



Project Requirements Form USDOT

CREATE UTC Contract Number 69A3552348330

Center Lead: Texas State University; University of Puerto Rico – Mayagüez

Research Project Name: Use of Enhanced Visualization Technology to Assess the States of Coastal Transportation Infrastructure.

Improving the Durability and Extending the Life of Transportation Infrastructure

Principal Investigator(s):

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Project Partners:

Puerto Rico Local Technical Assistance Program (LTAP) Center, the UPRM Coastal Resilience Center (CRC), the RISE-UP initiative at UPRM, and the Municipality of Isabela.

Research Project Funding:

Project Start Date: 09/01/2024 **Project End Date:** 08/31/2026

Project Description: The main goal of this project is to devise a mechanism that incorporates the needs and preferences of coastal communities in the development of a decision-making support tool that assesses risks for transportation corridors based on performance and that improves infrastructure and services in support of the blue economy. This project looks to enhance the transportation infrastructure of coastal communities through a methodology that assesses accessibility based on three states: perceived, actual, and designed, using mixed reality visualizations as educational tool. Integrating public and community participation in decision-making processes remains a challenging task for transportation planning, as there is often a gap between what is achievable and what is implemented. Incorporating visualization tools has high potential to facilitate communication with the community, both to convey information and to gather clear opinions and ideas from residents.

US DOT Priorities: This project develops a practical framework to create tools that promotes road accessibility for coastal communities through the implementation of virtual reality visualizations strategies. The research outcomes are expected to be adaptable to other transportation sectors. Additionally, these activities will contribute to USDOT Challenges of Preserving the Existing Transportation System, Improving the Mobility of People and Goods, and Promoting Safety. Furthermore, the approach of incorporating community preferences into design and communicating with the public through visualizations is highly appealing to professionals, researchers, and the public. This early public engagement approach through visualizations, demonstrated in the project, has the potential to transform practices applied to future projects.

Outputs: Develop and administer questionnaires to better understand community perspectives on Coastal Mobility in Puerto Rico. These instruments are continuously designed to gather valuable feedback from the different types of audiences, offering insights into their views and experiences related to the project's focus.

Development of a Research Methodology specifically addressing Coastal Mobility in terms of Road Accessibility. This methodology includes a preliminary experimental design that will integrate results within the 3 States (i.e., perceived, actual, designed) into advanced visualization techniques for better decision-making.



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A presentation was offered at the Mega Viernes Civil 2024 Conference of the Puerto Rico Institute of Civil Engineers, related to the project's overall scope and objectives. Additionally, a poster was also presented with an in-depth overview of our research.

We participated in the UPRM Research Symposium for Faculty and Graduate Students where we showcased three posters, related to the project activities in CREATE.

Outcomes/Impacts: CREATE-UPRM seeks to continue expanding the methodological concept based on the three states or dimensions: perception (social), reality (measured), and resilient design (target), to develop a comprehensive framework for a decision-making & project management tool. This model is also being referred to as the Equilibrium Cycle, which intends to address coastal mobility in terms of road accessibility due to multi-hazard by gathering perceptual information to propose solutions based not only on effectiveness and efficiency but also to propose tailored ones that meet the genuine societal needs of the most burdened communities.

CREATE-UPRM aims to develop interactive simulations using software such as Unity, which will allow for the creation of detailed models of solutions to improve accessibility on coastal roads for coastal communities through immersive virtual reality technologies. These models will serve as valuable tools to assess the impact of various proposed solutions before their real-world implementation. As the project progresses, there may be opportunities to patent specific simulation technologies or innovative evaluation methodologies. Integrating these simulations into the planning and design process will enable more active participation from the affected communities. This participatory approach will not only enhance the accuracy and relevance of the proposed solutions but also promote greater acceptance and adaptability of the final solutions. Additionally, the use of advanced visualization technologies will facilitate a more precise assessment of the communities' needs and preferences, ensuring that the solutions are optimally tailored to their specific realities.

CREATE-UPRM also aims to develop a tool similar to the Caltrans EQI to obtain a transportation-based priority populations screen for Puerto Rico coastal communities. By identifying not only measures to account for perception/realitydesigned outcomes and transportation-based priority communities, but also including blue economy workforce zones with potential sustainable development, the tool would assess issues within the transportation network, ensuring that all residents and visitors have access to transportation services. Similarly, the rise of the blue economy workforce development should provide opportunities for local entrepreneurship within coastal employment.

Final Research Report: URL to final Report will be provided upon completion.