$2.4 MILLION
DOT Funding at Vanderbilt, from FY 2016 to FY 2020

$5.4 MILLION
TDOT Funding at Vanderbilt, from FY 2016 to FY 2020

Vanderbilt Center for Transportation and Operational Resiliency

The Vanderbilt Center for Transportation and Operational Resiliency (VECTOR) has been a hub for interdisciplinary research and educational activities involving freight and passenger transportation since it was established in 1988. VECTOR researchers integrate transport engineering, the social sciences, planning, and risk analysis to assist in decision making by the private and public sectors. Major government sponsors of the center include the Departments of Transportation (DOT), Housing and Urban Development, Defense, and Homeland Security; the National Science Foundation; and the Tennessee Departments of Transportation (TDOT) and Economic and Community Development. The VECTOR portfolio includes projects ranging in scope from the local to national levels and across the transportation modes of marine, highway, and rail. VECTOR faculty are leaders in the transportation research community.

Collaborating to improve air quality

After receiving an initial $4.5 million Congestion Mitigation and Air Quality (CMAQ) grant from the Tennessee Department of Transportation (TDOT) in 2018, Vanderbilt received a second award of $4.2 million in summer 2020 to scale up activities for MoveVU—the university’s strategic transportation and mobility plan. Vanderbilt will match this second grant, as it did the first grant, increasing the funding for MoveVU by a total of $8.4 million. This second award is further recognition that Vanderbilt’s program is highly innovative, effective, and based on national best practices. The second award will fund shuttle service improvements, a bike share service launch, installation of traffic-detection technologies, data analytics to assess the efficiency of the system, and the development of curbside management and micromobility policies and programs. The university’s administration and School of Engineering continue to work together to employ sophisticated sensors and advanced data analytics techniques enabled by the grant to better understand transportation patterns around campus, measure the effectiveness of the program, and adapt the program as appropriate. A successful program will result in a reduction of drive-alone commutes, less traffic congestion, and improved air quality on campus and throughout the region. Vanderbilt’s current CMAQ grant runs until Summer 2022. The second CMAQ grant will launch in Spring 2021 and will run until 2024.

Dwight David Eisenhower Transportation Fellowships

Three engineering Ph.D. students associated with VECTOR received the prestigious Dwight David Eisenhower Transportation Fellowship in 2021. Their success, combined with the success of Vanderbilt’s nine prior Eisenhower Fellows, highlights Vanderbilt’s flourishing position as an epicenter of connected cities and resilience research. The awards are made by DOT’s Federal Highway Administration.

Investing in the future of transportation

Vanderbilt has participated as a member of US DOT University Transportation Center (UTC) consortia for years. Currently, Vanderbilt is one of five universities in the MarTREC UTC, the only DOT-funded UTC focused on the maritime domain. Through MarTREC, VECTOR researchers have focused on multiple projects related to flood impacts on transportation assets and communities— including how emergency response capabilities may be reduced, potential alternatives for flood water detention along rivers, optimization of recovery of transportation networks (highway, rail, and water) post-disruptive event, and how mitigation programs such as buyouts may adversely affect the local community social fabric and resilience.
Improving safety for rail transportation of hazardous materials

Vanderbilt engineers, in partnership with a private rail shipper, are funded by DOT’s Pipeline and Hazardous Materials Safety Administration to improve automatic detections of disruptions to the rail transportation of hazardous materials. They are also evaluating new methods to identify potential tampering and other incidents to advance the safety and security of rail transportation.

Addressing key transportation issues in Tennessee

Vanderbilt has an extensive portfolio of research supported by TDOT’s State Planning and Research Program. Research teams are working to analyze crash data and use predictive models to help inform safety improvement on Tennessee highways. They evaluate HOV lane utilization and violation rates to improve efficiency as well as consider the conversion of HOV lanes to high occupancy toll lanes. Researchers are facilitating the use of innovative information technologies in long-term planning, evaluating opportunities for cyber-physical systems to improve efficiency, safety, security, and sustainability of freight transportation. They are also identifying best practices for inclusion and diversity in hiring and retention practices in transportation careers; and considering ways to address the opioid epidemic through investments in transportation. Vanderbilt engineers also work with TDOT personnel to determine ways to put research into practice and to pilot emerging technologies.

Vanderbilt faculty received a grant from the DOT to enhance the I-24 smart corridor development with artificial intelligence. Together with TDOT and Southwest Research Institute, Vanderbilt is working to improve the effectiveness of Integrated Corridor Management systems like the multi-phase I-24 Smart Corridor project. Vanderbilt researchers are pioneering the application of artificial intelligence-based decision support systems to manage traffic on the corridor.

As an active partner of TennSMART, Vanderbilt researchers are working to promote intelligent mobility solutions and innovative approaches to transportation for Tennessee. TennSMART, a consortium of public and private organizations including representatives from TDOT, other state agencies, and Oak Ridge National Laboratory, has been awarded federal funding to support their work and is participating in a mentoring program for startups to improve innovation opportunities across the state.

Road test proves adaptive cruise control can add to traffic jam problem

A new open-road test of adaptive cruise control conducted by Vanderbilt researchers demonstrated that the feature, designed to make driving easier by continuously adjusting a vehicle’s speed in response to the car ahead, doesn’t yet solve the problem of phantom traffic jams. Because human drivers are responsible for the creation of this type of jam—which occurs without an obvious cause—the widespread use of these types of driver-assist technologies holds promise to eliminate the jams, if designed appropriately. Today’s driver-assist systems are not yet able to overcome the worst driving behaviors of humans that lead to extremely frustrating traffic jams, according to Vanderbilt researchers. The team’s work, supported by DOT’s Federal Highway Administration, builds on earlier research that showed adding even a few specially designed autonomous vehicles could eliminate phantom traffic jams by keeping an optimal separation between cars and avoiding sudden stops.

Map of Nashville showing roads impacted due to flooding that limit connectivity for a community’s emergency response. (VECTOR)

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