

North Dakota Senate Appropriations – Education and Environmental Committee

8:30 a.m. January 21, 2025 in Bismarck, ND

TESTIMONY OF:

Armstrong Aboah, PhD, NDSU Assistant Professor of Transportation Engineering

DEVELOPMENT OF AN IOT-BASED SENSOR FOR ADVANCING SAFETY MONITORING AND INTERVENTION AT WORK ZONE AREAS

Chairman Sorvaag and members of the North Dakota Senate Appropriations – Education and Environmental Committee, thank you for the opportunity to provide testimony today for SB 2003. My name is Armstrong Aboah and I'm an Assistant Professor of Transportation Engineering at North Dakota State University.

My team extends its gratitude for the funding received through the Economic Diversification Research Fund (EDRF), which has supported our efforts in developing an "Internet of things" - based sensor system designed to advance safety monitoring in work zones.

Work zones are inherently dangerous environments for all motorists, particularly for Commercial Motor Vehicles (CMVs) due to their significant size, extended stopping distances, and complex maneuvering requirements. In addition, speeding continues to be a primary factor contributing to work zone crashes.

According to data from the National Highway Traffic Safety Administration Fatality Analysis Reporting System, the involvement of CMVs in fatal work zone crashes is on the rise. In the United States, a work zone fatality occurs every 15 hours, while injuries related to work zone crashes happen approximately every 16 minutes. In 2019 alone, CMVs were involved in 19% of the 115,900 work zone related crashes. These 22,000 incidents included 4,000 injury crashes and 288 fatalities. These alarming statistics underscore the urgent need for innovative technologies to enhance work zone safety.

With the support of EDRF funding, our team has successfully developed a technology that integrates visual and audio alert systems to enhance driver awareness when approaching work zones. The system uses flashing lights to notify drivers exceeding the posted speed limit within the work zone. If drivers continue to exceed the speed limit in areas identified as highly dangerous, the system activates an audible alert in conjunction with dynamic signage to prompt drivers to reduce their speed.

Beyond improving safety, this initiative has provided significant benefits to North Dakota's workforce. The EDRF funding has directly supported nine students—seven graduate students and two undergraduate students—enabling the development of a skilled workforce within the state. This investment in human capital strengthens North Dakota's capacity for innovation and technical advancement in transportation.

Furthermore, we will be collaborating with the North Dakota Department of Transportation (NDDOT) through the Upper Great Plains Transportation Institute (UGPTI) to pilot and evaluate the effectiveness of this technology in real-world scenarios.

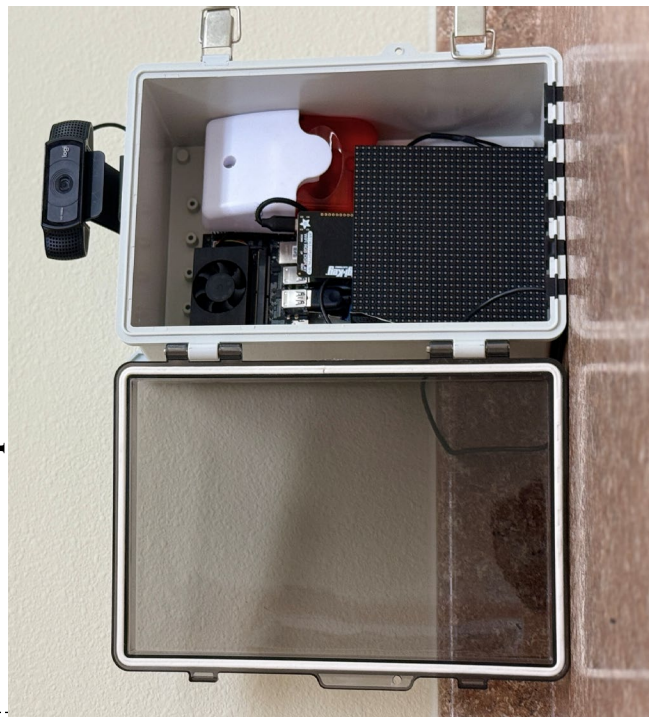
The funds have provided us with proof-of-concept technology, enabling us to apply for the High Priority–Commercial Motor Vehicle (HP-CMV) grant, due this spring. This grant offers up to \$2 million for approved projects and represents a significant opportunity to further enhance the scope and impact of our work.

This initiative highlights the transformative potential of technology in addressing critical safety challenges in work zones in North Dakota and the USA at large as well as demonstrating the impact of federal funding in fostering innovation, safety, and workforce development. Thank you for your continued support in advancing transportation safety and innovation.

DEVELOPMENT OF AN IOT-BASED SENSOR FOR ADVANCING SAFETY MONITORING AND INTERVENTION AT WORK ZONE AREAS

PI: Armstrong Aboah, Ph.D. Co-PI: Umamaheswara Rao Tida, Ph.D.

Our Developed Workzone device



Stage 1: Visual Alert



Stage 2: Audio Alert



Impact of EDRF

Work Force Development

Supported 9 (7 grad, 2 undergrad) students



Industrial Partnership

Partnership with UGPTI and NDDOT



Research Expansion

HIGH priority Federal Grant on Workzone Safety

to be submitted on 7th March 2025.

\$2M max per award



Federal Motor Carrier Safety Administration