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Progress Toward More Resilient Infrastructures

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Abstract : In recent years, resilience emerged as an important topic in transportation infrastructure practice, planning, and design to address the myriad stressors of future climate facing the Nation. Climate change has increased the frequency of extreme weather events and also causes climate and weather patterns to diverge from historic trends, culminating in circumstances where transportation infrastructure and assets are operating outside the scope of their design. To design and maintain transportation infrastructure that can continue meeting objectives over the infrastructure's design life, these systems must be made adaptable to the changing climate by incorporating resilience wherever practically and financially feasible. This study is focused on the adaptation strategies and incorporation of resilience in infrastructure construction, maintenance, rehabilitation, and preservation processes. This study will include highlights from some of the recent FHWA activities on resilience. This study describes existing resilience planning and decision-making practices related to transportation infrastructure; mechanisms to identify, analyze, and prioritize adaptation options; and the strain that future climate and extreme weather event pressures place on existing transportation assets and the stressors these systems face for both single and combined stressor scenarios. Results of two case studies from Transportation Engineering Approaches to Climate Resiliency (TEACR) projects with focus on temperature and precipitation impacts on transportation infrastructures will be presented. These case studies looked at the impact of infrastructure performance using future temperature and precipitation compared to traditional climate design parameters. The research team used the adaptation decision making assessment and Coupled Model Intercomparison Project (CMIP) processing tool to determine which solution is best to pursue. The CMIP tool provided project climate data for temperature and precipitation which then could be incorporated into the design procedure to estimate the performance. As a result, using the future climate scenarios would impact the design. These changes were noted to have only a slight increase in costs, however it is acknowledged that network wide these costs could be significant. This study will also focus on what we have learned from recent storms, floods, and climate related events that will help us be better prepared to ensure our communities have a resilient transportation network. It should be highlighted that standardized mechanisms to incorporate resilience practices are required to encourage widespread implementation, mitigate the effects of climate stressors, and ensure the continuance of transportation systems and assets in an evolving climate.

Keywords : adaptation strategies, extreme events, resilience, transportation infrastructure
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