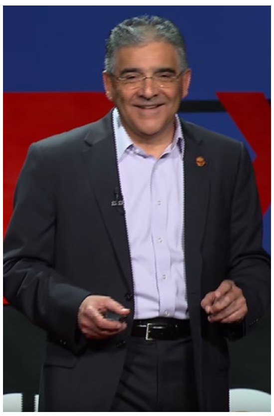
Traffic-Based Framework for Measuring the Resilience of Ground Transportation Systems under Normal and Extreme Conditions



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This seminar is free and open to the public.

ABSTRACT: Ground transportation systems are essential for the mobility of people, goods and services. Thus, making sure these systems are resilient to the impact of natural and man-made disasters has become a top priority for engineers and policy makers. One of the major obstacles for increasing the resilience of ground transportation systems is the lack of a measuring framework. Such measuring framework is critical for identifying needs, monitoring changes, assessing improvements, and performing cost-benefit analysis. This research addresses this problem by developing a traffic-based framework for measuring the resilience of ground transportation systems under normal and extreme conditions. The research methodology consisted of: (1) creating a microscopic traffic model of the road under study, (2) simulating different intrusions and interventions, and (3) measuring the resilience of the system under the different scenarios using the framework developed. This research expanded the current definition of infrastructure resilience, which includes the assessment of system performance versus time, to add a third dimension of resilience for ground transportation system's applications, namely: location. This third dimension considers how the system changes along the different locations in the network, which reflects more accurately the continuous behavior of a ground transportation network. The framework was tested in a 24 km segment of Interstate 95 in Virginia, near Washington, D.C. Four hazard conditions were simulated: inadequate base capacity, traffic incidents, work zones, and weather events. Intervention strategies tested include ramp meters and the use of the shoulder lane during extreme events. Public policy was also considered as a powerful intervention strategy. The findings of this research shed light over the current and future resilience of ground transportation systems when subject to multiple hazards, and the effects of implementing potential interventions.

Bio: Dr. Jesús M. de la Garza is Professor and Chair of the Glenn Department of Civil Engineering at Clemson University. Prior to joining Clemson, he was the holder of the Vecellio Endowed Professorship in Construction Engineering and Management at Virginia Tech. Dr. de la Garza has been inducted into the National Academy of Construction. He has received the Faculty of the Year award from the ASCE's student chapter, ASCE's Peurifoy Construction Research Award, ASCE's Thomas Fitch Rowland Prize, ASCE's Best Paper Award from the Technical Council on Computer Practices, and has been elected to the grade of Distinguished Member of ASCE. Dr. de la Garza has received CII's Outstanding Researcher Award, CII's Distinguished Professor Award, CII's Outstanding Instructor Award and CII's Richard L. Tucker Award for Leadership and Service. Dr. de la Garza is a Fellow of the Construction Management Association of America and a Fellow of the Project Management College of Scheduling.