Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I

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Abstract

Climate affects the design, construction, safety, operations, and maintenance of transportation infrastructure and systems. The prospect of a changing climate raises critical questions regarding how alterations in temperature, precipitation, storm events, and other aspects of the climate could affect the Nation's roads, airports, rail, transit systems, pipelines, ports, and waterways. Phase I of this regional assessment of climate change and its potential impacts on transportation systems addresses these questions for the region of the U.S. Central Gulf Coast between Galveston, Texas, and Mobile, Alabama. This region contains multimodal transportation infrastructure that is critical to regional and National transportation services.

Historical trends and future climate scenarios were used to establish a context for examining the potential effects of climate change on all major transportation modes within the region. Climate changes anticipated during the next 50-100 years for the Central Gulf Coast include warming temperatures, changes in precipitation patterns, and increased storm intensity. The warming of the oceans and decline of polar ice sheets is expected to accelerate the rate of sea level rise globally. The effects of sea level rise in most Central Gulf Coast counties will be exacerbated by the sinking of the land surface, which is accounted for in this assessment.

The significance of these climate factors for transportation systems was assessed. Warming temperatures are likely to increase the costs of transportation construction, maintenance, and operations. More frequent extreme precipitation events may disrupt transportation networks with flooding and visibility problems. Relative sea level rise will make much of the existing infrastructure more prone to frequent or permanent inundation – 25 percent of the major roads, 9 percent of the rail lines, and 72 percent of the ports are built on land at or below 122 centimeters (4 feet) in elevation. Increased storm intensity may lead to increased service disruption and infrastructure damage: More than half of the area's major highways (64 percent of Interstates; 57 percent of arterials), almost half of the rail miles, 29 airports, and virtually all of the ports are below 7 meters (23 feet) in elevation and subject to flooding and possible damage due to hurricane storm surge. Consideration of these factors in today's transportation decisions and planning processes should lead to a more robust, resilient and cost-effective transportation network in the coming decades.

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