

Federal Highway Administration (FHWA)

Pedestrian and Bicycle Research and Program Activities

March 2019

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources/trb_summaries/2019.cfm

This document presents recent and ongoing pedestrian and bicycle research efforts and related activities, organized by four goals from the [U.S. Department of Transportation \(DOT\) Strategic Plan for FY 2018-2022](#): Safety, Infrastructure, Innovation, and Accountability. These tools and resources support multimodal transportation projects that improve connectivity, accessibility, safety, and convenience for all users. See the web version of this document at https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources/.

Federal-Aid Funds for Pedestrian and Bicycle Programs and Projects

- In Federal fiscal year 2018, States obligated [\\$916 million](#) in Federal-aid highway program funds for pedestrian and bicycle programs and projects. FY 2018 pedestrian and bicycle funding was 2.3 percent of Federal-aid highway funding (\$40.5 billion). See https://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/bipedfund.cfm.
- FHWA lists [Pedestrian and Bicycle Funding Opportunities](#) to indicate potential eligibility for pedestrian and bicycle activities under U.S. DOT surface transportation programs. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/funding/funding_opportunities.cfm

FHWA Offices with Pedestrian and Bicycle Programs and Projects

- Office of Safety, Pedestrian and Bicycle Safety: https://safety.fhwa.dot.gov/ped_bike/
- Office of Federal Lands Highway: <https://flh.fhwa.dot.gov/>
- Office of Infrastructure, Geometric Design: <https://www.fhwa.dot.gov/programadmin/>
- Office of Innovative Program Delivery: <https://www.fhwa.dot.gov/innovativeprograms/>
- Office of Operations, Manual on Uniform Traffic Control Devices: <https://mutcd.fhwa.dot.gov/>
- Office of Planning, Environment, Realty
 - Office of Human Environment: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/index.cfm
 - [Bicycle and Pedestrian](#)
 - [Recreational Trails Program](#)
 - [Transportation Alternatives](#)
 - Office of Planning: https://www.fhwa.dot.gov/planning/processes/pedestrian_bicycle/
- Office of Policy and Governmental Affairs, Office of Highway Policy Information: <https://www.fhwa.dot.gov/policyinformation/>
- Office of Research, Development, and Technology: <https://highways.dot.gov/research/>
 - Exploratory Advanced Research: <https://highways.dot.gov/research/exploratory-advanced-research>
 - Pedestrian and Bicycle Safety: <https://highways.dot.gov/research-programs/safety/pedestrian-and-bicycle-safety>

FHWA Pedestrian and Bicycle Research and Program Activities

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/resources/trb_summaries/2019.cfm

SAFETY: Reduce Transportation-Related Fatalities and Serious Injuries Across the Transportation System.

Office of Safety

- **Pedestrian and Bicyclist Scalable Risk Assessment Methodology (ScRAM):** This assessment approach allows agencies to estimate pedestrian and bicyclist risk and inform funding decisions. The ScRAM tool was finalized in Fall 2018 and will be followed by 2 years of training and technical assistance for communities interested in using it. An Areawide Exposure Tool (an Excel spreadsheet) is supplemental to the Guide for ScRAM. This tool allows practitioners to obtain and summarize nationwide travel survey data to estimate risk at statewide and Metropolitan Planning Organization (MPO) area scales while providing functions for the user to supply local data when available. See https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa18032/.
- **Bikeway Selection Guide:** This resource guide helps State and local agencies identify the most appropriate types of bike facilities to use based on user and roadway characteristics. After development, technical assistance will be provided to several pilot communities as they use the guide. See https://safety.fhwa.dot.gov/ped_bike/tools_solve/. (PDF)
- **Safe Transportation for Every Pedestrians (STEP):** Through the FHWA Every Day Counts (EDC) program, STEP focuses on improving pedestrian crossing locations, urban and rural, and works with stakeholders to develop a systemic approach to improve quality of life for pedestrians of all ages and abilities. The following countermeasures will advance under EDC5 (2019-2020): Rectangular Rapid Flashing Beacons (RRFB), leading pedestrian intervals, Pedestrian Hybrid Beacons (PHB), crosswalk visibility enhancements, raised crosswalks, pedestrian crossing/refuge islands, and road diets. See https://safety.fhwa.dot.gov/ped_bike/step/.
- **Pedestrian and Bicyclist Focus States and Cities Technical Assistance:** Since inception in 2004, this program works to aggressively reduce pedestrian deaths by focusing extra resources on the cities and States with the highest pedestrian fatalities and/or fatality rates. The States and cities receiving technical assistance is revised every four or five years and currently includes 16 States and 35 cities. The Pedestrian/Bicyclist Focus States and Cities initiative supports Peer-to-Peer Exchanges, quarterly webinars, and technical assistance and training to improve safety and develop action plans. The objective is to arm the States and cities with knowledge and tools and guide them through processes they can use to make a measurable impact on pedestrian and bicyclist safety. https://safety.fhwa.dot.gov/ped_bike/ped_focus/.
- **Update Bicycle and Pedestrian Transportation University Course:** This project will update and modify the 2006 course materials based upon reports and guidelines that have been released since the last update. The goal is to mainstream the bicycle and pedestrian transportation content into multiple University-level courses. Expected Fall 2019.
- FHWA's [Pedestrian Forum Newsletter](https://safety.fhwa.dot.gov/ped_bike/pedforum/) highlights recent pedestrian safety activities that will help reach FHWA's safety goals and save lives. https://safety.fhwa.dot.gov/ped_bike/pedforum/.
- **Lighting for Pedestrians Design Guide:** The objective of this project is to develop a lighting design guide and implementation policy that will be cost-efficient to promote pedestrian safety in an urban street environment. The design guide and implementation policy will focus on

lighting the sidewalks as well as crosswalks and other pedestrian critical conflict points around schools. Expected Fall 2019.

Office of Safety R&D

- Published ***Pedestrian Countermeasures Crash Modification Factor Study***, the extension of FHWA's Countermeasure Deployment Project completed in 2009. The purpose of the project was to demonstrate the effectiveness of pedestrian safety plans in reducing pedestrian fatalities, injuries, and conflicts and to demonstrate the plan's portability to other jurisdictions within the United States. There are 2 countermeasures selected from technical panel to be evaluated for CMF: (1) Permissive to Protected Left Turn Phasing and (2) Leading Pedestrian Interval (LPI), posted at <https://www.fhwa.dot.gov/publications/research/safety/18044/index.cfm>.
- **SmartCross**: Traffic Signal Interface on the Smartphone (SBIR Phase IIB)
Recently completed the SmartCross project. This system enables pedestrians to safely navigate busy intersections with the help of a mobile application. This one-of-a-kind system enables the users to request a pedestrian walk phase directly from their smartphone. The app on the smartphone also alerts the user when it is safe to use the crosswalk. The user downloads the application on his/her smartphone from the app store (Android Market or iTunes Store). Once downloaded, the user configures the mode of operation through a first use screen with options of: pedestrian, bike, visually impaired, and wheelchair mode. Based on the user mode, the application varies its feedback mechanism. To use the system, the pedestrian simply approaches the crosswalk with the application running on the smartphone. On reaching the curb, he/she points the device towards the intended direction of travel (the crosswalk he/she wants to use). If the direction pointed aligns with a crosswalk, the user can request a walk phase by pressing the CROSS button on the app.
- Currently working on: ***Development of Crash Modification Factors (CMF) for Different Separated Bike Lane (SBL) Configurations***. This is the study for SBL Phase II, activity will then focus specifically on developing CMFs for midblock SBL locations. The overall goal is to determine the influence that SBLs have on the total number and severity level of crashes with particular attention to those crashes involving bicycles. Because intersections must accommodate bicycles that travel straight through the intersection, bicycles that may turn left or right at the intersection, and bicycles that need to execute a lane change due to the intersection design, Phase I of the study will evaluate the feasibility and requirements for developing CMFs for intersection-related crashes separately from crashes that occur at midblock locations.
- On-going research: ***Development of Pedestrian-Intersection Crash Modification Factors***. The objective is to develop CMFs where they do not currently exist for treatments and strategies that apply to intersections that feature pedestrian crosswalks. Obtaining CMFs for these strategies will allow the safety and design community to understand and quantify the safety effects on pedestrians specifically, but also intersections overall. Among the possible treatments to explore are: tighter radius and signal treatments (flashing yellow arrow for left turns, flashing arrow for right turns, protected left turns, leading-lagging left turns).

The [FHWA Office of Planning, Environment, and Realty](#) and the [Federal Railroad Administration](#) (FRA) are supporting a Rails-with-Trails: Lessons Learned study through the U.S. DOT Volpe Center. It will update a report issued in [2002](#). It will describe effective practices to plan, design, construct,

operate, and maintain rails-with-trails facilities. It describes methods to ensure railroad and trail safety and security, promote active transportation and health and wellness, support network connectivity and economic development, and enhance the environment. Expected Spring 2019.

Pedestrian and Bicycle Crash Analysis Tool (PBCAT): PBCAT is a crash typing software product that analyzes motor vehicle and pedestrian or bicyclist crashes. An update to PBCAT was included in the Highway Safety Information System project. Phase 1 of this update, examined the usability and functionality of PBCAT based on input from current and past PBCAT users, as well as those who had not used PBCAT but had expressed interest in typing crashes. Phase 2, will include the programming work to update PBCAT and release a new version, is currently being considered by FHWA under a new Highway Safety Information System (HSIS) task order that began in December 2018. See http://www.pedbikeinfo.org/pbcat_us/.

FHWA has a cooperative agreement with the [University of North Carolina Highway Safety Research Center](#) to support the [Pedestrian and Bicycle Information Center](#) to develop, synthesize, promote, and distribute bicycling and walking information to improve the quality of life in communities through the increase of safe walking and bicycling as a viable means of transportation and physical activity. See <http://www.pedbikeinfo.org/>.

INFRASTRUCTURE: Invest in Infrastructure to Ensure Mobility and Accessibility and to Stimulate Economic Growth, Productivity, and Competitiveness for American Workers and Businesses.

FHWA is updating the [National Highway Institute](#) Bicycle Facility Design course. It will be converted to a web-based course and will be available in Fall 2019. <https://www.nhi.fhwa.dot.gov/home.aspx>.

FHWA posted [Case Studies in Realizing Co-Benefits of Multimodal Roadway Design and Gray and Green Infrastructure](#), which provides information to encourage agencies interested in making improvements to their pedestrian and bicycle networks that also provide green infrastructure and resiliency benefits. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/

FHWA's [Office of Federal Lands Highway](#) supported the [National Park Service](#) (NPS), and other FHWA offices, through the U.S. DOT [Volpe Center](#), to develop the [NPS Active Transportation Guidebook](#). The guidebook helps parks and partners identify opportunities for active transportation, and introduce a variety of policies, programs, and types of infrastructure to support and promote the use of active transportation. See <https://www.nps.gov/subjects/transportation/bikeped.htm>.

FHWA signed a cooperative agreement with [The Corps Network](#) (TCN) to support Youth Service and Conservation Corps Workforce Development. TCN will develop resources to help encourage States to enter into contracts and cooperative agreements with qualified youth service or conservation corps to perform appropriate projects, including pedestrian and bicycle projects and recreational trail projects. See <https://www.fhwa.dot.gov/map21/qandas/qayscc.cfm>.

INNOVATION: Lead in the Development and Deployment of Innovative Practices and Technologies that Improve the Safety and Performance of the Nation's Transportation System.

Understanding traffic systems with innovative pedestrian and cyclist detection. Working in partnership with the U.S. DOT's Intelligent Transportation Systems (ITS) Program and the Federal Transit Administration (FTA), FHWA is pursuing research to enable the secure sharing of electronic messages between traffic management systems, ITS devices, transit vehicles and systems, and travelers using connected mobile devices. The goals of research and future efforts include (1) exploit the sharing, integration, and use of data with connected devices (CDs) to proactively manage and control traffic, and (2) improve the safety and mobility of all travelers. The research includes pedestrians and bicyclists as road users.

The Sharing and Using Connected Device Data to Improve Traveler Safety and Traffic Management project is exploring the requirements to enable the exchange of electronic messages between roadside devices, traffic management systems transportation service providers, in-vehicle devices, and mobile devices to support the needs of various transportation system users while improving their safety and mobility. This project will identify concepts of operations, use cases and requirements for connected mobile devices using various types of communications available to send and receive data contained within electronic messages with connected (e.g., transit) and automated vehicles, other connected mobile devices, ITS devices, and traffic management systems. This project will identify the technical and other issues to consider in the planning or assessing the feasibility of developing and sustaining the ability to enable an environment that fosters the sharing and use of these electronic messages in early 2020. This project builds upon the proof-of-concept testing and development of the D2X Hub (software platform) that support the sharing and use of electronic messages with connected mobile devices.

The **Smart Phone Based Mid-Block Pedestrian Crossing In-Vehicle Warning** Phase II work builds upon the Phase 1 application project funded by the FHWA with FY 2017 funds. The goal of this application is to increase pedestrian safety at mid-block crossings. Using mobile phone-based communication, pedestrians send notifications to drivers within a predefined specified range. The Phase 1 project conducted experimental subject testing of the application on site at the pedestrian mid-block crossing at FHWA's Turner-Fairbank Highway Research Center facility. Given the initial success, the FY 2018 funded Phase 2 project has begun to evaluate pedestrian perceptions of usefulness and application interface design. In 2019, the application will be further refined and evaluated at three diverse mid-block crossings in Northern Virginia. A successful Phase 2 project has the potential to be followed by a FY 2019 funded Phase 3 project to partner with a State or local transportation agency for a broader field test evaluation.

The [Multimodal Alerting Interface with Short-Range Transmissions \(MAIN-ST\)](#) is a Small Business Innovation Research ([SBIR](#)) project awarded to Charles River Analytics (Cambridge, MA) in 2016 (Phase I) and 2017 (Phase II) to develop hardware and software to bring bicycles onto connected vehicle networks and to provide safety information related to possible hazards to the bicyclist. The project developed prototype Dedicated Short Range Communication (DSRC) capability using commercially available hardware, as well as a software hazard detection and notification system that will work with any connected vehicle hardware transport mechanism (potentially including 5G or Bluetooth). The project also developed a virtual reality bicycle simulator and supporting software that has been installed at the Turner-Fairbank Highway Research Center (TFHRC) and that interoperates with the existing driving simulator. Testing of the MAIN-ST system is being conducted

through a cooperative research and development agreement (CRADA) with TFHRC, who will continue to conduct research using the bicycle simulator after the completion of the SBIR project (in June 2019). MAIN-ST will be submitted to a Technology Readiness Level review in February 2019, to support future commercialization of the research product. Additional information:

<https://www.cra.com/work/case-studies/main-st>

The [Fostering Innovation in Pedestrian and Bicycle Transportation Pooled Fund Study](#) is a [Transportation Pooled Fund](#) (TPF) focuses on bicycle and pedestrian network planning, safety, design issues (e.g. design flexibility, developing crash modification factors, network connectivity), traffic control devices (e.g., experimenting on innovative markings, signals, and signs), and other relevant issues as designed by TPF participants (e.g., equity, trip data). This TPF study is a collaborative effort of 14 States and numerous FHWA offices, including the Office of Planning, Environment, and Realty; Office of Operations, Office of Operations Research and Development; Office of Safety, Office of Safety Research and Development; Office of Infrastructure, Office of Highway Policy Information; and Office of Transportation Policy Studies. <https://www.pooledfund.org/Details/Solicitation/1441>.

Two projects are currently underway, and additional projects are anticipated to begin in the Spring and Summer of 2019.

- Project 1 — Driver Comprehension and Sign Design Options for Left Turn Yield to Bikes and Shared Street Signs: This study will evaluate driver comprehension and sign design options to inform decision making relating to the Manual on Uniform Traffic Control Devices (MUTCD).
- Project 2 — Development of Crash Modification Factors for Curb Extensions and Bicycle Specific Intersection Markings: This study is to complete the necessary literature review, data collection, and state of the practice scan to serve as the precursor to the full development of CMFs for these two safety interventions.

The [FHWA Office of Planning](#) has been coordinating a pooled fund effort with 7 States and 3 MPOs to develop [VisionEval](#), a framework and set of models for strategic planning and scenario evaluation at State and regional scales. VisionEval is currently being updated to evaluate new metrics related to active transportation, including health outcomes and mode share. See <https://visioneval.org>.

FHWA produced the [Guidebook for Measuring Multimodal Network Connectivity](#), which focuses on measuring pedestrian and bicycle network connectivity and incorporating connectivity analysis into the transportation planning process.

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_connectivity/

FHWA is supporting 8 Measuring Multimodal Network Connectivity Pilot projects to operationalize multimodal network connectivity measures into a performance-based planning and/or project development approach. FHWA selected 8 metropolitan planning organizations representing a variety across the country. Each report will describe prior work, identify the planning or project development context, define the analysis method, assemble data, and compile the results.

- MetroPlan Orlando, FL
- Mid-America Regional Council, MO-KS
- New Hampshire MPOs

- Eastgate Regional Council of Governments, OH
- Corvallis and Albany MPOs, OR
- Houston-Galveston Area Council, TX
- Utah DOT/Wasatch Front Regional Council/Mountainland Association of Governments
- Washington State DOT

FHWA awarded a **Small Business Innovation Research (SBIR)** Phase II to Knowledge Based Systems, Inc. (KBSI) to design and develop the “WalkOn™” mobile application. It will facilitate the crowd-sourced collection of sidewalk inventory and condition assessment data. The tool will use recent advances in social networks, mobile data collection, and data mining to provide integrated sidewalk datasets. Expected late 2019.

The **National Bicycle Network** will gather national geospatial data in a consistent common format to represent bicycle travel facilities such as routes, trails and shared use roadways including both bicycle routes as part of the roadway systems and independent bicycle trails. It will develop a mechanism such as crowd sourcing or other data sources where new bicycle geo-spatial data and other directly necessary information can be supplied by the public and agencies to maintain the bicycle geo-spatial inventory’s accuracy on a timely basis. The project will be completed by June 2019. Contact: Steven Jessberger at 202-366-5052 or steven.jessberger@dot.gov.

The USDOT’s **Accessible Transportation Technologies Research Initiative (ATTRI)** is a joint USDOT initiative, co-led by the FHWA, FTA, and Intelligent Transportation Systems Joint Program Office (ITS JPO), with support from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR), and other Federal partners. The ATTRI Program is leading efforts to develop and implement transformative applications to improve mobility options for all travelers, particularly those with disabilities. ATTRI research focuses on removing barriers to transportation for people with visual, hearing, cognitive, and mobility disabilities. Emerging technologies and creative service models funded by ATTRI offer all Americans enhanced travel choices and accessibility at levels once only imagined. The USDOT has awarded application development funding for [Wayfinding and Navigation](#), [Pre-trip Concierge & Virtualization](#), [Safe Intersection Crossing](#) with NIDILRR awarding a grant in the [Robotics and Automation](#) technology area.

[FHWA’s Office of Innovative Program Delivery](#) — Center for Accelerating Innovation administers the [Accelerated Innovation Deployment \(AID\) Demonstration Program](#). In September 2018, FHWA awarded \$8.4 million to 9 States to improve safety, mobility and project delivery and will encourage similar innovations nationwide. Florida received \$1 million for a project using state-of-the-art connected vehicle technology to improve safety for bicyclists and pedestrians near the University of Florida and throughout the City of Gainesville by improving access to real-time traffic information to them and enhancing the city’s existing “SmartTraffic” system. For more information on AID Demonstration or the project, see <https://www.fhwa.dot.gov/innovation/grants/>.

The **[FHWA Office of Innovative Program Delivery](#)** also administers the State Transportation Innovation Council ([STIC](#)) Incentive funds, which can provide funding for safety, mobility, and project delivery.

FHWA's Exploratory Advanced Research (EAR) Program is starting new research projects on Mobile Ad Hoc Networks (MANETs) with one of the projects focused on a rural application. Mobile ad hoc networks are fluid wireless moving networks that can form independently on an ad hoc basis. The network is defined by mobile nodes (smart devices, vehicles, etc.) that receive and transmit data and require no fixed or dedicated infrastructure. This network paradigm lends itself well to fast moving, complex, and dynamic applications (e.g. Transportation System Management and Operations or wayfinding and navigation solutions). Nodes can move cognitively into and out of the network through physical movements or through devices turning on or off, thus redefining the network's characteristics. The network can then reconfigure itself to accommodate these changes. Mobile ad hoc network research and development generally has been for Defense Department and first responder communications system applications. For additional discussion, please refer to the white paper located at <https://www.fhwa.dot.gov/publications/research/ear/18027/index.cfm>.

ACCOUNTABILITY: Serve the Nation with Reduced Regulatory Burden and Greater Efficiency, Effectiveness, and Accountability.

FHWA produced [Strategies for Accelerating Multimodal Project Delivery](https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_delivery/), which identified strategies and techniques for accelerating multimodal project delivery. It highlights proven techniques that agencies are using to get high quality results, and opportunities to address barriers or delays in the project delivery process.

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_delivery/

The [Traffic Monitoring Guide](#) (TMG), published by the [FHWA Office of Highway Policy Information](#), presents information on recommended data collection strategies for motorized vehicles, and for bicycles and pedestrians. The TMG also contains specifications of data structures for count locations and count data that are implemented in the Traffic Monitoring Analysis System. The Traffic Monitoring and Analysis System (TMAS) is a national database of traffic counts, originally established to gather automated traffic counts collected by State transportation agencies. TMAS is currently being updated to receive and manage bicycle and pedestrian count data (including counts collected both manually and by machine, both from temporary and permanently installed count locations). For information on contributing or review data in TMAS, contact Steven Jessberger (steven.jessberger@dot.gov) or Jeremy Raw (jeremy.raw@dot.gov).

FHWA posted the FY 2017 **Transportation Alternatives Annual Report** at https://www.fhwa.dot.gov/environment/transportation_alternatives/annual_reports/. The Transportation Alternatives Set-Aside is the single largest source of Federal-aid highway program funds for bicycle and pedestrian projects.

FHWA posted FY 2017 **Recreational Trails Program Annual Report** at https://www.fhwa.dot.gov/environment/recreational_trails/overview/report/2017/. The RTP supports trails that provide access to outdoor recreation areas.

FHWA's [Fostering Multimodal Connectivity Newsletter](#) provides transportation professionals with real-world examples of ways that multimodal transportation investments promote economic

revitalization, provide access to jobs, and achieve safer communities through support of accelerated project delivery, technology and design innovation, and public/private partnerships. This newsletter communicates FHWA and partner efforts in support of the U.S. DOT Strategic Plan by improving connectivity, accessibility, safety, and convenience for all users. See <https://www.fhwa.dot.gov/livability/newsletter/>.

FHWA's [Human Environment Digest](#) is a biweekly email sharing the latest information from a range of Federal and non-Federal sources, addressing transportation and its relationship to the human environment. Through this information exchange, FHWA hopes to foster dialogue at all levels and continue to further the state of the practice on these important topics in support of safety; infrastructure, including accelerated project delivery, access to jobs, and community revitalization; technology and design innovation; and accountability, including, data-driven decisions and performance-based planning. See https://www.fhwa.dot.gov/livability/he_digest/.