

Successes **in** Stewardship

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Adaptation of Transportation Infrastructure to Climate Change Impacts

The projected effects of climate change could have significant implications for the nation's transportation system. Rising sea levels, increasingly extreme temperatures, changes in the frequency and intensity of storm events, and accelerating patterns of erosion could damage infrastructure, flood roadways, and disrupt safe and efficient travel. Certain effects, such as sea level rise and increases in storm intensity, present obvious challenges. However, subtle changes, such as those expected in temperature, will likely necessitate a shift in the design, construction, and maintenance of infrastructure toward incorporation of materials and building techniques that can withstand temperature extremes. Some climate change effects may positively impact transportation, as higher average temperatures in certain regions could reduce safety and maintenance concerns associated with snow and ice accumulation. Although mitigating the effects of climate change through reductions in greenhouse gases is an important element of the Federal Highway Administration's (FHWA) climate change strategy, FHWA places equal importance on acknowledging that certain changes may require appropriate adaptation strategies. Recognizing the need for adaptive transportation systems, FHWA has developed several programs and initiatives that can provide transportation agencies with the data and tools needed to adapt infrastructure to ever-increasing climate change threats.



The anticipated effects of climate change on transportation include roadway flooding. (Courtesy of [U.S. Global Change Research Program](#))

In late 2008, FHWA established the Sustainable Transport and Climate Change Team to coordinate activities related to climate change and sustainability. A key goal of the team is to assist FHWA Division Offices, State Departments of Transportation (DOTs), and Metropolitan Planning Organizations (MPOs) in their efforts to identify and adapt to climate-related impacts on vulnerable transportation infrastructure. The most notable challenge to achieving this goal is the uncertainty of future projections regarding climate change and its impacts. FHWA must rely on such projections because anticipated climate changes will likely surpass past trends, which have traditionally been the basis for transportation decisionmaking. Adaptation to climate change necessitates a shift in existing design and planning paradigms, as the demands placed on transportation will require more robust systems that can cope with an increasingly extreme and volatile climate.

Report Projects Regional Climate Change Effects

To address the risks that climate change poses, State, regional, and local planning and transportation organizations first need to understand and evaluate the threats facing their systems. In the spring of 2010, FHWA's Office of Planning, Environment, and Realty and Office of Infrastructure jointly released a report entitled [Regional Climate Change Effects: Useful Information for Transportation Agencies](#) (the *Effects* report), which discusses the effects of climate change that will have the greatest anticipated impacts on transportation systems. Drawing on the expertise of multiple Federal agencies, including the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration, and the Department of Energy, the *Effects* report presents the science of climate change in the context of transportation at a regional level. The report is organized by region (Northeast, Southeast, Midwest, Great Plains, Southwest, Pacific Northwest, Alaska, Hawaii, Puerto Rico), time horizon (2010 – 2040, 2040 – 2070, 2070 – 2100), and climate effect (projected change in temperature, precipitation, storm activity, sea level) and includes the best available climate projections. These projections are presented through narrative descriptions, tables and maps, and a Climate Change Effects Typology Matrix, which aggregates projections by region and, in certain cases, subregions, States, and cities. In addition to summarizing the current understanding of projected climate change effects, the report includes a brief discussion linking these effects to potential impacts on infrastructure, such as flooded roads and damage to bridges. Although the *Effects* report does not present adaptation strategies, it does provide information that highway planners can use to begin to identify and address vulnerabilities and to generate discussion between the transportation and climate science communities.

Gulf Coast Phase 2 Study Targets Impacts of Climate Change in Mobile, Alabama



Study area for *Gulf Coast Phase 1*. Mobile, Alabama, on the eastern edge of the study area, serves as the focus of *Phase 2*. (Courtesy of FHWA)

In 2008, FHWA, on behalf of the USDOT Center for Climate Change and Environmental Forecasting and in coordination with other modes, completed a climate change impact project entitled, [Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase 1](#). The project focused on the Central Gulf Coast region that stretches from Houston and Galveston, Texas, to Mobile, Alabama. Project partners selected the Gulf Coast due to its combination of population centers and multimodal transportation systems, including infrastructure focused on freight and petroleum movement. As a follow-up to that effort, *Gulf Coast Phase 2* commenced in 2010 with a narrowed focus on the Mobile MPO. *Gulf Coast Phase 2* broadens the intent, to include a more in-depth analysis of anticipated climate change effects and impacts on transportation in the Mobile area, development of tools and guidance for assessing vulnerability, and strategies for adapting transportation systems to anticipated changes in climate. FHWA is working with representatives from the Mobile MPO and the South Alabama Regional Planning Commission, and is receiving

support from the USGS, to complete the *Gulf Coast Phase 2* study in 2013, with the goal of providing tools and guidance for conducting similar assessments in other areas.

FHWA Conceptual Model Assesses Risks and Vulnerability for Transportation Infrastructure

In 2009, FHWA began developing a conceptual model to guide State DOTs and MPOs in an evaluation of the vulnerability of their existing and planned transportation infrastructure to climate-related risks. The model, which is currently in draft form, will provide a framework for agencies to inventory their transportation assets, gather climate information, and conduct a systems-level analysis of the likelihood and consequences of climate change impacts on specific assets. Through their use of the conceptual model, agencies will develop a prioritized list of at-risk assets, allowing them to focus their initial adaptation efforts on assets that have a high likelihood of suffering severe damage and to proceed to lower-risk assets as time and resources allow.



FHWA's Conceptual Risk Assessment Model will allow transportation agencies to identify critical assets that face the greatest risk of damage due to the effects of climate change. (Courtesy of [U.S. Global Change Research Program](#))

In September 2010, FHWA selected five transportation agencies — the San Francisco Bay Metropolitan Transportation Commission, New Jersey DOT/North Jersey Transportation Planning Authority, Virginia DOT, Washington State DOT, and Oahu MPO — to pilot and provide feedback on the conceptual model through September 2011. These agencies and locations were chosen in part on the basis of their existing climate change adaptation activities, which FHWA hopes will accelerate through the pilot. FHWA expects each pilot agency to generate a final report detailing its activities, partners, lessons learned, and recommendations for future applications of the conceptual model. Based on input from these agencies, FHWA will revise and finalize the model for use nationwide. For additional information about the model, visit the [FHWA Highways and Climate Change website](#).

Climate Change Activities Foster Interoffice Collaboration

While earlier climate change adaptation efforts were largely completed within a single office, several offices, including FHWA's Office of Operations and Office of Infrastructure, have contributed to and collaborated with FHWA's Sustainable Transport and Climate Change Team on adaptation activities including *Gulf Coast Phase 2* and the *Effects* report. The Office of Infrastructure is a co-sponsor of the conceptual model pilots and also co-sponsored the *Effects* report. An FHWA Adaptation Working Group was established two years ago to promote cooperation among these offices as well as with the Office of Safety and the Office of Federal Lands Highway (see partial list of contacts below). Team members acknowledge the success of their efforts in fostering increased education and awareness within engineering and planning disciplines and have been asked to speak in front of numerous MPOs and professional organizations.

FHWA engages in climate change adaptation initiatives beyond those highlighted in this newsletter (see sidebar) and is currently developing a draft agency-wide Strategy for Adaptation to Climate Change Effects. For additional information about FHWA's climate change adaptation and mitigation activities as well as resources, publications, and frequently asked questions, please visit the [FHWA Highways and Climate Change website](#).

Other Notable FHWA Climate Change Adaptation Initiatives

- Eastern Federal Lands: *Adapting the Nation's Refuge Roads System to Climate Change*
- Western Federal Lands: *Assessing the Impact of Climate Variability on Transportation Infrastructure*
- Participation in the Pacific Northwest Climate Change Collaboration and the Northeast Federal Partners

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Look What's New!

- The Environmental Protection Agency updated its guidelines for Federal agencies on filing of environmental impact statements (EISs) under the National Environmental Policy Act. The agency's EIS Filing System Guidance, last updated in 1989, addresses requirements for filing draft, final, and supplemental EISs. Comments are due February 28, 2011. For more information, please see the [Federal Register notice](#).
- On January 28, 2011, FHWA released the fifth Caltrans Audit Report, under the Surface Transportation Project Delivery Pilot Program. Under a Memorandum of Understanding with FHWA, the California Department of Transportation (Caltrans) assumes responsibility for environmental review and approval related to federally-funded highway projects. The FHWA audit team found that Caltrans has made progress in fulfilling responsibilities of the Pilot Program and addressed corrective actions from previous audits. For more information, please see the [Federal Register notice](#).

Successes in Stewardship is a Federal Highway Administration newsletter highlighting current environmental streamlining and stewardship practices from around the country. To subscribe, visit http://environment.fhwa.dot.gov/sis_registration/Register.aspx or call 617-494-2273.