Ensuring Transportation Infrastructure and System Resilience

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1. Introduction

Under Executive Order No. 13514 and Council on Environmental Quality (CEQ) Implementing Instructions, the U.S. Department of Transportation (DOT) is required to submit a Climate Adaptation Plan for implementation in 2013. DOT's work on climate adaptation began a number of years before this requirement because potential climate impacts influence DOT's strategic goals of safety, state of good repair and environmental sustainability. This plan reflects FY12 and FY13 commitments as well as other DOT accomplishments. It incorporates DOT's earlier report on vulnerabilities to climate variability and change. DOT's Policy Statement on Climate Adaptation is attached.

The Department's mission is to serve the United States by ensuring a safe, efficient, accessible and convenient transportation system that meets vital national interests and enhances the quality of life of the American people, today and into the future. The Department and its modal agencies oversee the safe operation of the United States transportation system including more than 3.9 million miles of public roads, 120,000 miles of major railroads, 25,000 miles of commercially navigable waterways, 5,000 public-use airports, 500 major urban public transit operators and more than 300 coastal, Great Lakes, and inland waterways ports.[1]

Scientists have concluded that some level of climate change has already occurred, weather patterns are changing, and these changes are expected to continue or accelerate in the future.[2] Additionally, past weather and climate patterns appear to be much less reliable indicators of future weather and climate than in recent decades, which necessitates greater flexibility in planning and decision-making processes.

> DOT shall integrate consideration of climate impacts and adaptation into the planning, operations, policies, and programs of DOT in order to ensure that taxpayer resources are invested wisely and that transportation infrastructure, services and operations remain effective in current and future climate conditions.
>
> **Excerpt from DOT Policy Statement on Climate Adaptation**

Transportation both contributes to and will be impacted by climate change. While mitigating transportation contributions to greenhouse gas emissions and adapting to climate impacts on the transportation system are equally important for the transportation sector to address, this plan addresses adaptation work only.

[1] Source: http://www.nationalatlas.gov/transportation.html
[2] See USGCRP, Global Climate Change impacts in the United States, particularly pp.27-40. http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/full-report

DOT recognizes that climate variability and change pose potential threats to U.S. transportation systems. The range of impacts from these threats may include roadway deterioration, flooding, limited waterway access, and weakened structures. Severe conditions may reduce the life of capital assets and increase operational disruptions. Some consequences may require changes in the design, construction, and maintenance of infrastructure. For example, incorporation of certain materials and building techniques will enable infrastructure to better withstand extreme temperatures.

Building resilience to climate and weather-related risk is common sense management to protect current and future investments and to maintain safe operational capabilities. Adaptation to climate change can include adjusting how transportation infrastructure is planned, designed, built and operated. Making climate adaptation a standard part of agency planning can ensure that resources are invested wisely and that services and operations remain effective.

Transportation infrastructure is inherently long-lived. Bridges, tunnels, ports and runways may remain in service for decades, while rights-of-way and specific facilities continue to be used for transportation purposes for much longer. In addition to normal deterioration, transportation infrastructure is subject to a range of environmental risks over long time spans, including wildfire, flood, landslide, geologic subsidence, rock falls, snow, ice, extreme temperatures, earthquakes, storms, hurricanes and tornados. Infrastructure designers and operators must decide the magnitude of environmental stress that any particular project will be able to withstand over its lifetime.

Notable Potential Impacts

- More frequent/severe flooding of underground tunnels and low-lying infrastructure, requiring drainage and pumping, due to more intense precipitation, sea level rise, and storm surge.
- Increased numbers and magnitude of storm surges and/or relative sea level rise potentially shorten infrastructure life.
- Increased thermal expansion of bridge joints and paved surfaces, potentially causing possible degradation, due to higher temperatures and increased duration of heat waves.
- Higher maintenance/construction costs for roads and bridges, due to increased temperatures, or exposure to storm surge.
- Asphalt degradation and shorter replacement cycles; leading to limited access, congestion, and higher costs, due to higher temperatures.
- Culvert and drainage infrastructure damage, due to changes in precipitation intensity, or snow melt timing.
- Decreased driver/operator performance and decision-making skills, due to adverse weather.
- Increased risk of vehicle crashes from improperly maintained vehicles, due to severe weather.
- System downtime, derailments, and slower travel times, due to rail buckling during extremely hot days.
- Reduced aircraft performance leading to limited range capabilities and reduced payloads.
- Air traffic disruptions, due to severe weather and precipitation events that impact arrival and departure rates.
- Reduced shipping access to docks and shore equipment and navigational aid damage.
- Restricted access to local economies.

Good project design balances both costs and benefits. It is important that infrastructure designers use the best possible information to assess all future environmental risks, including longer-term risks from climate variability and change, because many of the structures being built today will still be in use fifty or, in some cases, one hundred years in the future. If a project is overbuilt, it may cost too much and prevent other, more useful investments. If it is underbuilt, it is subject to risks of premature damage or destruction that require premature repair or replacement and impose an additional cost of being out of service on the public.

Climate variability and change present new challenges as DOT develops and advocates solutions to national transportation needs. DOT recognizes that particular changes in global climate and domestic weather patterns may require different adaptation strategies than in the past. DOT began to explore integrating climate change considerations into its planning and programs several years ago. While DOT has made progress, the process to more fully integrate climate considerations into planning and programs, and to build a more resilient transportation system, is expected to take place over time. Early consideration and development of proactive adaptation strategies can help achieve a more efficient and cost-effective approach to preserve transportation infrastructure and enhance public safety.

DOT's operating administrations are taking steps to address the impacts of climate variability and change on their respective missions, which, in turn, address the Department's overarching vulnerabilities. These steps vary among modes, but collectively substantial effort is focused on adapting to climate variability and change implications.

As required by EO 13514 and CEQ Implementing Instructions, DOT identified three high-level priority actions for implementation in both Fiscal Years 2012 and 2013. Each of these actions will support DOT's mission and improve the transportation sector's ability to assess and build resilience to risks posed by climate variability and change. DOT operating administrations committed to implementing the following priority actions:

DOT Priority Actions for Implementation

Purchase this course to see the remainder of the technical materials.