



TriDurLE

**National Center for Transportation
Infrastructure Durability & Life-Extension**

| UTC Project Information – National UTC TriDurLE | |
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| Project Title | Collaborative Research: Multi-Level Resilience-Based Transportation Asset Management (TAM) Framework using Bayesian Network |
| University | Washington State University (WSU) and Case Western Reserve University (CWRU) |
| Principal Investigator | Ji Yun Lee (WSU) and Yue Li (CWRU) |
| PI Contact Information | Ji Yun Lee: jiyun.lee@wsu.edu (email); 509-335-3018 (phone) Yue Li: yue.li10@case.edu (email); 216-368-2423 (phone) |
| Funding Source(s) and Amount Provided (by each agency or organization) | UTC fund: \$124,874.45 (UTC) Non-federal match: \$49,918.16 (CEE at WSU) and \$74,956.29 (CE at CWRU) |
| Total Project Cost | \$124,974.45 (WSU: \$49,918.16; CWRU: \$74,956.29) |
| Agency ID or Contract Number | NA |
| Start and End Dates | May, 2020 – June, 2021 |
| Brief Description of Research Project | This project proposes a multi-level resilience-based transportation asset management framework using Bayesian network. The framework is aimed at (a) measuring transportation network resilience at multiple management levels (e.g., project, network and enterprise levels), (b) tracking and quantifying uncertainties existing at every level so as to effectively manage uncertainties in assessing the overall network resilience, (c) determining the optimal combination of inspection/monitoring techniques based on Value of Information, and (d) providing the optimal allocation of budgets to multiple pre- and post-disaster resilience-enhancing strategies. |
| Describe Implementation of Research Outcomes (or why not implemented) | The project will provide decision-makers (e.g., state DOT risk managers, executives, and program and project managers) with several analytical models, including (a) component-level time-dependent reliability analysis and its updating procedure based on different types of inspection and monitoring techniques; (b) network analysis which can incorporate both the robustness of components and the adaptive capacity of a network; (c) Bayesian-network-based resilience assessment model that evaluates each resilience capacity at multiple transportation management system levels and quantifies uncertainty at every assessment stage; and (d) asset management strategies by disaggregating resilience into the three resilience capacities using backward simulation. The framework itself and such analytical models can be implemented in risk-/resilience-based transportation asset management. Moreover, this project can be |
| Place Any Photos Here | |

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| | <p>extended to develop a Python interactive tool, which is designed to enable transportation agencies to understand how the research findings can be easily and successfully implemented in improving the resilience of their transportation system.</p> |
| <p>Impacts/Benefits of Implementation (actual, not anticipated)</p> | <p>If research outcomes would be successfully implemented, DOT risk managers, executives, program and project managers can have better understanding on the resilience of road network and make cost-effective transportation asset management plans to enhance the resilience of road network, considering the competing demands for the limited resources</p> |
| <p>Web links</p> <ul style="list-style-type: none"> • Reports • Project website | |