded: "collision reductions were more consistent among wildlife bridges than culverts" and estimated the annual financial benefits from reduced wildlife-vehicle collisions for each crossing structure to be between $235,000–$443,000. In a 2007 report to Congress, *Wildlife-Vehicle Collision Reduction Study*, Hujiser et al. estimated the cost of a wildlife overcrossing at $3.5 million, which, in light of their assumption of an 80-year useful life and the *Transportation*

ABOVE: Bighorn sheep are one of the animals impacted significantly by traffic and roadways that divide their natural habitat.
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For More Information

- "Wildlife Crossing Structure Handbook Design and Evaluation in North America" (*https://www.fhwa.dot.gov/clas/ctip/wildlife_crossing_structures/*)
- "Habitat Fragmentation and Large-Scale Conservation: What Do We Know for Sure?" (*https://www.jstor.org/stable/3683030*)
- "A Survey and Overview of Habitat Fragmentation Experiments" (*https://www.life.illinois.edu/ib/451/Debinski%20(2000).pdf*)
- "Effects of Habitat Fragmentation on Biodiversity" (*https://www.annualreviews.org/doi/abs/10.1146/annurev.ecolsys.34.011802.132419*)
- "Use of Highway Undercrossings by Wildlife in Southern California" (*https://www.researchgate.net/publication/222518086_Use_of_undercrossings_by_wildlife_in_southern_California*)
- "Impact of Wildlife Crossing Structures on Wildlife-Vehicle Collisions" (*https://journals.sagepub.com/doi/abs/10.1177/0361198122110815?journalCode=trra*)
- "Wildlife-Vehicle Collision Reduction Study: Report to Congress" (*https://www.fhwa.dot.gov/publications/research/safety/08034/*)
- "Wildlife Crossing Structure Handbook: Design and Evaluation in North America" (*https://rosap.ntl.bts.gov/view/dot/41646*)
- "Caltrans, California Department of Fish and Wildlife and Brightline Agree to Build Wildlife Overcrossings for Rail Project" (*https://dot.ca.gov/news-releases/news-release-2023-005*)
- "Bighorn Sheep in California" (*https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=113835*)
- "Wildlife Crossings Program" (*https://highways.dot.gov/federal-lands/programs/wildlife-crossings*)

Research Record study's estimation of benefits, may indicate substantial net savings from reducing wildlife-vehicle collisions through properly placed overcrossings. In particular, wildlife overcrossings, such as landscape bridges and wildlife overpasses, are more suitable for large mammals that may not be willing to regularly use underpasses and culverts.

One such animal is the bighorn sheep, occupying the deserts and mountains of the southwestern United States. Traffic is one of the leading killers of bighorn sheep, which depend on a wide-ranging habitat. Caltrans (California's transportation agency), California Department of Fish and Wildlife, and a private rail company have agreed to develop three wildlife crossings above I–15 between Las Vegas and southern California. These overcrossings would span the width of the current I–15 highway as well as the proposed rail system in the median. The highway borders the Mojave National Preserve and passes several wilderness areas home to bighorn sheep, bisecting their natural habitat.

FHWA's report to Congress estimated there are between one and two million wildlife-vehicle collisions per year, and large mammals such as moose and deer account for many of those collisions causing human injury or fatality. In considering that report, Congress created the Wildlife Crossings Pilot Program to provide competitive grants for improving habitat connectivity and reducing collisions. Wildlife crossings such as the three proposed over I–15 are one measure transportation planners can use to address the greater than $8 billion annual cost of wildlife-vehicle collisions to improve driver safety and preserve biodiversity that occur around the Nation. Public roads need not be at loggerheads with the bighorn sheep and other large mammals; by integrating roadways with existing ecologies, overcrossings can reduce traffic fatalities and provide substantial savings for drivers.

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Wildlife overpasses reduce vehicle-animal collisions on highways and allow animals to safely traverse their natural habitats.

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STEM and Transportation: Using Technology and Engineering to Drive a Safer Future for Teens on Roadways

by **SYDNEY COOPER**

Data from the Centers for Disease Control and Prevention show teen drivers (ages 16–19) have a deadly crash rate nearly three times as high as adult drivers (ages 20 and up) per mile driven. The National Safety Council declared that "motor vehicle crashes continue to be the number one cause of preventable death for U.S. teens," and that crashes involving young drivers impact people of all ages. STEM—which stands for science, technology, engineering, and math—can be used to solve this issue. It is important to find a solution to this problem to save the lives of teen drivers and many others in the future. A few methods involving virtual reality (VR), autonomous vehicles (AV), and video games can likely be effective and serve as solutions to help decrease the number of motor vehicle crashes involving teens.

VR is a computer-generated experience that uses tracking of body movements and high-tech glasses to make the user feel like they are inside a virtual world. This links the technology category in STEM with the first possible solution. VR can be used to better prepare teens for driving in the real world, introducing them to the U.S. transportation system (e.g., neighborhood streets and highways) and how to interact with its elements, including signs and pavement markings, pedestrians, and work zone and emergency personnel while driving. According to Youth.gov, factors that increase the risk of crashes among teens are risky driving (e.g., fast driving and illegal lane changes), driving under the influence of drugs and alcohol, distracted driving (e.g., eating and adjusting the radio), and driving with other teens in the car. These common risk factors are ones to simulate or expose teens to as well as other causes of car accidents. With placing headsets equipped with various scenarios in schools and places teens frequently visit (e.g., malls, arcades, and movie theaters), VR can familiarize teens with real-life driving experiences and depict road safety precautions as training to avoid dangerous situations.

A self-driving AV is an automobile with a driving/communication system and high-tech sensors that drives itself safely, so a driver does not have to manually do so. This possible solution uses the engineering component of STEM. AVs can be used as tools to teach teens how to drive and to help them drive more safely by being engineered to prevent dangerous encounters from occurring. For example, a modified AV that can support multiple levels of automation can not only detect other objects in a roadway while being driven by a teen, but it can automatically steer itself away from possible collisions with such objects as other vehicles, trees, mailboxes, bicyclists, and pedestrians. This vehicle can also be made to automatically slow down to the roadway's posted speed limit and while traveling in bad weather. With making modified AVs available for use in high school driver education courses, State-approved certified driver training schools, and for purchase, teens can be taught the importance of paying attention while driving and being fully aware of their environment. This solution can also prevent accidents from happening much better than the cars driven now.

Most teens love to play video games. More than 84 percent of teens (ages 13–17) say they have a game console at home or access to one. Ninety percent also say that they play video games on multiple devices like consoles, cellphones, and computers. This final possible method also makes use of the technology component of STEM and can be both effective and

ABOVE: Using technology, such as virtual reality, can help teen drivers improve their ability and safety behind the wheel of a real car.

For More Information

- "Teen Drivers and Passengers: Get the Facts" (*https://www.cdc.gov/transportationsafety/teen_drivers/teendrivers_factsheet.html#theproblem*)
- "Teen Drivers" (*https://injuryfacts.nsc.org/motor-vehicle/road-users/teen-drivers/*)
- "Factors that Increase the Risk of Crashes" (*https://youth.gov/youth-topics/factors-increase-risk-crashes*)
- "5 facts about Americans and Video Games" (*https://www.pewresearch.org/short-reads/2018/09/17/5-facts-about-americans-and-video-games/*)
- "Getting the Most Value From Driver's Education" (*https://www.moneygeek.com/insurance/auto/resources/benefits-of-drivers-education/*)
- "Study: Driver's Ed Significantly Reduces Teen Crashes, Tickets" (*https://newsroom.unl.edu/releases/2015/08/13/Study:+Driver's+ed+significantly+reduces+teen+crashes,+tickets*)

accessible. A video game can be defined as an electronic game controlled by a user with an input device such as controllers or keyboards. Like VR, video games can be used to introduce teens to the real world of driving and be helpful in promoting safe driving habits. A driver's education game can make use of the latest technology and elements that teens have come to enjoy, including state-of-the-art and unique graphics, sounds, characters (with an opportunity to choose a persona and vehicle), sceneries (with an opportunity to view different areas and components of the U.S. transportation system), rewards (with an opportunity to gain points for exercising good driving behaviors), and real-time interconnectivity (with an opportunity to play the video game alongside other teen drivers).

Implementation of one or more of the solutions mentioned above—VR, AVs, and video games—could possibly and positively change the data regarding car accidents involving teens. Studies show that driver's education classes reduce teen crashes. Implementing the solutions in conjunction with driver's education classes can reinforce what happens on roads in a real-world setting, promote correct and safe driving behaviors, and prevent car crashes involving teens from occurring so often. This prevention can help build a better transportation system and save more lives.

SYDNEY COOPER is a junior at Westlake High School in Atlanta, GA, and will graduate in 2025.

According to data, car crashes are "the number one cause of preventable death for U.S. teens." However, steps can be taken by teens to help reduce that number.

CREATING SAFE AND EQUITABLE TRANSPORTATION

by **ROHINI KAR**

Safety is something that all individuals desire, and they expect that public roadway agencies will provide means of helping people travel efficiently and safely. Although all road users are at risk of serious crashes and resulting injuries, people who are black, Hispanic, indigenous, and/or live in rural areas have been found to be more impacted by traffic crashes compared to others. An equitable transportation system ensures that there is safe, reliable, and affordable mobility to meet the needs of all community members despite their income, age, abilities, or color.

There are growing concerns also with environmental issues, which will especially impact the health and safety of low-income areas having limited resources and transportation options. To alleviate these issues, the Federal Highway Administration (FHWA) of the U.S. Department of Transportation (USDOT) has a goal of creating a transportation industry with little to no fatalities or serious injuries for all citizens. The key strategies that FHWA is using are to improve safety data systems and other technologies, continue research on automated vehicles, implement regulations and policies on projects, and have a wide range of diversity within public agencies.

ABOVE: Crash analysis is one of the key elements in creating safer roads and improving vehicle technology.
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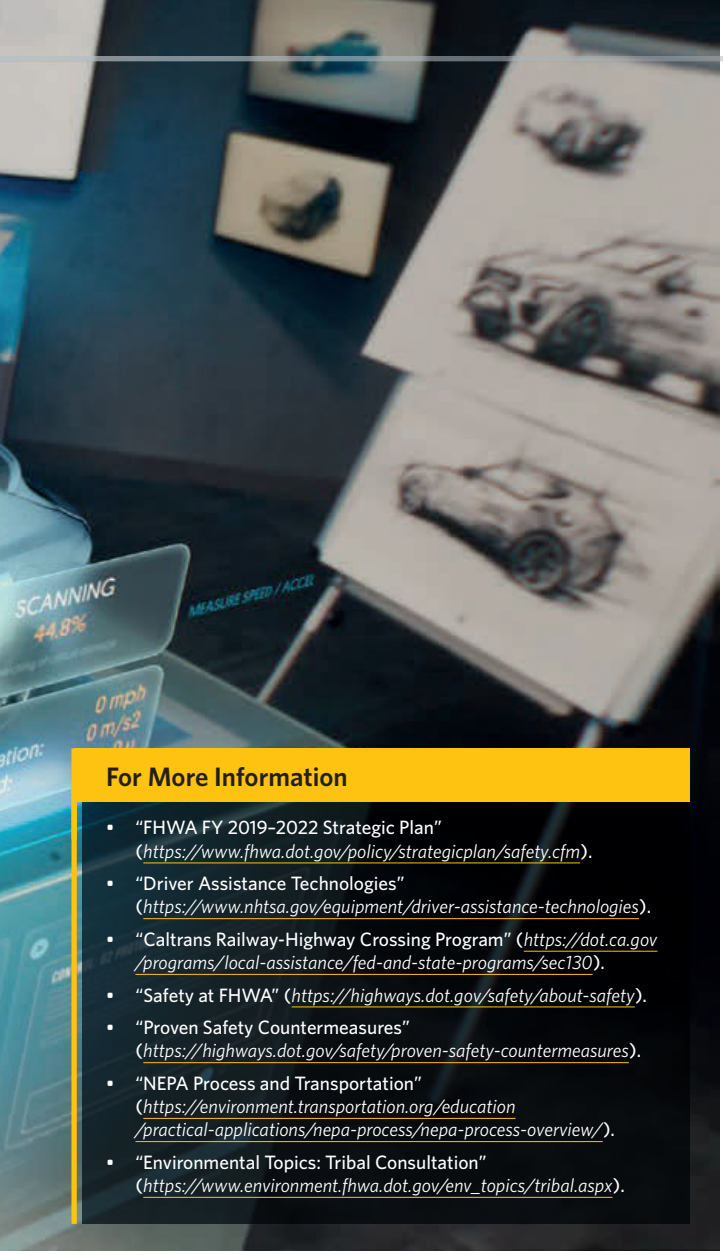
CRASH ANALYSIS

One key component to creating safer roads and vehicular technology is to analyze potential issues in the transportation systems. FHWA highly encourages and supports agencies that study traffic control systems and crash data; for some agencies, FHWA provides technical assistance through the Roadway Data Technical Assistance Program so that they have a well-managed approach to track crashes on all public roads.

Cost-effective data management for States is also important when implementing changes, so FHWA encourages States to use data-driven safety analysis methods to create more effective plans that are not too expensive and are more effective. Improving roadway inventory and traffic volume components of safety data systems also helps with evaluations that decrease the number of crashes on all roads, ranging between urban and rural. Identifying the problems of roadways and traffic operations will lead to a more effective system and save more lives.

TRANSPORTATION PROJECTS

Fatality rates have been found to be more predominant in rural areas, yet a significant portion of the public funding and



For More Information

- "FHWA FY 2019–2022 Strategic Plan" (*https://www.fhwa.dot.gov/policy/strategicplan/safety.cfm*).
- "Driver Assistance Technologies" (*https://www.nhtsa.gov/equipment/driver-assistance-technologies*).
- "Caltrans Railway-Highway Crossing Program" (*https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/sec130*).
- "Safety at FHWA" (*https://highways.dot.gov/safety/about-safety*).
- "Proven Safety Countermeasures" (*https://highways.dot.gov/safety/proven-safety-countermeasures*).
- "NEPA Process and Transportation" (*https://environment.transportation.org/education/practical-applications/nepa-process/nepa-process-overview/*).
- "Environmental Topics: Tribal Consultation" (*https://www.environment.fhwa.dot.gov/env_topics/tribal.aspx*).

programs have been directed toward urban areas. To come up with safety solutions that aid disadvantaged regions, FHWA is continuing to support multiple programs that create projects that target rural areas.

Programs such as the Highway Safety Improvement Program and Strategic Highway Safety Plan are coming up with projects like the Lane Departure Program, which is designed to prevent drivers from drifting out of a lane, and the Railway-Highway Crossing Program, which works to reduce crashes at railroad crossings, to focus on rural roads that have higher fatality rates. Alongside FHWA, the Bipartisan Infrastructure Law provides a plethora of resources and opportunities to fund projects that can save lives on all public roads. All these programs and projects collectively add more opportunities to improve safety.

DRIVERS

To ensure that drivers and other road users are traveling in a well-monitored and managed transportation system, FHWA is also working toward several proven safety countermeasures. By implementing those countermeasures, different types of crashes and their severity can be reduced. According to USDOT's safety website, "This strategy embraces a Safe System Approach, which builds multiple layers of protection around road users and is based on the reality that although people make mistakes, those mistakes do not have to be fatal." By implementing proven safety countermeasures on all public roads, things like speed and roadway departures can be managed, which help the transportation industry work toward their goal of zero fatalities.

AUTOMATED DRIVING SYSTEMS

With rapid developments in technology, especially artificial intelligence, autonomous vehicles serve as a window to the future of transportation. To address and mitigate safety concerns, such as hacking and malfunctioning, FHWA is encouraging evidence-based safety programs to conduct research to improve vehicle technology. Driverless cars that have extra safety features and regulations could potentially increase survival rates and decrease the number of fatalities. People who are disabled, unable to drive to work, or have other barriers will be able to travel in a much safer way since the cars are put through a series of tests and safety standards to ensure their safety before implementation in the real world. Devices and programs can also track crashes to develop safety tools that will increase its quality, which will help decrease crash-related fatalities and serious injuries everywhere.

ENVIRONMENT

Environmental concerns have also driven FHWA to take serious measures and precautions. In order for new infrastructure projects to be approved, Federal, State, and local agencies must research the area's vulnerability to dangers such as floods, runoff, and water pollution. Many highways do not allow rainwater to penetrate, which results in the runoff of debris and pollution into water sources. The diminished water quality can significantly impact the health and safety of low-income and rural communities. FHWA has taken this into account and placed policies under the National Environmental Policy Act to control the water runoff after storms by altering transportation projects. Flood risks are also increasing throughout the years, which threaten the safety of communities that have flat pavements. The guidelines and requirements that FHWA placed are there to ensure that the road designs can prevent floods and keep all citizens and the ecosystem safe.

CONCLUSION

FHWA is constantly investing in the safety of the community and the environment. Federal grant programs and funding prioritize small businesses, communities of color, and disadvantaged societies to ensure that there are not any cost or infrastructure burdens. Several projects are initiated so the technologies are being placed for the purpose of safety and effectiveness. To create a safe environment that is respecting cultural and historical grounds, FHWA also works with Tribal agencies to ensure that transportation projects are not disruptive. Overall, FHWA is working with many agencies to improve safety and the environment to eventually achieve their goal of zero fatalities nationwide.

ROHINI KAR is a junior at Desert Vista High School in Phoenix, AZ, and will graduate in 2025.

Along the Road features current and upcoming activities, developments, trends, and items of general interest to the transportation community.

ABOVE: Strategies for electric vehicle charging are critical to advancing a clean transportation plan.
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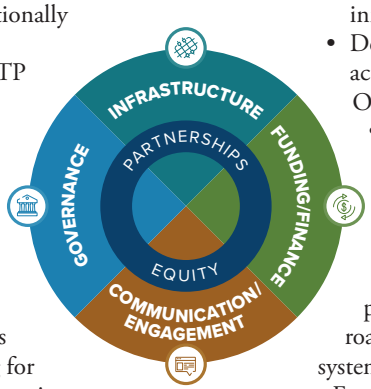
RIGHT: *Source: The N.C. Clean Transportation Plan.*

Public Information and Information Exchange

NCDOT Releases a Statewide Clean Transportation Plan

The North Carolina Department of Transportation (NCDOT) released the guidance document, *North Carolina Clean Transportation Plan* (NCCTP), in April 2023, detailing a coordinated strategy for how the State can achieve an equitable, versatile, and clean transportation future. The document also describes equitable outcomes for everyone—including people in traditionally underserved communities.

The strategies described in the NCCTP outline four focus areas: governance, infrastructure, funding/finance, and communication/engagement. One strategy from each focus area includes creating a dedicated clean transportation team (governance); evaluating and deploying clean transportation infrastructure to support all types of fleet vehicles and applications (infrastructure); evaluating and applying for new funding that advances clean transportation outcomes (funding/finance); and establishing a coordinated clean transportation communication strategy to increase awareness, align resources and partnerships, and advance the initiative (communication/engagement). Overall, the NCCTP will result in:



- Sharing best practices and increasing awareness of the current landscape of clean transportation initiatives in North Carolina.
- Tracking progress, such as new registration and sales of zero emission vehicles, the per capita reduction in vehicle miles traveled, and metrics tied to workforce development initiatives.
- Developing strategies, with an emphasis on near-term action that will support achieving the goals in Executive Order 246 and the goals of the NCCTP.
- Assessing the opportunities, challenges, and considerations of creating a more equitable clean transportation system. This should focus on the potential impacts on traditionally underserved communities.

The NCCTP encourages stakeholders from the public and private sectors to collaborate and develop a roadmap for achieving an equitable clean transportation system for North Carolina.

For a summary of the NCCTP, visit: *https://www.ncdot.gov/initiatives-policies/environmental/climate-change/Pages/clean-transportation-plan.aspx*. To review the full NCCTP, visit: *https://www.ncdot.gov/initiatives-policies/environmental/climate-change/Documents/nc-clean-transportation-plan-final-report.pdf*.

Lake Tahoe Transportation Projects Awarded Funding for Improvement

As part of the 2023 Regional Grant Program, the Tahoe Regional Planning Agency, a federally designated metropolitan planning organization, awarded over $11 million in May 2023 to seven transportation projects that seek to improve safety and climate resilience in the Tahoe region of California and Nevada.

The funding will go toward reducing congestion, expanding regional walking/running/biking trails, continuing free transit, and supporting equitable recreation access. For example, the Kings Beach Western Approach project on the North Shore—an existing signalized intersection awarded $1.5 million and scheduled for completion in 2026—will be converted to a roundabout for improved mobility, safety, efficiency, level of service, and public transit access.

Similarly, the Apache Avenue Pedestrian Safety and Connectivity project on the South Shore—awarded nearly $1.7 million and scheduled for completion in 2026—will be enhanced to provide a safe, walkable, and bikeable roadway through additional roadway signage, highly visible crosswalks and pavement markings, improved stormwater drainage system, bike lanes on both sides of the roadway, and Americans with Disabilities Act-defined curb ramps.

Other projects include the Pioneer Trail/U.S. Highway 50 Intersection Safety Improvement on South Shore (awarded nearly $3.7 million to convert into a modern roundabout and due for completion in 2026); Microtransit EV Charging Base Station (awarded nearly $270,000 to convert microtransit fleet to electric and due for completion in 2024); and continuing the Free-to-the-User Transit Program (awarded $1 million and due for implementation in 2025). The Free-to-the-User Transit Program will utilize the existing Tahoe Transportation District transit service for a free system to help eliminate traffic. A version of the service was rolled out sooner than expected during the COVID-19 pandemic to eliminate fare exchanges between drivers and riders. Nevertheless, zero-fare transit systems have been shown to positively impact on-time performance, efficiency, safety, and climate change mitigation.

For more information on all seven projects, visit: *https://www.trpa.gov/11-1-million-awarded-to-seven-transportation-projects/*.

The Apache Avenue Pedestrian Safety and Connectivity project will improve the avenue's accessibility, mobility, and safety with added signage, street markings, bike lanes, and more.

INSET: *© 2016 County of El Dorado.*

LEFT: *© Alta Planning + Design.*

USDOT's Project Delivery Center of Excellence Dedicated to Delivering Infrastructure on Time, on Task, and on Budget

In July 2023, the U.S. Department of Transportation launched the Project Delivery Center of Excellence at the USDOT Volpe National Transportation Systems Center. The Center of Excellence provides information and resources to support the successful implementation of infrastructure projects from concept to completion.

"We want this resource to be useful, so we will partner with Federal, Tribal, State, and local Bipartisan Infrastructure Law project sponsors to grow the Center of Excellence to ensure good projects are delivered well—and that means on time, on task, and on budget," said USDOT Volpe Center Director Anne Aylward in a press release.

The Center of Excellence aims to bridge the gap between practitioners in the field and leading thought leaders and academic researchers, to share perspectives, exchange expertise, and identify best practices. "We are optimistic about what can be done, but we also know that it won't happen on its own," said Pete Buttigieg, US Secretary of Transportation, in an official statement.

Buttigieg added that now is "the best chance probably in our lifetimes in the United States to transform our transportation systems for the better, to make communities safer, to make transportation cleaner, to advance equity, and to connect people to the resources, opportunities, and jobs that are going to shape their lives."

Additional plans for the Center of Excellence focus on best practices related to streamlining construction contracts and examining the causes of construction change orders. Find out more at the Project Delivery Center of Excellence's website: *https://www.volpe.dot.gov/project-delivery*.

The Project Deliver Center of Excellence is helping to advance infrastructure work around the Nation, including bridge reconstructions.

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STIPDG Internship Helps Further USDOT Diversity Goals

The Summer Transportation Internship Program for Diverse Groups (STIPDG) is a unique opportunity for undergraduate, graduate, and law students to gain hands-on experience in public service while learning about transportation challenges and advancements in the United States. With opportunities available in each operating administration within the U.S. Department of Transportation, STIPDG is a critical part of USDOT's efforts to increase diverse representation in its workforce. Recruitment for the program is targeted toward Historically Black Colleges and Universities and minority-serving institutions. All students who have completed at least their freshman year of college are encouraged to apply.

Through an internship at USDOT, students build professional networks, develop vital skills, and learn about exciting opportunities. Students are assigned to a USDOT employee who serves as a mentor throughout the 10-week program, and opportunities are available throughout the country, as well as Puerto Rico. Compensation includes a competitive stipend in addition to fully furnished housing and roundtrip travel to the assignment location.

USDOT student internships create new opportunities in public service and transportation.
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For more information about STIPDG, please visit: *https://twc.edu/programs/summer-transportation-internship-program-diverse-groups*.

Technical News

Federal Highway Administration Partners with NSF on Convergence Accelerator Program

In 2019, the National Science Foundation (NSF) launched the NSF Convergence Accelerator to merge innovative ideas, approaches, and technologies from a diverse range of sectors to solve societal challenges. Areas funded by the accelerator include People and Society; Education and Training; Earth and Environment; Technology; Facilities and Infrastructure; and Engineering. According to their website, the NSF Convergence Accelerator "support[s] engineering research that addresses national challenges—such as smart manufacturing, resilient infrastructure, and sustainable energy systems—and brings about new innovations, from biotechnologies to semiconductors."

In May 2023, NSF leveraged FHWA's applied engineering expertise for their Convergence Accelerator program, "Sustainable Materials for Global Challenges." Ben Graybeal, the Bridge Engineering Research team leader in FHWA's Office of Infrastructure Research and Development, served as an expert for a panel discussion on the ways funded research teams can become better aware of the needs of infrastructure owners and the pathways through which innovation can move from research concept to deployed solutions.

"It's great to see that NSF is placing an emphasis on facilitating connections between basic research and deployed solutions, between the researchers and the owner/operator/user community," Graybeal said. "It was a pleasure to share insights with a broad range of subject matter experts who know their technical topic areas but might lack connection to the end users of the technologies that they are developing. At FHWA, we can be a conduit through which NSF-funded solutions can reach the surface transportation community of practice."

For more information, visit NSF Convergence Accelerator website at *https://new.nsf.gov/funding/initiatives/convergence-accelerator*.

The NSF Convergence Accelerator can prove useful for future transportation technologies and applications.
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The Cherokee Nation in Oklahoma received an FTA grant to support its long-range planning.
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Policy, Regulations, and Grants

$20 Million in Grants to Help Communities Prosper Via Transit

In July 2023, the U.S. Department of Transportation's Federal Transit Administration (FTA) announced that $20 million in Federal support will be divided among 47 communities across the country (*https://www.transit.dot.gov/funding/grants/grant-programs/fiscal-year-2023-areas-persistent-poverty-aopp-project-selections*) to help improve public transportation options in areas experiencing long-term economic distress. The award comes via FTA's Areas of Persistent Poverty (AoPP) program, which provides support to State and local governments, transit agencies, and nonprofit organizations to improve the accessibility and affordability to transit for residents with limited or no viable transportation options. Improved transit options can lead to better jobs, resources, and other opportunities.

Through the AoPP program, grants are awarded for studies to advance transit in low-income areas defined by data provided by the U.S. Census Bureau. For this award, FTA received applications totaling close to $36 million in requests. Requests were narrowed and projects selected based on criteria described in the award's Notice of Funding Opportunity (*https://www.transit.dot.gov/notices-funding/areas-persistent-poverty-program-fy-2023-notice-funding-opportunity*), including being able to demonstrate the requisite legal, financial, and technical capabilities to receive and administer Federal funds under the AoPP program.

The Cherokee Nation in Northeastern Oklahoma is one entity that will receive an AoPP grant. The Tribal Nation will receive $576,188 to update the Cherokee Nation's long-range transit plan to guide the planning, construction, and deployment of future Tribal transit projects. The update will include an electric vehicle infrastructure assessment to plan for expansion and increase user access for its 450,000 Tribal citizens.

For more information, visit: *https://www.transit.dot.gov/about/news/biden-harris-administration-announces-20-million-grants-help-communities-prosper*.

Empowering Truck Drivers: Your Roads. Their Freedom.

In May 2023, the U.S. Department of Transportation's Federal Motor Carrier Safety Administration (FMCSA) announced a new human trafficking awareness campaign—"Your Roads. Their Freedom."—to provide the Nation's 8.7 million commercial motor vehicle (CMV) drivers with information to help identify and report suspected human trafficking.

Human trafficking is a form of modern-day slavery that involves the use of force, fraud, or coercion to obtain labor or a commercial sex act, including the commercial sexual exploitation of children under any circumstance. Globally, an estimated 25 million people are subjected to human trafficking and forced labor, which produces adverse effects for the safety and health of communities and transportation networks.

RIGHT: "Your Roads. Their Freedom." represents FMCSA's new human trafficking awareness campaign to alert the Nation's nearly 9 million CMV drivers.
Source: USDOT.

Human traffickers often use transportation systems (e.g., truck stops, rest areas, and travel centers) when recruiting and trafficking victims. Through this national campaign, FMCSA aims to educate and empower CMV drivers by raising awareness of the signs of human trafficking and encouraging drivers to report possible issues to authorities.

Along with FMCSA, "the Federal Highway Administration seeks to combat human trafficking by reaching a broad audience of public sector partners who may be building, operating, and maintaining public rest areas where truckers stop," says Caitlin Hughes, director of FHWA's Office of Freight Management and Operations. "We encourage States, local governments, port terminal operators, and more to incorporate the anti-trafficking design recommendations for truck parking facilities that we included in the *2022 Truck Parking Development Handbook* (*https://ops.fhwa.dot.gov/Freight/infrastructure/truck_parking/docs/Truck_Parking_Development_Handbook.pdf*)."

If CMV drivers see or suspect any indicators of human trafficking, they are encouraged to call 911, the National Human Trafficking Hotline (888-373-7888; text HELP or INFO to BeFree (233733); or follow their company's reporting policy, if established.

For more information on the "Your Roads. Their Freedom." campaign, along with shareable resources, visit *https://www.fmcsa.dot.gov/stophumantrafficking*. To review a previous article on anti-human trafficking efforts in *Public Roads*, visit: *https://highways.dot.gov/public-roads/winter-2021/combating-human-trafficking*.

FHWA's AID Demo Resumes Call for Innovation in Highway Transportation

Since the Federal Highway Administration launched the Accelerated Innovation Deployment (AID) Demonstration in 2014, more than $95.7 million was awarded for 127 grants. These grants are incentives to accelerate the deployment and adoption of proven innovative practices and technologies in highway transportation projects. In October 2023, FHWA announced a call for AID Demonstration applications and will issue nearly $12.5 million in grants during fiscal years 2024 through 2026 from amounts authorized within the Technology and Innovation Deployment Program under the Infrastructure Investment and Jobs Act.

AID Demonstration funds are available to eligible entities for activities authorized for assistance under Title 23, United States Code; involve in any phase of a highway transportation project between project planning and project delivery, including planning, finance, operation, structures, materials, pavements, environment, and construction; and address the Technology and Innovation Deployment Program goals. State departments of transportation (DOT), Federal land management agencies, and Tribal governments are eligible and encouraged to apply. Local public agencies may apply for AID through their State DOT. The FY 2024 application deadline is April 23, 2024. FHWA will also host a webinar.

For complete eligibility requirements, webinar information, and more, visit *https://www.fhwa.dot.gov/innovation/grants/*.

Highway construction projects, and others, benefit from AID Demonstration funding.

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Using TSMO to Improve Current Transportation Systems

by **JIM HUNT** and **SABRINA SYLVESTER**

Transportation Systems Management and Operations (TSMO) is a set of strategies, activities, and mobility services that maximize the performance of existing transportation systems. TSMO enables more efficient use of transportation infrastructure, better aligns travel demand with system capacity, and provides integrated and comprehensive solutions that can typically be implemented quickly and at low cost relative to traditional capacity expansion. The benefits of TSMO include the following: improving safety, enabling smoother and more reliable traffic flow, reducing congestion, providing real-time highway and transit traveler information, and enhancing environmental conditions.

To support improved TSMO implementation, the Federal Highway Administration's National Highway Institute (NHI) now offers a series of training courses that provide the fundamentals of TSMO and shows how agencies can institutionalize TSMO practices in their organization.

Achieving Success With NHI

NHI currently offers four TSMO training courses, including three, newly developed courses. The first two courses are Web-based Training (WBT) that provide a detailed introduction to TSMO, its concepts, and how to apply these strategies to the transportation planning process. The third course is a Web-conference Training (WCT) that helps learners apply these concepts to real-world scenarios in a live, virtual space with subject matter experts. The fourth TSMO training discusses the benefits of various institutional, organizational, and procedural changes to make TSMO practices more effective.

Planning for TSMO Introduction (FHWA-NHI-133131)

This WBT is an introductory course that focuses on how agencies plan and effectively integrate TSMO into their transportation planning and programming processes. Participants will get an overview of TSMO planning and methods for institutionalizing TSMO practices and collaboration.

Planning for TSMO—Concepts and Applications (FHWA-NHI-133132)

This WBT builds on the *Planning for TSMO Introduction* (FHWA-NHI-133131) course. The training teaches how TSMO can be integrated into a transportation planning process; enhance planning, programming, and project development outcomes; and be evaluated.

Planning for TSMO—Putting Concepts Into Action (FHWA-NHI-133133)

This WCT is an interactive course that uses engaging activities and applies a scenario that brings the concepts of planning for TSMO to life. Learners can apply concepts to their specific interests and needs when integrating TSMO into their transportation planning, programming, and project development processes.

This three-course training series is designed for transportation planners and operations staff with TSMO experience who want to deepen their knowledge and learn strategies for integrating TSMO within their agency.

Making the Business Case for Institutional, Organizational, and Procedural Changes for TSMO (FHWA-NHI-133128)

This WBT identifies the benefits and considerations for implementing TSMO practices and recommended TSMO business case components. This training also describes the role and importance of leadership in instituting TSMO practices.

Additional TSMO Courses

The following NHI TSMO-related courses will soon be available through the NHI website:

- *TSMO 101.*
- *TSMO Benefit-Cost Analysis.*
- *Understanding and Applying the Capability Maturity Model to Advance TSMO Programs.*

Beyond the NHI training courses, information on other FHWA's TSMO initiatives and resources can be found at *https://ops.fhwa.dot.gov/plan4ops/index.htm*.

How to Attend or Host a Course

NHI invites all transportation professionals interested in a course to visit *https://www.nhi.fhwa.dot.gov/* to learn more information on how to register or host a course. The course catalog lists over 350 courses in 18 program areas.

NHI is an approved Accredited Provider by the International Accreditors for Continuing Education and Training (IACET). As an IACET Accredited Provider, NHI offers continuing education units for its programs that qualify under the American National Standards Institute/IACET Standard.

JIM HUNT is an FHWA TSMO program manager.

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Source: NHI.

PREPARE YOUR SUBMISSION—*PUBLIC ROADS* IS DOING IT AGAIN!

Second Student Writing Competition Coming This Spring

We issued the call for student articles, and you answered!

In this issue, *Public Roads* published the winners of the Student Writing Competition—the first one ever in the publication's 105-year history.

With the success of its debut, *Public Roads* has decided to do the competition again. Coming this spring, look for the launch of the Student Writing Competition 2024, with winners to be published in a future issue.

If you didn't apply last time, now's your chance to be part of history and have your work featured in *Public Roads*.

Look for launch details and information on social media or our website: https://highways.dot.gov/public-roads/home.

FHWA's Transportation Pooled Fund Program


Source: FHWA.

Leveraging Resources to Achieve Common Research Goals


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The Transportation Pooled Fund (TPF) Program enables public and private entities to combine resources to conduct high priority research on a wide variety of shared, highway related problems. Over more than 45 years, the TPF Program has supported more than 750 successful multi-agency projects.

Participate in Diverse Research and Topic Areas

Investing in TPF studies helps partners stretch their research dollars to support a diverse array of topic areas.

Make an Impact Through a TPF Study!

Learn more about initiating a pooled fund study and browse the list of open solicitations on the TPF website at ***www.pooledfund.org***.

For more information, contact Tricia Sergeson, TPF Program Manager, at ***Patricia.Sergeson@dot.gov***.


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TPF TRANSPORTATION POOLED FUND

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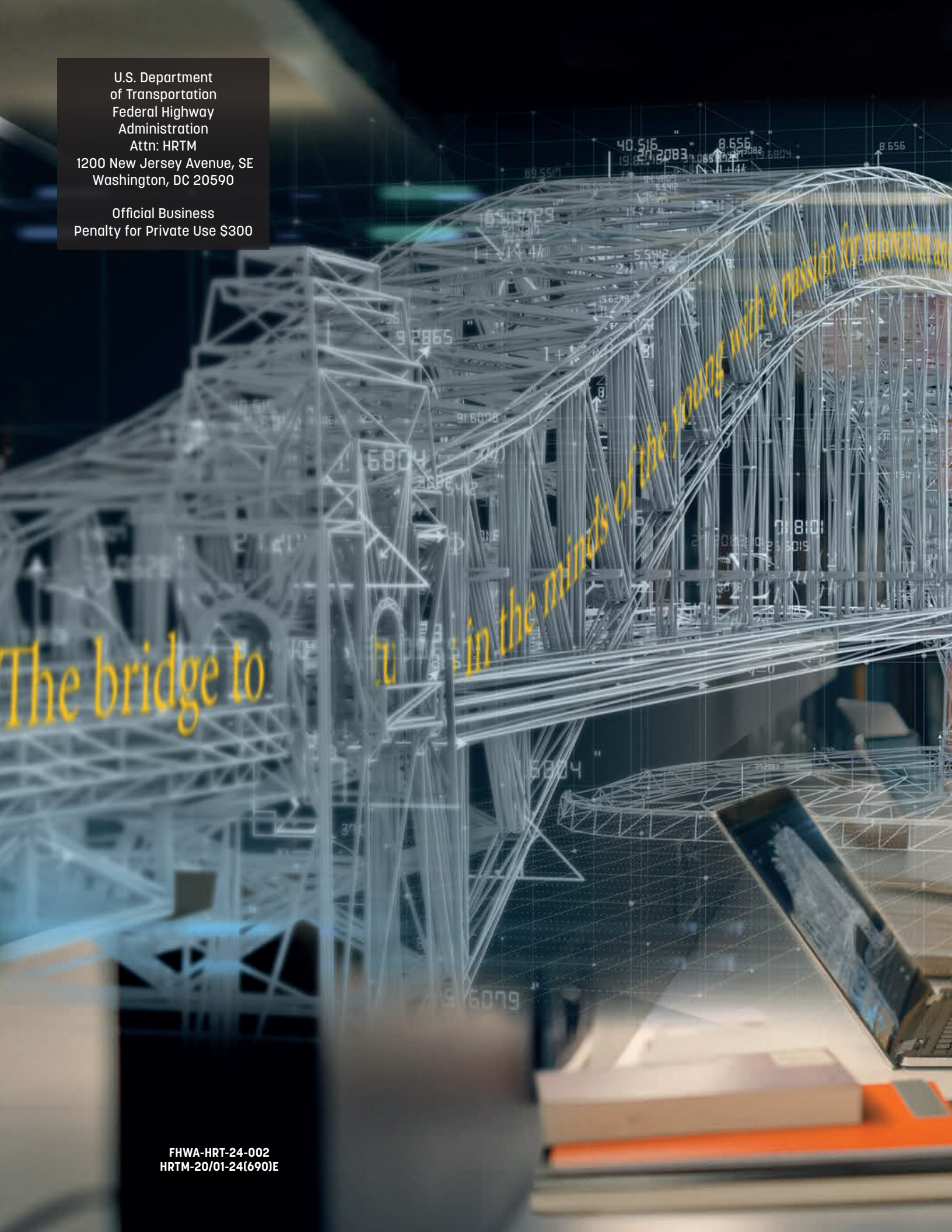

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